

# The BRIDGE

Civil, Architectural and Environmental Engineering

Spring 2014 | Vol. 32



*Reusing scrap tires*

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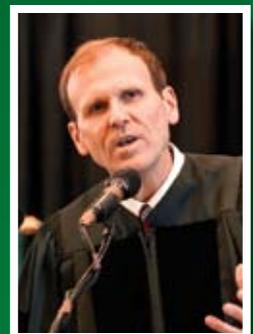
MISSOURI  
**S&T**



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# Message

## from the associate chair

**Joel G. Burken, Ph.D., P.E., BCEE**

The CArE Department is entering an exciting time with new, engaging opportunities on the horizon. We are still working toward our vision, which includes program changes, expanded learning opportunities, improvements in laboratory facilities, and new scholarships and fellowships for the undergraduate and graduate students who will CHANGE THE WORLD.

Within our faculty ranks, we are pleased to announce **Genda Chen** has been named the Robert W. Abbett Distinguished Chair in Civil Engineering, and we are currently searching for five new faculty members.

In addition, a cross-campus effort led by **Kamal Khayat** was selected as a campus strategic “signature area.” This multidisciplinary investment in talent and facilities will propel the international reputation of sustainable infrastructure materials at Missouri S&T.

We also pay tribute to a prominent author that scripted part of our current legacy. **Paul Munger** leaves behind a 40-year career as a student and faculty member. We commemorate him as a mentor, teacher and friend who inspired us to advance our institution and the civil engineering profession.

Excellence has been a long-standing tradition by students from Rolla, and we are pleased to celebrate gifts such as the **Aaron and Zelda Greenberg** Scholarship — a \$1.6 million endowment to support civil, architectural and environmental engineering students. These students have remarkable role models to emulate, such as the eight new members of the Academy of Civil Engineers that were inducted in April.

To ensure our students (i.e. future alumni) have premier instruction, we are thrilled to offer two new junior named faculty awards. The **Bryan A. and Jeanne Stirrat** Faculty Excellence Award and the **Francisco M. Benavides** Faculty Excellence Award. These awards denote and entice excellence among our professors. We greatly appreciate these gifts and the alumni who have helped us create and advance our exciting vision.

For nearly 150 years, S&T has fostered discovery and creativity that applies knowledge in bold new ways to turn ideas into realities. Many of our faculty members and students are highlighted on the pages that follow for their activities and research. Please take a few minutes to read these stories.

Great things are happening within the department and will continue well into the future. Please join us as we endeavor to CHANGE THE WORLD for the better.



### ACML Lab Inauguration

During S&T Academy of Civil Engineers weekend, the Center for Infrastructure Engineering Studies (CIES) celebrated the inauguration of the Advanced Construction Materials Laboratory (ACML). The renovated laboratory showcased over 35 recently purchased pieces of specialized equipment, made possible by a grant from the U.S. Department of Transportation in the amount of \$2.25M. This equipment will enable the development, manufacturing, and implementation of advanced and sustainable materials for transportation infrastructure, with emphasis on concrete.

Visit the department website at [care.mst.edu](http://care.mst.edu) or follow us on Facebook at MissouriSandTCArE





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Scrap tires could gain a new purpose as ingredients for construction materials, thanks to research at Missouri S&T.

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## Chemical transport in plants likened to that of humans

Similarities could make it easier to assess chemical risks for both people and plants, and may even lead to a new approach to testing medications.

### Academy Poster Contest

**Kerry Magner**, a Ph.D. student, visits with **John Mathes**, an S&T Academy of Civil Engineers member, about his research poster. (see page 18)

### DEPARTMENT ADMINISTRATION

**Department Chair** William P. Schonberg, Ph.D., P.E.

**Associate Chair** Joel Burken, Ph.D., P.E., BCEE

#### Assistant Chairs

Civil: Ronaldo Luna, Ph.D., P.E.

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

Environmental: Mark Fitch, Ph.D.

Graduate Program: Cesar Mendoza, Ph.D.

#### Undergraduate Advising Center Director

Eric Showalter, Ph.D., P.E.

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Letters should include the writer's full name, address, email and daytime phone number. Copy may be edited for clarity and space.

### Getting a round in before the rain.

Academy of Civil Engineers  
Golf Tournament 2014



*Scrap*

# *tires*

*used to boost*

*masonry blocks*

**Scrap tires could  
gain a new purpose  
as ingredients for  
construction materials,  
thanks to research  
at Missouri S&T**

Story by Linda Fulps  
Photos by B.A. Rupert



Discarded tires are a big problem. Landfills are teeming with them and they can harbor disease-carrying mosquitos and rodents. Stockpiles of old tires also burn easily — creating fires that can quickly get out of control and may burn for months or even years.

But the longevity and resilience of scrap tires also makes them ideal for other uses. **Dr. Mohamed ElGawady**, a researcher at Missouri S&T, is currently testing new masonry blocks made with ground tires.

“Rubber has a lot of benefits in addition to its sustainability,” says ElGawady, associate professor specializing in structural engineering. “It’s very durable and provides good insulation. Among their many potential benefits, these new blocks could cut heating bills by 50 percent.”

ElGawady has been working with Midwest Block and Brick, a Jefferson City, Mo.-based company, to create the blocks, which are made from sand and scrap tires ground to fine particles.

These rubber-added blocks, called rubberized blocks, were constructed with a variety of ratios of sand and rubber particles before coming up with the right balance.

“The rubber makes the blocks a bit weaker, so after testing various percentages, we now only replace about 20 percent of the sand with rubber, so the blocks retain their strength,” ElGawady says.

