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The Bridge Newsletter Spring 2015

Missouri University of Science and Technology

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The BRIDGE

Civil, Architectural and Environmental Engineering

Spring 2015 | Vol. 34



Wastewater treatment technologies that cost less and save energy

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MISSOURI
S&T



Open windows and air quality ...
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NASA honors Schonberg ...
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Message from the Chair

William P. Schonberg, Ph.D., P.E.

As many of you may already know, I am stepping down as chair of the department effective the end of this academic year. The following paragraphs highlight the major transformations and advancements that we as a team of faculty, staff, alumni and students have achieved in the Missouri S&T Civil, Architectural and Environmental Engineering Department since my arrival at S&T in the fall of 1999.

► Educational Programs Offered

1999: One accredited undergraduate program (BSCE), three graduate programs (MSCE, MSEnvE, PhDCE)
2014: Three on-site accredited undergraduate programs (BSCE, BSArchE, BSEnvE), one off-site accredited undergraduate program (BSCE); on-site graduate programs unchanged, but plans being developed to implement additional graduate programs in architectural engineering and in environmental engineering; also, two off-site M.S. programs (in CE and in EnvE) at Fort Leonard Wood.
Benefit: Portfolio of programs expanded to meet undergraduate and graduate educational needs of state, region and nation.

► Student Enrollments

1999: Undergraduate – 277; graduate – 76
2014: Undergraduate – 403; graduate – 139
Benefit: Faculty can draw from a wider pool of graduate students to support them in their research; undergraduate students are more diverse since introduction of new B.S. degree programs; undergraduate students are more qualified following adjustment of program entry requirements in accordance with new Strategic Plan.

► Research Awards

1999: \$1.3M
2014: \$5.4M
Benefit: Faculty and their research programs are more productive and more visible on national and international levels.

► Directed Alumni Contributions to Department (Annual Department Phonathon)

1999: Approximately \$33K/year average
2014: Over \$120K/year average
Benefit: Increased stability in department's budget and annual expenditures; department operations are less susceptible to yearly budget fluctuations.

► Marketing and Public Relations

1999: Minimal (semi-annual black-and-white newsletter sent primarily to alumni)
2014: Robust marketing campaign supported by an in-house communications specialist; variety of full-color publications mailed nationwide to alumni, other department chairs, and engineering deans; publications include: (1) *The Bridge*, (2) *Common Ground* – a NEW publication showcasing accomplishments of student groups, (3) *Faculty Scholarly Productivity* – a NEW publication highlighting faculty research and scholarly accomplishments, (4) a *New Faces Brochure* – a NEW publication introducing new faculty to the academic community, (5) *Vision 2020* – the department's Strategic Plan and annual updates, (6) *By the Numbers* – a flyer succinctly highlighting new and/or exciting departmental characteristics, and (7) numerous other faculty- and student-related brochures, flyers, etc.
Benefit: Increased ability to better inform alumni, constituents, and colleagues of the many exciting activities and accomplishments of the department's faculty, staff, students and alumni.

► Department Budget and Budgeting Processes

1999: Haphazard accounting, bookkeeping, etc.
2014: Streamlined accounting and budgeting processes
Benefit: Department is able to deliver its instructional programs at the high level that is expected of the top department at Missouri S&T; increased budget stability also allows Chair and staff to perform more accurate budget forecasts and to meet unexpected budget needs as they arise.

(continued on page 4)



Pictured above: An outside view of the new Hasselmann Alumni House and Matt Coco, second from left, with his family during the dedication ceremony.

Hasselmann Alumni House

Matteo “Matt” Coco, a 1966 civil engineering graduate, contributed a generous amount of time and energy toward completion of Hasselmann Alumni House. Coco’s expertise in construction and the generosity of many other donors helped build a house where 57,000 S&T alumni now have a permanent gathering place that “feels like home.”

THANK YOU to our many donors!

Thomas Abernathy, CE’52
 Paul Andrew, CE’81
 Charles Atkinson, CE’65
 Wendy Bailey, ArchE’07, MS CE’08
 Robert Bay, CE’49
 Jerry Bayless, CE’59, MS CE’62
 Steven Beattie, CE’98
 Tracy Beattie, CE’98, MS EMgt’01
 Robert Berry, CE’72
 Raymond Betz, CE’66
 Robert Brinkmann, CE’71
 Preston Carney, CE’02, MS CE’03
 Matteo Coco, CE’66
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 Landon Viles, CE’49
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 Amanda Withers, CE’99, MS EnvE’02
 Michael Woessner, CE’76
 Christopher Yarnell, CE’84

Search “Missouri S&T’s new alumni house” on YouTube to view a video introducing Hasselmann Alumni House.

The BRIDGE

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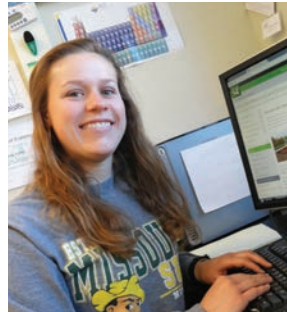
New column testing

One of our researchers is testing a new kind of hollow concrete column

6

Farmstead project

Students gain real-world experience on the construction and preservation of historic buildings



Gibler honored

Madison Gibler, a master’s student in environmental engineering, took second place for her paper titled, “Comprehensive Benefits of Green Roofs,” in the Graduate Division of the

2015 Environmental and Water Resources Institute (EWRI) Student Technical Paper Competition. Her advisor is **Dr. Joel Burken**.

DEPARTMENT ADMINISTRATION

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

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

Assistant Chairs

Civil: Genda Chen, Ph.D., P.E., F.ASCE

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.

Message from the Chair (continued from page 2)

► Interaction with Non-STEM Departments

1999: Minimal

2014: Significant and varied: (1) required art and history classes are part of the BSArchE curriculum; (2) department-led effort to save Orientation Week reading program from cancellation; (3) department supports campuswide weekly film program; (4) seed money provided by department for new campus Hispanic Film Festival; (5) faculty from English and psychology departments frequent guest lecturers

Benefit: Department is a more integral part of the university community while still maintaining its leadership position on campus.

► Alumni/Industry Undergraduate Scholarships

1999: 39

2014: 77

Benefit: Enhanced ability to recruit exceptional undergraduate students; Greenberg Scholars Program developed to support BS+MS students as part of new Strategic Plan.

► Alumni/Industry Graduate Fellowships

1999: 2

2014: 9

Benefit: Enhanced ability to recruit exceptional graduate students.

► Distance Education Operation

1999: Minimal, with faculty driving 100 miles to St. Louis to deliver courses in person to students living and working in the St. Louis area

2014: Extensive internet-based course delivery to place-bound students around the world

Benefit: Increased access of working professionals to our courses and degree programs; income-sharing arrangement with faculty and university has created a new income stream for the department; more efficient use of faculty time.

► Strategic Planning

1999: Had just begun

2014: Fully mature; department fully engaged in new Strategic Plan that has specific goals and objectives related to undergraduate students and program, graduate students and programs, faculty development and retention, and faculty enhancements

Benefit: Faculty and alumni have a cohesive sense of purpose regarding the future of the department and its education, research and technology transfer programs. New initiatives such as the Greenberg Scholars Program and the Stirrat and Benavides Faculty Scholars Program showcase exciting activities of our faculty and students.

► Facilities

1999: 40-year-old 90,000 sq.ft. building, outdated laboratories and equipment

2014: new 150,000 sq.ft. building, state-of-the-art teaching and research facilities; planning under way for additional laboratory expansions and enhancements

Benefit: Students and faculty excited to learn and work in new facilities; also serves as a major recruiting tool for visiting students and parents.

► Faculty Numbers

1999: 16 full-time faculty

2014: 25 full-time faculty

Benefit: Increased numbers and broader diversity of faculty allow increased program and course offerings as well as growth in research activities.

► Faculty Mentoring and Support

1999: Minimal; rudimentary policies regarding promotion and tenure

2014: (1) Formal mentoring process in place; (2) sustainable processes in place taking advantage of income from

new or expanded auxiliary enterprises to support start-up funds for new hires and support for development activities for new faculty; (3) clear, articulate promotion and tenure policy

Benefit: Has allowed department to sustain a growth mode in terms of its portfolio of program offerings, student enrollment, research awards, faculty and staff, and directed alumni contributions.



► Faculty Retention Programs

1999: None

2014: Alumni-funded Faculty Scholars Program in place to recognize, support, and retain promising junior faculty in accordance with new Strategic Plan

Benefit: Department is able to retain “rising star” faculty and able to provide resources to facilitate their career advancement.