He and his students use a compression machine to test and compare the strength of prisms built with the rubberized blocks to conventional concrete masonry blocks.

Both rubberized and conventional blocks are being tested in an environmental chamber at S&T.

In the chamber, the blocks undergo cycles of extreme temperatures and

humidity levels, simulating different weather conditions. The rubberized blocks are also tested under cyclic compression loads simulating earthquake loads.

“Construction with these new blocks could improve a building’s resiliency during an earthquake by acting as shock absorbers,” says ElGawady.



**Dr. Mohamed ElGawady, associate professor specializing in structural engineering (right), with graduate student Ahmed Gheni.**

**“Construction with these new blocks could improve a building’s resiliency during an earthquake by acting as shock absorbers.”**

**— Dr. Mohamed ElGawady**

# Advanced materials is among first 'signature' areas named

By Andrew Careaga

Missouri S&T has made significant headway in carrying out its strategic plan by identifying two of four areas in which the campus aims to achieve best-in-class, or signature, status as a research university.

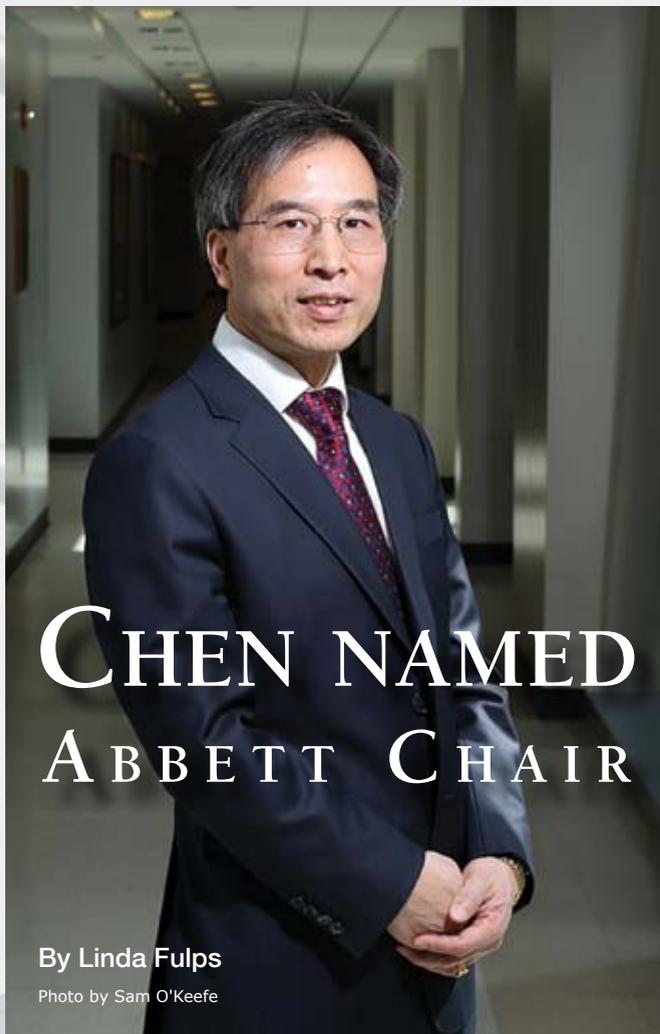
The two areas — advanced manufacturing and advanced materials for sustainable infrastructure — were chosen from among 15 proposals submitted by Missouri S&T faculty. The proposals and subsequent presentations were screened by a committee of faculty representatives from all academic areas on campus, then selected by S&T Chancellor **Cheryl B. Schrader** and Provost **Warren K. Wray**. The proposals were judged on how well they connected to long-term critical national issues, research and entrepreneurship potential, and alignment with Missouri S&T's strategic plan.

"From the beginning, we have known that to successfully implement our strategic plan, we would have to focus on signature areas of excellence," Schrader says. "Our plan isn't about being everything to everyone. It is about deciding where it makes the most sense to invest, enable and grow, and providing the best return on that investment to our customers. These two areas represent a bold step in the future vitality of this university and will offer research and educational solutions to benefit Missouri, the nation and the world."

*(continued on page 11)*



**The signature area of advanced materials for sustainable infrastructure will focus on the rehabilitation of urban mass-transportation centers. It encompasses four S&T research centers and six academic departments and will be led by Dr. Kamal Khayat, the Vernon and Maralee Jones Professor of Civil Engineering and director of Missouri S&T's Center for Infrastructure Engineering Studies.**



## Genda Chen has been named the Robert W. Abbett Distinguished Chair in Civil Engineering at Missouri S&T.

**Dr. Genda Chen**, professor of structural engineering at S&T, has been named the Robert W. Abbett Distinguished Chair in Civil Engineering. The appointment takes effect July 1.

The chair was established in 2005 through a gift from the estate of Robert W. Abbett, a 1927 civil engineering graduate of the university.

“We are very pleased that Dr. Chen will take on this new challenge,” says Dr. Cheryl B. Schrader, chancellor of Missouri S&T. “He brings a wealth of experience and innovation to the infrastructure area.”

A member of the Missouri S&T faculty since 1996, Chen is associate director of the Mid-America Transportation Center, a consortium of eight universities designated as the Region VII University Transportation Center by the U.S. Department of Transportation.

After earning a Ph.D. degree in 1992 from The State University of New York at Buffalo and completing postdoctoral training at the National Center for Earthquake Engineering Research, Chen joined Steinman Consulting Engineers, a New York City-based bridge consulting firm. In 1993, he was hired as a lead seismic analysis engineer on the seismic evaluation project for the Queensboro Bridge, a double-deck, double-cantilever bridge that spans the East River in New York, the first major project of its kind on the East Coast.