(continued on page 18)



Dr. Mohamed ElGawady, pictured front row wearing a green hard hat, and his students tested a hollow core FRP-concrete-steel column. The Department of Bridge Office Engineers from MoDot, pictured wearing yellow hard hats, were onsite for the testing.

Researcher strengthens concrete by hollowing it

By Peter Ehrhard

New concrete bridge columns formed by **Dr. Mohamed ElGawady**, an associate professor of structural engineering at Missouri S&T, feature a steel tube surrounded by 3 inches of concrete. The columns are covered by a fiberglass-reinforced polymer coating. This work is the first large-scale research project of its kind in the United States.

“The polymer coating on the outside extends the lifespan of the bridge and protects it from corrosion,” says ElGawady. “Our final step in the process is perfecting the cohesion between the concrete and the polymer to ensure a firm bond.”

Although the columns use far less concrete than current practice, vehicle impact simulations show that they can withstand the same amount of force. Damage to these hollow pillars is transferred throughout the structure, minimizing damage to the overall column. In a similar vehicle impact analysis, current bridge supports sustain localized damage, which requires immediate repairs — sometimes repairs are as extreme as removing and replacing entire columns.

ElGawady has also conducted earthquake simulation tests, which monitor the flexibility of the bridge. The expected average flex in bridges during moderate earthquake conditions is 4 percent, but the hollow columns can withstand a flex of up to 15 percent. This difference could be key to preserving infrastructure in earthquake-prone or extremely windy locations, he says.

When used, ElGawady’s new columns will be pre-fabricated and then delivered to construction sites. A typical bridge column takes 15-18 hours to create, but these hollow supports can be completed in a couple of hours because the inner steel pipe and outer polymer pipe act as a stay-in-place framework. The columns’ relatively light weight makes them easy to transport.

“The United States has a rapidly aging infrastructure,” says ElGawady. “Over one-fourth of all bridges are structurally obsolete. With this new formation of columns, I see them exceeding the typical 50-year lifespan of a bridge.”

ElGawady has been working with the Missouri Department of Transportation, the Mid-America Transportation Center, the National University Transportation Center, Pittsburgh Pipe and Atlas Tube to develop the columns. His work was inspired by another professor in the field, Dr. Jin-Guang Teng, chair professor of structural engineering at The Hong Kong Polytechnic University, who initially conducted small-scale hollow concrete research.



Photo by Sam O’Keefe

From the left: ElGawady’s concrete column, the steel tube and polymer without concrete, and the current standard.



Double Saddle Barn

Piney River Heritage Farm Project

As a follow-up to the last *Bridge* report on the Piney River Heritage Farm Project, S&T students continue to develop their findings on the 11 buildings at the farmstead.

Next steps

A second visit is coming up to complete the assessment. Once the assessment is finished, the report will then be shared with the Missouri Barn Alliance and Rural Network (MO BARN) Alliance, the U.S. Department



Main House



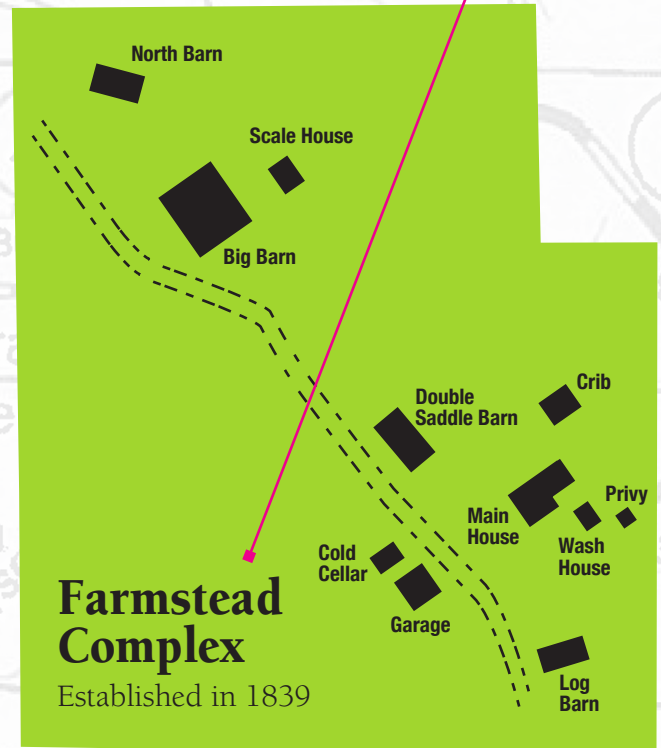
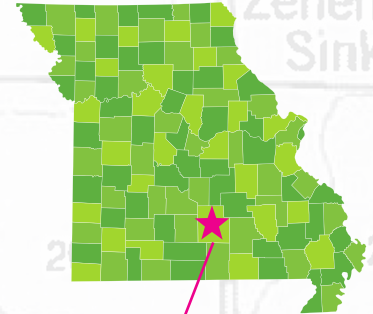
North Barn