Chen has been widely published for his pioneering research on structural behavior monitoring, inorganic enamel coating of steel rebar for enhanced corrosion resistance and bond strength in concrete, and a damping-enhanced strengthening strategy for performance-based earthquake engineering.

He was the lead inventor on a patent granted in 2008 for strain-sensitive coax cable sensors for monitoring structures, in collaboration with Dr. James L. Drewniak, Curators' Professor of electrical and computer engineering at Missouri S&T, and Dr. David Pommerenke, professor of electrical and computer engineering at S&T. He was co-inventor on a patent granted in 2011 for corrosion-resistant glasses for steel enamels granted in collaboration with Dr. Richard K. Brow, Curators' Professor of materials science and engineering at S&T.

Chen received the National Science Foundation's Faculty Early Career Development (CAREER) Award in 1998; the Joseph H. Senne Jr. Academy of Civil Engineers Faculty Achievement Award in 2004; and Missouri S&T Faculty Research Awards in 2009, 2011 and 2013.

He is active in the American Concrete Institute, American Society of Civil Engineers, Earthquake Engineering Research Institute, International Society of Optics and Photonics, International Society for Structural Health Monitoring of Intelligent Infrastructure, Structural Engineering Institute and Transportation Research Board. He is associate editor of the *ASCE Journal of Structural Engineering* and was a recent guest editor of *Structural Engineering and*

*(continued on page 8)*

# 2013 CTIS Student of the Year: Mahdi Arezoumandi

For the past 22 years, the U.S. Department of Transportation has honored an outstanding student from each University Transportation Center (UTC) at a special ceremony held during the Transportation Research Board (TRB) Annual Meeting in Washington, D.C. This year, the Center for Transportation Infrastructure and Safety (CTIS) selected **Mahdi Arezoumandi**, pictured left, as its Outstanding Student of the Year.



### Student Profile:

Arezoumandi graduated in December 2013 from Missouri S&T with a Ph.D. in civil engineering. His graduate research topic studied shear and fracture behavior of high performance concretes. He is a friend of TRB AFF30 Committee (Concrete Bridges), TRB AFN10 Committee (Basic Research and Emerging Technologies Related to Concrete) and TRB AFN20 Committee (Properties of Concrete). He is also a member of ACI committees 408 (Development and Splicing of Deformed Bars) and 445 (Shear and Torsion).

Arezoumandi received the Nevada Medal in 2013 for his distinguished graduate student paper in bridge engineering. In addition he received a Post Tensioning Institute Scholarship in 2013 and a Chi Epsilon Scholarship in 2012.

### Selection Criteria:

Arezoumandi was selected as the Outstanding Missouri S&T UTC Student of the Year for his outstanding academic performance, as well as the technical merit and national importance of his research. Arezoumandi obtained his undergraduate and master degrees from Amirkabir University in Tehran, Iran. **Dr. Jeffery Volz**, a former faculty member, was his advisor.

## Oerther elected treasurer of AAEES

By Peter Ehrhard

Starting in January 2014, **Dr. Daniel Oerther**, the John A. and Susan Mathes Professor of Environmental Engineering at S&T, will begin a three-year term as treasurer of the American Academy of Environmental Engineers and Scientists (AAEES).

The nearly 3,000 members of AAEES are licensed professional engineers who have received additional training and testing to become board certified. As leaders in the environmental engineering profession, AAEES is responsible for accreditation of degree programs at universities and advising federal, state and local governments.

Oerther's duties will include planning and fiscal management of an annual budget of approximately \$1 million dollars and a staff of six full-time employees, all located in Washington, D.C.

## CHEN NAMED ABBETT CHAIR CONTINUED FROM PAGE 7...

*Mechanics: an International Journal*. He has served in leadership roles in ASCE committees and as an executive member of the U.S. Panel on Structural Control and Monitoring. He was elected an ASCE Fellow in 2007 and SEI Fellow in 2013.

Chen was an invited member of the U.S. Department of Transportation's post-earthquake reconnaissance

teams following the 2008 earthquake in China and the 2010 earthquake in Chile, as well as the DOT's post-earthquake study tour following the Great East Japan Earthquake in 2011. He also served on the U.S. Geological Society's post-hurricane reconnaissance team following the 2005 Atlantic hurricane.

# DAVID RICHARDSON

CE'71, MS CE'73, PhD CE'84

*Associate Professor*  
Materials Engineering



Photos by Bob Phelan

## *Gifted in* **PAVEMENT & ENTERTAINMENT**

**Dr. David Richardson** is a modern-day Renaissance man. He's equally at home as a construction materials engineer, playing mandolin, building and repairing things in his shop, remodeling buildings or working on his farm. Also known as that entertaining "asphalt guy from Rolla," Richardson, CE'71, MS CE'73, PhD CE'84, is an associate professor of civil engineering and leader of a bluegrass band.

His wide variety of interests and well-rounded accomplishments include:

- **An important job.**

Richardson began his career on the Missouri S&T campus as a student in the civil engineering department in

the late '60s. Since then, he has practiced engineering in the geotechnical, environmental, transportation, materials, structural, hydraulics/hydrology and construction fields.

His varied career includes working as a carpenter, boilermaker, inspector, construction engineer, design engineer, laboratory director, and businessman, the latter as owner of a commercial testing laboratory and partner in an engineering consulting firm. Returning to campus as an assistant professor in 1984, he focused on making a difference in the lives of students and has received 11 Outstanding Teaching Awards — the most of any current faculty

member on campus. Historically, he ranks second behind retired faculty member, **Dr. William Andrews**, who won a total of 13 awards. As one student says on the rate-my-professor website, "If you want to learn, really learn the subject, this is the go-to guy!" Not only a great teacher, he has also won several advising awards and national research and teaching awards. As a result of his broad educational background (B.S. in civil, M.S. in environmental, and Ph.D. in geotechnical engineering), he has published over 45 papers and reports in a wide variety of disciplines, including geotechnical, construction materials, geological, hydraulic, and structural engineering, has conducted

*(continued on the next page)*

# Gifted in PAVEMENT & ENTERTAINMENT

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more than 135 Superpave short courses, 60 conferences, and taught more than 4,500 students while at S&T.

- **A modest art collection.**

His “art” collection includes many samples of pavement, including some from the legendary AASHTO Road Test. From aggregate particle shapes to concrete specimens, these are possessions that he talks about with interest. He also brings up tattoos a lot, encouraging his students to get two: “Lower w/c, Good Curing” and “Bricks Grow, Blocks Shrink.”

- **The library.**

Few people possess more published literature on pavements and construction materials than Richardson, and if he can't find what he's looking for in his personal collection, he is just a hop, skip or click away from the Curtis Laws Wilson Library.

- **Appreciation of music.**

Bluegrass music tugs at Richardson's heartstrings. He has played and sung bass and baritone with country and

bluegrass bands and in a gospel quartet, producing four CDs. At present he plays the mandolin, sings high tenor backup and lead vocals for his bluegrass band, Dixie Union. The band performs at festivals, fairs, church events, trail rides, picnics, benefits, pubs, on the radio, and at the Missouri State Fair, where it placed second in the bluegrass band competition.

- **A wide circle of acquaintances.**

He is a member of several organizations including: the American Society of Civil Engineering (ASCE), the American Concrete Institute (ACI), and the Association of Asphalt Pavement Technologists (AAPT).

Like one of his favorite bluegrass tunes, his circle of friends and acquaintances will be unbroken and he believes “There's a better home a-waiting in the sky...” Richardson has been an elder and treasurer at every church he has joined. He also cuts and delivers



several cords of firewood each year for a local charitable organization.

- **Sports and dance.**

As captain of S&T's swimming team, Richardson set two varsity records, and remained competitive in swimming until the age of 30. Out of the water, he enjoys dancing and once took first place in a clogging contest at Silver Dollar City.

- **An interesting man.**

While his credentials are impressive, more impressive is the man himself. Richardson is a humble, all-around great guy with a hearty — but sometimes dry — sense of humor. Even after 30 years at S&T, he continues to work hard and is enthusiastic about aggregate, asphalt, concrete and masonry research and education. Every day he hopes to inspire his students to keep learning, broaden their interests and seek to become keepers of the Renaissance spirit.



Richardson pictured in his 1971 swimming team photo.

## 'Signature' areas (continued from page 6) ...

Attaining signature status in these areas means that Missouri S&T will build on their distinctive strengths in teaching and research to make the areas among the nation's best, Schrader says. To better position S&T to achieve this status, last September Schrader announced new funding from campus and the University of Missouri System to support the hiring of additional faculty in signature areas, as well as in other areas of strategic importance. In all, S&T plans to add 100 new faculty positions by 2020, an increase of nearly 20 percent.

In the signature area of advanced manufacturing, S&T will emphasize instruction and research in the fields of additive manufacturing; energy manufacturing; micro- and nano-scale manufacturing; network-centric and cloud manufacturing; advanced materials for manufacturing; and intelligent, sensor-enabled manufacturing.

The area will be led by Dr. Ming Leu, the Keith and Pat Bailey Missouri Distinguished Professor of Integrated Product Manufacturing and involve a team of multidisciplinary researchers.

"This is a perfect fit for Missouri S&T because of the national importance of advanced manufacturing, the existing S&T strength in this area and our confidence in developing it to be among the best in the nation," Leu says.

The signature area of advanced materials for sustainable infrastructure will focus on the rehabilitation of urban mass-transportation centers, including highways, bridges, tunnels, rail, airports, and port and water navigation channels, as well as utility and nuclear infrastructure.



*"Infrastructure is the foundation that connects the nation's businesses, communities and people, driving our economy and improving our quality of life."*

— Dr. Kamal Khayat

It encompasses four S&T research centers and six academic departments and will be led by **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).

Those from the department of civil, architectural and environmental engineering working with Khayat include **Dr. William Schonberg**, chair of the department, **Dr. John Myers**, professor specializing in structural and architectural engineering and **Dr. Dimitri Feys**, assistant professor specializing in materials engineering.

"Infrastructure is the foundation that connects the nation's businesses, communities and people, driving our economy and improving our quality of life,"