Student Evaluators

Samantha Ammann
 Robann Bowdry
 Elyse Carter
 Jonathan Cureton
 Jacob Danielson
 Claire Davis
 Madison Jung
 Jennifer Nickel
 Kelly Pachowicz
 Alyssa Purdy
 Malachi Rein
 Kaitlyn Satterfield
 Timothy Schmitt
 Jeffrey Smith
 Bradley Wilt

Texas County, Missouri



of Agriculture and the State Historic Preservation Office with the intent of submitting a proposal or work plan to begin restoration of the farm. With the approval from both the Forest Service and the State Historic Preservation Office, the MO Barn Alliance under the direction of Wilson Elliot will begin the process of restoring the historic buildings.

“What do students gain out of this experience, the appreciation of what went into constructing these historic places and how they can help save them for future generations to come,” says **Dr. Stuart Baur**, associate professor of architectural engineering.

“Terms like ‘Half and Full Dove Tail Notch’ may sound like some type of wild species, but they are actually terms describing the different joints that were hewn into the logs to interlock them at the corners,” **Jennifer Nickel**, a junior in architectural engineering from Lake St. Louis expressed. “These are terms that, although learned in the classroom, could only be really appreciated in the field,” Nickels says. This type of real-life, hands-on experience will give distinction to the assessment report to be submitted to MO Barn Alliance.

Rebecca Rost, Hist’05, preservation planner and grants manager with the State Historic Preservation Office states, “The report will play a very significant role in future planning on the part of Missouri BARN, Wilson Elliot, the Forest Service, the State Historic Preservation Office, and all parties involved in the property.” Real-life projects like this one are an integral part of our student’s experiential learning here at Missouri S&T.

If you would like to learn more about the Piney River Heritage Farm Project, please visit their website at <http://www.fs.usda.gov/detail/mtnf/newsevents/?cid=STELPRDB5409709>. The MO BARN Alliance’s mission is to advocate for the preservation, documentation and re-use of historic barns and farmsteads in the state of Missouri.



The next wave of wastewater management

By Joe McCune

A Missouri S&T professor has shown that improving wastewater treatment and saving energy are not only essential, but they're also compatible.

Dr. Jianmin Wang, professor of environmental engineering at S&T, has developed multiple wastewater treatment technologies that produce freshwater that is not only cleaner than wastewater treated using traditional methods, but also requires less maintenance and energy. Additionally, his inventions can be used to retrofit existing wastewater treatment plants.

On Feb. 6, Missouri Gov. Jay Nixon announced nearly \$1.1 million in grants for the Small Community Engineering Assistance Program, implemented through the Department of Natural Resources to help communities with wastewater engineering costs, whether it's commissioning a report or making repairs and upgrades.

Although his technology is too new, in regulatory terms, to be of use in the grant recipient communities, Wang says

his technology is superior to existing ones in terms of cost and treatment efficiency.

Wang says 0.8 percent of America's energy use is spent on wastewater treatment. Much of that energy is used to aerate the tanks where wastewater is treated. The energy is used to feed oxygen to the microorganisms that consume the waste, and traditionally wastewater treatment plants maintain an oxygen concentration of 2 milligrams per liter to feed the bugs in the tanks, "which makes them happy," Wang says.

The prevailing thought has been that providing less than 2 milligrams per liter of oxygen would make the microorganisms "unhappy." But Wang does not believe that is an issue, saying that if you feed them at a lower concentration, such as 0.5 milligram per liter, it makes them a little less happy, but the microorganisms will live longer and enrich more — plus you use 30 percent less energy during oxygen infusion to produce the same results.

“You can make them a little unhappy,” Wang says, “because bugs do not have a union.”