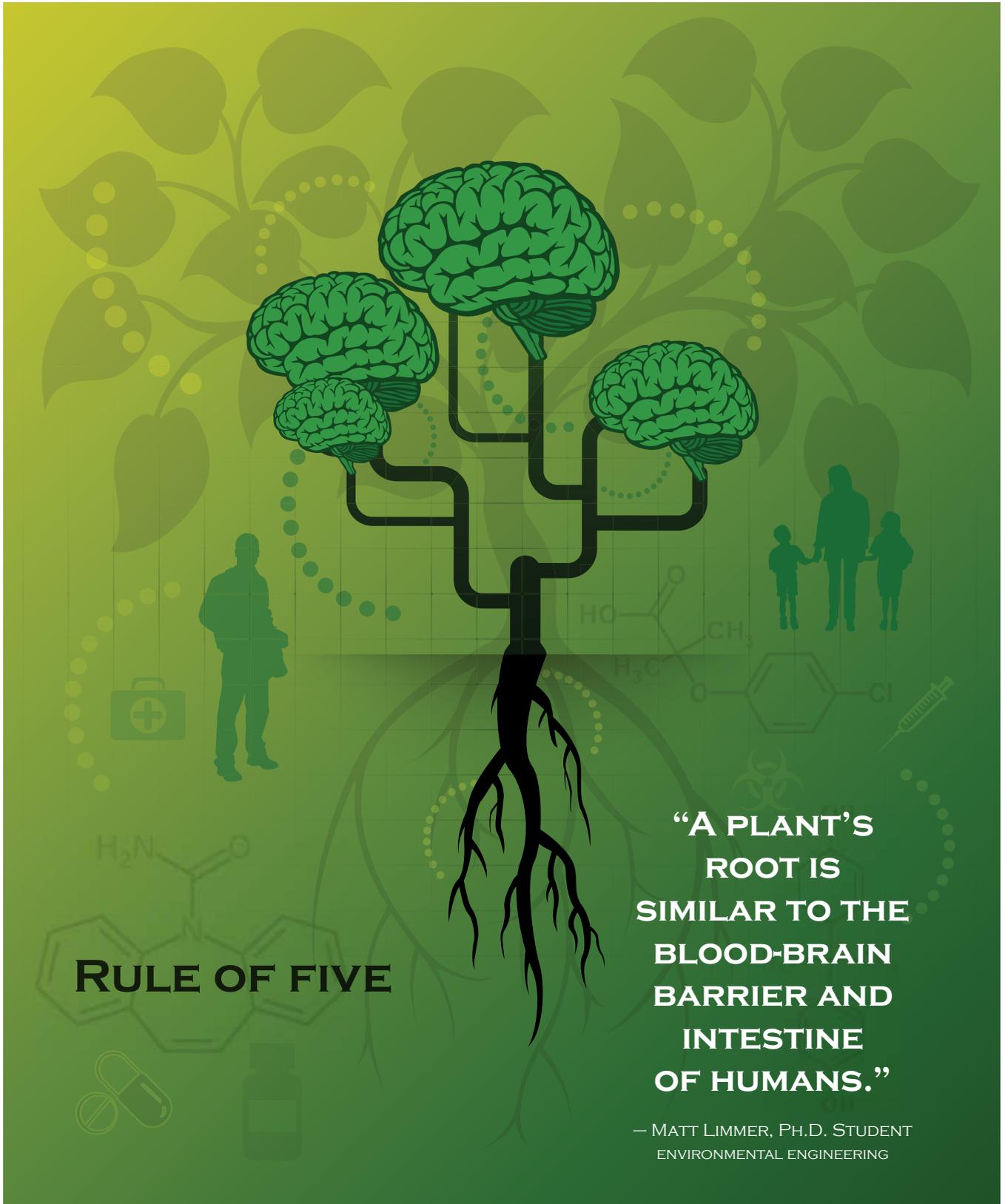
says Khayat. "Missouri S&T has existing strengths in this area and with further emphasis, we can become a best-in-class leader."

## U.S. News ranks S&T among top online graduate programs

Fourteen online master's degree programs at Missouri S&T were ranked among the best in the country in three categories, according to *U.S. News & World Report's* 2014 Best Online Programs Rankings. These rankings were released in January and are available online at [www.usnews.com](http://www.usnews.com).

S&T's online graduate engineering programs were tied for 17th place overall and ranked 13th among public universities. S&T offers online graduate degree programs in 11 disciplines, including civil and environmental engineering.

S&T began its first online degree program in 1998. Today S&T offers online graduate degree programs in 17 disciplines. More information about Missouri S&T's online degree programs is available online at [dce.mst.edu](http://dce.mst.edu).



**RULE OF FIVE**

**“A PLANT’S  
ROOT IS  
SIMILAR TO THE  
BLOOD-BRAIN  
BARRIER AND  
INTESTINE  
OF HUMANS.”**

— MATT LIMMER, PH.D. STUDENT  
ENVIRONMENTAL ENGINEERING

By Linda Fulps

# CHEMICAL TRANSPORT IN PLANTS LIKENED TO THAT OF HUMANS



Plant roots and certain human membrane systems resist chemical transport in much the same way, say researchers at Missouri S&T in a recent journal article that was highlighted in *Science* magazine. This similarity could make it easier to assess chemical risks for both people and plants, and may even lead to a new approach to testing medications.

“A plant’s root is similar to the blood-brain barrier and intestine of humans,” says **Matt A. Limmer**, a doctoral student in environmental engineering at Missouri S&T. “It’s amazing when you think about it — plants and animals evolved separately but somehow developed comparable structures to control transport of water and dissolved chemicals.”

**Dr. Joel G. Burken**, professor of civil and environmental engineering and director of Missouri S&T’s Environmental Research Center, is working with Limmer to study how these systems all act as barriers to outside substances, allowing some in and repelling others. A substance’s movement through a plant, or translocation, is measured by how efficiently it moves from the root to the plant’s shoot.

Considering the multitude of chemicals used in industry, testing each to determine how well it moves through a plant would be an exhaustive undertaking. Instead, using computer models, Limmer studied measurements of 110 compounds using 21 types of plants with a method originally applied to orally administered pharmaceuticals, Dr. Christopher A. Lipinski’s “rule of five.”

“Lipinski’s rule of five looks at the commonality of drugs that work,” says Limmer. “It shows that drugs are more likely to be absorbed by the human intestine if the compounds have five or fewer hydrogen bond donors, 10 or fewer hydrogen bond acceptors, and a molecular mass of less than 500, among additional similar constraints.”