He has also developed another treatment system called an Alternating Anaerobic-Anoxic-Oxic (A3O) process that “can achieve superior effluent quality since it can remove organic pollutants plus nitrogen and phosphorous nutrients,” Wang says. It does this without chemicals, and its effluent contains only 5 milligrams per liter of total nitrogen and 0.5 milligram per liter of total phosphorous. It also saves more than 10 percent of energy compared to the conventional pre-anoxic process, which has significantly less total nitrogen and total phosphorus removal.

With its high performance, high energy efficiency and low operational costs, on a large scale the technology could help curb global surface water eutrophication, which is one of the National Academy of Engineering’s Grand Challenges — the accessibility of freshwater.

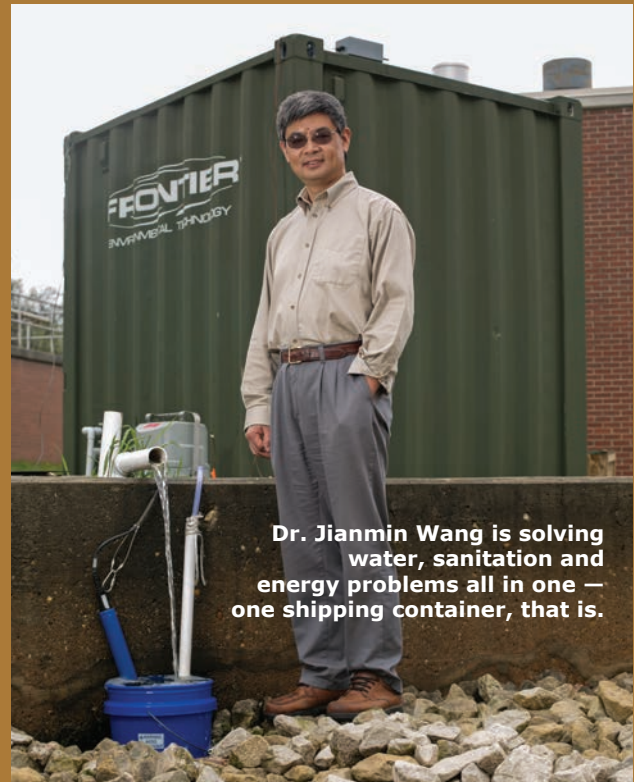
Eutrophication is the enrichment of an ecosystem with chemical nutrients, typically nitrogen, phosphorus or both. When excessive nitrogen and phosphorous levels are present, undesirable side effects such as algae blooms can occur. When algae die, they decompose. The decomposition consumes oxygen, and with less oxygen, naturally occurring aquatic plants, fish, crustaceans and other organisms can die. Algae blooms also produce algal toxins that directly pollute the source of drinking water intake. “It is happening in Lake Erie, many other places in the nation and throughout the world,” Wang says.

Wang has also developed a self-mixing anaerobic digester, which can effectively convert wastewater sludge and other organic waste to biogas energy. It improves environmental quality by removing the sludge, and it also recovers a useful resource during the process. Additionally, his high-rate digester operates itself, without an external energy hookup.

Based on his calculations, Wang says a combination of his technologies can produce a net 10 percent energy gain in contrast to the 27 percent net energy use the wastewater industry currently operates on.

Although the water his systems produce is suitable for irrigation, making it potable is also possible. “People are dying for the technology that turns wastewater into freshwater,” Wang says.

Sometimes, literally dying.



Dr. Jianmin Wang is solving water, sanitation and energy problems all in one — one shipping container, that is.

Photo by Sam O’Keefe

In military battlefield camps, water must be hauled in by convoy, resulting in casualties along the known convoy routes. That’s where Wang’s small-scale deployable baffled bioreactor (dBRR) could make a difference, and that’s why it is being tested at the Naval Surface Warfare Center in Carderock, Maryland. The unit has been 88 percent more energy efficient than military guidelines when tested with municipal wastewater, and it produces high effluent quality with both low biochemical oxygen demand and suspended solids. In addition, it achieves tertiary treatment quality instead of the required secondary treatment guidelines with minimal operator attention.

Wang, who also co-founded Frontier Environmental Technology for technology demonstration and promotion, says he has received a military request to develop an operator training course for the dBRR.

“Advances such as these demonstrated by Professor Wang represent the next wave of wastewater management,” says Dr. Glen Daigger, past president of the International Water Association, a recognized authority in wastewater technology and a member of the National Academy of Engineering, “Given growing water and resource constraints on the planet, we must turn to sources such as used water — to both supplement our water supply and to do this with a reduced environment footprint.”