Limmer says that this “rule of five” has successfully predicted the absorption, distribution, metabolism and excretion of compounds, and has been used to speed up the discovery

of new drugs as well as evaluating pollutant transport.

“These rules are popular because they’re so easy to implement and the parameters are easy to calculate,” he says. “In risk assessment we usually take a tiered approach. Our study would be a first pass: Does this chemical appear to pose a concern to the food chain? If so, we need to try something else or gather experimental data.”

Limmer’s findings were published in the February 2014 issue of the journal *Environmental Science & Technology Letters* and highlighted in the March 21, 2014, issue of *Science* magazine. His paper “Plant Translocation of Organic Compounds: Molecular and Physicochemical Predictors,” was co-authored by Burken.



**Pictured above: Matt Limmer (left), a doctoral student in environmental engineering who plans to graduate in 2014, and his advisor, Dr. Joel Burken.**

## Oerther appointed to STTI board

By Peter Ehrhard

**Dr. Daniel Oerther**, the John A. and Susan Mathes Chair of Environmental Engineering at S&T, will begin a four-year appointment to the seven-member board of the Sigma Theta Tau International (STTI) Honor Society of Nursing Building Corp. beginning in January 2014.

STTI is composed of three primary organizations including: the honor society, the foundation and the building corporation. Organized as a 501(c) (2) in 1993, the building corporation manages global real estate assets for the organization including the 40,000-square-foot international headquarters located at Indiana University.

Oerther is one of three appointees of Hester Klopper, the president of STTI. His appointment is based in part on his experience in sustainable buildings. Oerther and his family resided in the S&T Solar Village for three years. Recently, he also served as the lead engineer in the construction of an award-winning hospital and an elementary school in rural Tanzania. Previously, Oerther served on the board for the Green Learning Station in Cincinnati, which includes the retrofit of a former gas station to include a green roof demonstration, pervious pavers and rainwater swales all to reduce gray infrastructure as part of the stormwater run-off abatement plan for metro Cincinnati.

## Study tracks chemical levels in human subjects

**Dr. Glenn Morrison**, professor of environmental engineering, spent 10 days this spring at the Technical University of Denmark (DTU), near Copenhagen, studying the way chemicals in indoor air move through the skin into our bodies. Not only did he design the experiments, he participated as a human subject.

The chemicals of interest are compounds called phthalates (pronounced \ˈthal-|āt\ ) that are found in many personal care products, plastics, furnishings and building materials. These chemicals are of concern for their ability to mimic human hormones. Many years of animal testing and epidemiological investigations have identified associations between these chemicals and the occurrence of reproductive effects and asthma.



Morrison would like to determine just how much our built environment contributes to the “body burden” of these chemicals. Specifically, he believes that transfer from air-to-clothing-to-skin-to-blood is one of the most important routes. By identifying exposure routes and sources, we can appropriately modify building materials and consumer products to make them safer.

To test his ideas, Morrison worked with researchers at DTU who have the facilities to expose human subjects to phthalates under highly controlled conditions. In the photo above, he is wearing a breathing hood with clean air to ensure that any chemicals that enter the bloodstream are coming through the skin, not by breathing them in. For two 60-hour periods, he and other professors that participated in the experiments as human subjects, had to eat a very restrictive diet of bananas and Wasa crackers. He was most enthusiastic about the post-experiment pizza. The results of the experiments look promising and should be published by the end of the year.

## SOLAR HOUSE ENERGY ANALYSIS PUBLISHED

The energy efficiencies of a solar house could result in significant energy savings, according to research by an undergraduate engineering student at Missouri S&T.

**Samantha Wermager**, a senior in civil engineering from Hokah, Minn., co-authored “Energy Analysis of a Student-Designed Solar House” with her advisor, **Dr. Stuart Baur**, associate professor of architectural engineering at S&T. The research was published Dec. 4 in the journal *Energies*.

The article presents findings from research she began through S&T’s Opportunities for Undergraduate Research Experience program. Wermager compared the energy efficiency, consumption and generation of a solar house to a traditional home of similar size and layout, built using traditional construction methods. The solar house she used was modeled after S&T’s entry into the 2013 U.S. Department of Energy Solar Decathlon.

Wermager analyzed the solar house’s design efficiency using Energy-10 software, which provides feedback on energy performance and helps identify optimum approaches to energy efficiency. For this comparison, she created a fictional American couple and estimated their energy-use habits, which she entered into the program.



**Samantha Wermager**

Energy-10 projected a 71 percent energy savings by adding energy conserving strategies like energy efficient appliances, lights and HVAC system; low emissivity windows; insulation; proper HVAC controls; duct leakage; and a solar domestic hot water heater. Wermager found that when photovoltaic (PV) arrays (linked solar panels) were also installed, the energy generated could surpass the energy consumed.

“Often ‘going green’ is seen as an expensive, cumbersome process,” says Wermager. “Yet, this research clearly shows that embracing green technologies such as a solar PV system can be not only beneficial for the environment, but also financially advantageous to the homeowner.”

Wermager says that the Energy-10 results, along with a solar-estimator calculator available from Solar-Estimate.org that helps determine the financial feasibility of installing renewable energy systems, will help homeowners and designers to see beyond the high initial costs.



## S&T Steel Bridge Team wins regional competition

The Missouri S&T Steel Bridge Design Team earned first place at the American Society of Civil Engineers’ Mid-Continent Student Conference, held Thursday, April 24, through Saturday, April 26, at Oklahoma State University in Stillwater, Okla.

Missouri S&T competed against 13 other collegiate teams at the conference. The team earned a spot at the national competition that will be held May 23-24, at the University of Akron in Akron, Ohio.

**Dr. Timothy Philpot**, associate professor specializing in structural engineering, is the Steel Bridge Team faculty advisor.