A change in indoor air may impact your health

By Mary Helen Stoltz



When it's snowing, raining or extremely hot, you may not expect many people to open windows in their homes. However, **Dr. Glenn Morrison**, professor of environmental engineering at Missouri S&T, says that lots of people have windows open even in extreme weather.



Morrison

Photo by Sam O'Keefe

Morrison is using a recently awarded three-year, \$999,999 grant from the Environmental Protection Agency (EPA) to study the effect of open windows on the air quality inside a home.

His project, titled "Indoor exposure to pollutants associated with oxidative chemistry: field studies and window-opening behavior," is the first of its kind. Morrison says studying window-opening behavior, and its relationship to chemistry, is new to everyone — including him.

"I always want to do new things and move on from other projects," Morrison says. "I've worked a lot with indoor chemistry before but working with window openings is very new to me."

With a portion of the grant funds, Morrison will hire a polling company

to compile data from all corners of the United States to compare the window-opening habits of people in several geographic locations. Dr. Morrison noted that this poll will be used in conjunction with prior studies to provide a more comprehensive view of window-opening.

"People's window-opening behavior depends on their climate and energy costs," Morrison says. "When it comes to opening windows and the resulting chemistry, I need to understand what people are doing across the country and when during the year."

The other facet of his project will be a quantitative analysis of indoor air quality in rented residences in Houston and St. Louis during the summer and winter months.

"If you have the window open even a crack, more outdoor air is coming into the house and that affects the air turnover rate and that alters the air composition," he says.

Morrison says this change in air composition could have an unsettling consequence.

"When chemicals enter and react inside your home, they can actually end up creating a complex smog episode," he says.

He hopes to study that change in air composition and combine the data with the results of the poll.

"I can combine the polling results and data from other researchers with the experimental data and learn what having a window open does to the

air at certain times of the year in certain regions," he says.

Morrison says field-testing in St. Louis and Houston will begin in late spring 2015 and the first set of high-quality tests will take place in September 2015.

Morrison hopes his data will be used for a greater purpose than just understanding the air quality changes in a home when a window is open.

"I would like for policy recommendations to be made based on this data for people with emphysema and other breathing problems," say Morrison. "I would love for this to lead to building design that protects people who are sensitive to air pollution."



Morrison is working with Dr. Nuran Ercal, professor of chemistry at S&T, Dr. Prem Lobo, associate director of the Center of Excellence for Aerospace Particulate Emissions Reduction Research at S&T, and Dr. Brent Williams, assistant professor of energy, environmental and chemical engineering at Washington University in St. Louis.

Myers named associate dean

College of Engineering and Computing

Dr. John Myers, professor of civil, architectural and environmental engineering at Missouri S&T, was named associate dean for academic affairs for the College of Engineering and Computing effective Jan. 1, 2015.



“As a leading professional in his field, in addition to being a trusted mentor and advisor, Dr. Myers brings a wealth of knowledge and experience to this position as a faculty member, researcher and leader,” says **Dr. Ian Ferguson**, vice provost and dean of the College of Engineering and Computing. “With his broad reach across campus, Dr. Myers will play

an instrumental role in the College of Engineering and Computing. I look forward to working with him.”

As associate dean for academic affairs, Myers will oversee all curriculum and instruction matters; oversee development and implementation of strategic planning related to academic programs; establish plans for program development, faculty

recruitment and development; and coordinate academic review with the department chairs in the college to review, study and develop curriculum, and improve instruction.

A member of the S&T faculty since 1999, Myers is the current director of the Structural Engineering High-Bay Laboratory and former director of the Center for Transportation Infrastructure and Safety. Myers is the co-author of seven textbooks and six reference manuals and design guides, and he is the author or co-author of numerous peer-reviewed papers and presentations internationally and in the U.S.

Myers holds a Ph.D. in civil engineering from the University of Texas at Austin, where he specialized in structural engineering and construction materials. He also holds a bachelor of architectural engineering degree from Pennsylvania State University and a master of science degree from the University of Texas at Austin.

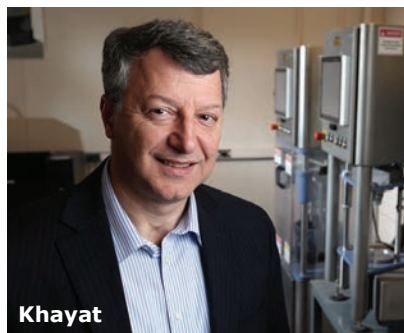
The recipient of numerous teaching and professional awards, Myers most recently was honored with the 2014 ASCE Professional Recognition Award and awarded Fellow status in The Masonry Society in 2014.

Khayat awarded Arthur R. Anderson Medal

Dr. Kamal H. Khayat, the Vernon and Maralee Jones Professor of civil, architectural and environmental engineering at Missouri S&T, has earned the Arthur R. Anderson Medal from the American Concrete Institute (ACI). The award was presented at ACI's Concrete Convention and Exposition in April 2015.

The award recognizes Khayat's work to develop and sustain world-class research facilities and for solving highly significant problems in concrete design, materials and construction.

The award was established in 1972 by the ACI in recognition of a past president of the institute. It is given to people, firms or organizations for



outstanding contributions to the advancement of knowledge of concrete as a construction material. The award is not presented every year, only when decided by the ACI Board.

Khayat earned a bachelor of science degree in civil engineering in 1982, a master of engineering degree in

construction engineering and management in 1984, a master of science degree in structural engineering in 1985 and Ph.D. in civil engineering in 1989, all from the University of California-Berkeley. He is a Fellow of the ACI and a recipient of numerous awards, including the ASTM (American Society for Testing and Materials) International Sanford E. Thompson Award, the ACI/CANMET Award for contributions to the development of chemical admixtures for self-compacting in concrete and recently won the G.H. Tattershall Award for contributions in the area of sustainability and durability of concrete.



Photo courtesy of Mays

**Pictured at left:
Larry Mays, second from left,
receives his international
water prize in Saudi Arabia.**

watershed development in urban areas. The books by Mays, with their breadth, depth and broad relevance, have made a unique and tangible contribution to water resources engineering and the management of water resources throughout the world. His books include *Ancient Water Technologies* (2010), *Ground and Surface Water Hydrology* (2012), and *Integrated Urban Water Management: Arid and Semi-Arid Regions* (2008). One of his most unique contributions is to demonstrate how ancient water technologies can be applied today to manage water resources in concentrated urban areas and alleviate many present-day sustainability problems.”

In his acceptance speech, Mays emphasized his personal feelings, “I deeply feel that my 39 years of university research and teaching efforts in the areas of water resources engineering and hydrology has paid off with this great honor.”

Mays also presented a keynote address at the 6th International Conference on Water Resources and Arid Environments (ICWRAE) at King Saud University, held concurrently with the Prince Sultan Award at King Saud University in Riyadh. The title of the address was “Realities of Water Resources Sustainability, Traditional Knowledge, and the Future.” This conference was organized by the Prince Sultan Institute for Environmental, Water and Desert Research.

Dr. Mays has been the author, co-author or editor-in-chief of 23 books. His text and reference books are used around the world. He is a fellow of American Society of Civil Engineers (ASCE), and also a fellow of the International Water Resources Association. He has been

Mays honored with international water prize

Larry W. Mays, CE’70, MS CE’71, a professor of civil and environmental engineering at Arizona State University (ASU), received the Prince Sultan Bin Abdulaziz International Prize for Water — Surface Water Prize in Riyadh, Saudi Arabia in December.

The award was presented to him at the ceremony by Crown Prince Salmon Bin Abdulaziz, now King Salmon of Saudi Arabia and Prince Khaled Bin Sultan Bin Abdulaziz. Mays also presented a keynote address at the International Conference on Water Resources and Arid Environments (ICWRAE) at King Saud University. The title of the address was “Realities of Water Resources Sustainability, Traditional Knowledge, and the Future.”

Mays served in the U.S. Army from 1970 to 1973 and was stationed at the Lawrence Livermore National Laboratory in California. He earned a Ph.D. in civil engineering from

the University of Illinois at Urbana-Champaign in January 1976.