**Missouri S&T Steel Bridge Team 2014**

Photo by Bob Phelan

## Oerther selected for Environmental Engineering Education Award

**Dr. Daniel Oerther**, the John A. and Susan Mathes Chair of Environmental Engineering at Missouri S&T, has been selected as the third recipient of the Excellence in Environmental Engineering Education Award. The annual award is presented jointly by the American Academy of Environmental Engineers and Scientists and the Association of Environmental Engineering and Science Professors. Oerther received the award in April, at the National Press Club in Washington, D.C.



**Daniel and Sarah Oerther**

“Dan is the consummate professional engineer and tireless educator advocating for professional practice,” writes a former doctoral student in his nomination letter.

Oerther was selected for his “significant contributions to the profession of environmental engineering in the area of educating practitioners.” He was recognized for developing novel teaching materials that introduced genome-enabled molecular biology tools to track microorganisms in environmental

samples and advocating for experiential learning and study abroad. He was also recognized for the innovative teaching methods he uses in his Fundamentals of Environmental Engineering course at Missouri S&T, like mastery learning, a flipped classroom and asynchronous online lectures.

“I’m humbled and honored to have been selected,” says Oerther. “Teaching is a passion. Professional engineering is my love. To blend teaching and professionalism is a wonderful opportunity to grow one’s impact to make the world a better place now and for future generations.”

## GREIG JOINS DEVELOPMENT TEAM

We are please to announce that **Marcia Early Greig** joined the S&T Office of Development as senior development officer for civil, architectural and environmental engineering in April. She brings over 25 years of fund-development experience to this role. Greig will support department projects by building bridges between alumni and the university and soliciting funding.



**Marsha Greig**

## Forsee recognized by UM System

By Mary Helen Stoltz

**Gary Forsee**, former president of the University of Missouri System and a graduate of Missouri S&T, is one of eight Missourians honored for outstanding service to the University of Missouri.

Each year, the University of Missouri Alliance of Alumni Associations and Extension awards the Presidential Citation Award for Outstanding Service to the University of Missouri and its four campuses. The alliance selects one person from each campus and Extension, and the University of Missouri president selects recipients on behalf of the system.

Forsee earned a bachelor of science degree in civil engineering from S&T in 1972 and was awarded a professional degree in 2000.

Active in volunteer leadership positions for his alma mater, Forsee served Missouri S&T as both president of the Board of Trustees and chair of the Advancing Excellence campaign. He is a member of the Order of the Golden Shillelagh donor society and is an Honorary Knight of St. Patrick. Forsee was instrumental in the name change from University of Missouri–Rolla to Missouri S&T in 2008. In 2011, he was honored as one of Missouri S&T’s 28 Alumni of Influence.

Forsee served the University of Missouri as president from 2008 to 2011, focusing on making college affordable for all students and increasing the UM System’s concentration in science, technology, engineering and math (STEM). Prior to joining the UM System, Forsee served as chair and chief executive officer of Sprint from 2003 to 2007.

# Water.org co-founder tells S&T grads to follow their passion

By Mary Helen Stoltz



*“Your life should be about finding the intersection of your greatest passion and the world’s greatest needs.”*

— Gary White CE’85, MS CE’87

Let your passion lead you to address “the world’s greatest needs,” the co-founder of Kansas City, Mo., based Water.org, which helps people in developing nations gain access to safe water and sanitation, told graduates of Missouri S&T.

**Gary White**, chief executive officer of Water.org, delivered both commencement addresses at S&T in December.

White, who co-founded Water.org with actor Matt Damon, discussed his journey as a social entrepreneur and the relevance of his journey to graduates of today.

“Your life should be about finding the intersection of your greatest passion and the world’s greatest needs,” White told the graduates.

White’s entrepreneurial vision has driven innovations in the way water and sanitation projects are delivered and financed. He is a leading advisor in the water and sanitation sector and a founding board member of the Millennium Water Alliance and WASH Advocates.

During commencement, White was awarded the doctor of engineering degree, honoris causa. He earned bachelor of science and master of science degrees in civil engineering from Missouri S&T in 1985 and 1987, respectively.

White also holds a master of science degree in environmental engineering from the University of North Carolina at Chapel Hill.

In March 2009, Water.org, which White co-founded with actor Matt Damon, received the Skoll Foundation’s Award for Social Entrepreneurship and White was inducted into the community of Skoll Social Entrepreneurs. In 2009, he was named an advisor to the Clinton Global Initiative. In 2011, he was named to the TIME 100 list of the world’s most influential people. In 2012, he received the World Social Impact Award from the World Policy Institute, was named one of the Schwab Foundation Social Entrepreneurs of 2012 and was named one of Missouri S&T’s 28 Alumni of Influence.

## NEW MEMBERS

Eight civil engineers with ties to Missouri S&T were inducted into the S&T Academy of Civil Engineers in April.

### Francisco M. Benavides

CEO and President  
PENTA Engineering Corp.  
St. Louis, Missouri

### Reginald H. Benton

President and Principal  
Benton & Associates Inc.  
Jacksonville, Illinois

### Michael W. Burke

Executive Vice President  
J.S. Alberici Constructors Inc.  
St. Charles, Missouri

### John Frerking

Business Development Manager  
Engineering Surveys and Services  
Columbia, Missouri

### Dale L. Houdeshell

Director of Public Works  
City of Clayton  
Clayton, Missouri

### Ralph C. Jones

Chairman and CEO  
Structural Engineering Associates Inc.  
Shawnee Mission, Kansas

### Sanjeev Kumar

Chair, Professor and  
Distinguished Teacher  
Department of Civil and  
Environmental Engineering  
Southern Illinois  
University-Carbondale  
Carbondale, Illinois

### Alard Kaplan

Owner  
Energy Projects Consulting  
Houston, Texas

*Full bios will be published in  
the next Bridge newsletter.*

# CONCRETE EXPERT *presents Stueck Lecture*

Called one of the “10 Most Influential People in the Concrete Industry” by *Concrete Construction* magazine in 2005 for his ability to make learning about concrete behavior “fun,” Dr. Kenneth Hover presented the 2014 Stueck Lecture at Missouri S&T in April. He discussed the changes that take place during concrete’s first 24 hours. “Wild things are happening,” during this transition from a liquid to a solid, he said. “The exciting first day in the life of concrete: Chemical and physical processes at the micro-level drive macro-level construction operations” was the title of Hover’s presentation.

A professor of civil and environmental engineering at Cornell University, Hover is widely recognized as one of the top speakers on the technical aspects of concrete. He teaches concrete design and materials, and his research focuses on testing and evaluation, and the effects of weather and construction technique on concrete properties and durability.



**Dr. Kenneth Hover**

The Stueck Distinguished Lecture Series is made possible by a fund established by **Maurita Stueck** to bring additional outside perspectives to Missouri S&T students, and to honor her late husband, **Neil Stueck**, a 1943 civil engineering graduate of the university.

## POSTER CONTEST

The Civil Engineering Academy hosted its first poster contest, in the Kummer Atrium of Butler-Carlton Hall, after the Stueck Lecture in April. Posters were presented by current students and judged by Academy members. Cash prizes were awarded in graduate and undergraduate divisions. The Academy plans to make it an annual event.



**Academy member Amy Strauss visits with graduate student, Hesham Tuwair about his research poster.**

# HONORING PAUL MUNGER: PROFESSOR, MENTOR, FRIEND

We lost a key author of the S&T civil engineering legacy this spring with the passing of **Dr. Paul R. Munger**, on April 19 at the age of 82.

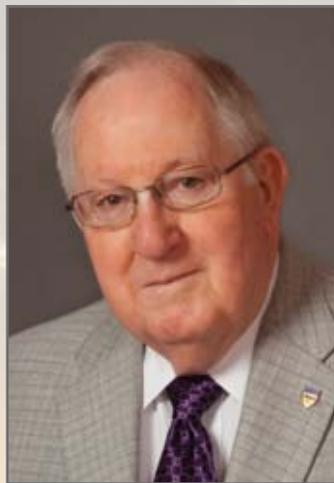
Munger was a S&T alumnus who earned bachelor of science and master of science degrees in civil engineering in 1958 and 1961, respectively. He earned a Ph.D. from the University of Arkansas in 1972 and was a member of the S&T Academy of Civil Engineers. He joined the S&T faculty in 1958 and retired in 2000 as professor emeritus of civil engineering.

“Paul demonstrated professionalism in all that he did for students and the civil engineering profession, but most of all he was a great friend and family man,” says **Reginald H. Benton**, S&T Civil Engineering Academy member.

Paul was a dedicated servant to the profession about which he was so passionate. He served on the Missouri Board for Architects, Professional Engineers and Land Surveyors for 17 years, with 14 years as chair. During this time, Munger was involved in the investigation of the 1981 collapse of the Hyatt Regency skywalks in Kansas City, Mo., one of the deadliest structural failures in U.S. history. He led the licensing disciplinary actions following the tragedy. Engineering ethics and the events of the Hyatt failure as a case study were interwoven throughout the remainder of Paul’s career, and he traveled far and wide to give talks and lead efforts to strengthen engineering ethics nationwide.

His work to change registration procedures following the collapse earned Munger the Outstanding

Service Award from the Missouri Society of Professional Engineers and the Distinguished Service Award from the National Council of Examiners for Engineering and Surveying. His work on ethics is still highlighted on the ASCE national website [www.asce.org](http://www.asce.org).



“AIM ABOVE  
MORALITY.  
BE NOT  
SIMPLY GOOD,  
BE GOOD FOR  
SOMETHING.”

- HENRY DAVID THOREAU

His extensive leadership roles included serving as national president of Chi Epsilon, president of the NCEES, president of the National Institute of Engineering Ethics, charter president

of the Council of Engineering Specialty Boards and president of the National Council of Engineering Ethics.

Paul’s awards and accolades are plentiful, but far more numerous are the students whose lives he impacted as a faculty member, mentor and friend. He will be remembered for having an open door, attending student meetings late into the evening, and being a steadfast professor, willing to teach all that were willing to learn.

“The phrase ‘he is a gentleman and a scholar’ certainly is an excellent way to describe the life and professional career of Paul Munger,” says longtime friend, **Jerry Bayless**, associate professor of civil engineering.

“His service and scholarly activities were exceptional,” Bayless says. “Professors Butler and Carlton were two of the Missouri engineers who were instrumental in organizing the Missouri Society of Professional Engineers and securing the legislative approval of Missouri’s first engineering licensing bill. Paul not only carried on that tradition of engineering professionalism, but enhanced it greatly through his work in promoting the ethical practice of engineering. He was truly passionate about his chosen profession up until the day of his passing.”

“When I joined the civil engineering faculty as an instructor in 1959, Paul, a veteran of one year, took me under his wing and there I remained for the next 55 years. Above all else he loved his family dearly,” says Bayless.



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From left, graduate student Alex Griffin and Ph.D. candidates Eli Hernandez and Hayder Alghazali work with professor John Myers on the design and construction of a new highway bridge that uses new longer-lasting concrete beams developed at Missouri S&T.