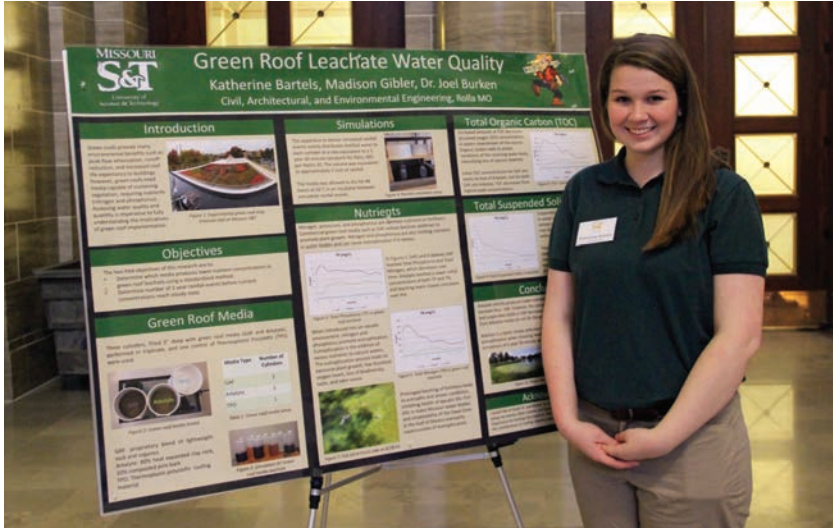
His 39-year career as a professor began at the University of Texas at Austin in 1976 where he served for 13 years. He spent the last 26 years at Arizona State University. Mays served as chair of the civil and environmental engineering department from August 1989 until July 1996. Prior to that, he was director of the Center for Research in Water Resources at the University of Texas at Austin.

The citation for the Prince Sultan Award stated: “The Surface Water Prize is to be awarded to Dr. Mays for his comprehensive work in surface water hydrology and water resources engineering, culminating in three leading and innovative textbooks in the field and the development of optimization models in practical hydrology for current problems, including real-time optimal dam releases during flood conditions and

(continued on page 16)

Research on display

Undergraduates from Missouri S&T traveled to Jefferson City, Missouri, to exhibit their latest research projects to the state's top legislators in March. These students, who work on research projects under the direction of faculty advisors, participated in the annual Undergraduate Research Day at the Capitol, an event that welcomes undergraduates from all four campuses in the University of Missouri System. The event is designed to inform Missouri's lawmakers about research that is occurring at Missouri universities.



Katherine Bartels, a sophomore in environmental engineering from Independence, Missouri, presented "Green Roof Leachate Water Quality." Her advisor is Dr. Joel Burken, professor of environmental engineering.

EIGawady appointed to committee by Transportation Research Board

Dr. Mohamed EIGawady, associate professor of structural engineering at Missouri S&T, has been named a member of the Standing Committee on Seismic Design and Performance of Bridges — AFF50 — by the Transportation Research Board (TRB). EIGawady's appointment began April 15, 2015, and continues through April 14, 2018.

The mission of the Transportation Research Board (TRB) is to promote innovation and progress in transportation through research. TRB is a division of the National Research Council (NRC), a private, nonprofit institution that provides expertise in science and technology to the government, the public, and the scientific and engineering communities.

TRB's varied activities engage more than 7,000 engineers, scientists and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest by participating on TRB committees, panels and task forces. This program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

NEW MEMBERS

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

Randy Dreiling

Vice President and Senior Structural Engineer
Design Nine Inc.
St. Louis, Missouri

Diane Heckemeyer

Chair of Construction and Civil Technology
State Technical College of Missouri
Linn, Missouri

Karin M. Jacoby

Senior Counsel
Husch Blackwell
Kansas City, Missouri

Steve Meyer

Director of Environmental Services
City of Springfield
Springfield, Missouri

Allen G. Minks

Geotechnical Department Manager
Terracon Consultants Inc.
St. Louis, Missouri

Charles E. Powell

Owner
CEPCO L.L.C.
Ozark, Missouri

Dr. David Richardson

Associate Professor of Civil Engineering
Missouri S&T
Rolla, Missouri

Dave Wisch

Fellow
Chevron Corp.
Houston, Texas

Full bios will be published in the next Bridge newsletter.

Missouri S&T receives NSF funding to study climate variability

By Mary Helen Stoltz

Missouri S&T is one of nine institutions in a research consortium that received a \$20 million grant from the National Science Foundation. The grant will fund a five-year multi-institutional project to study climate variability and its potential agricultural, ecological and social impacts in Missouri.

“The Missouri Transect: Climate, Plants and Community” project received funding from the Experimental Program to Stimulate Competitive Research (EPSCoR), a program initiated by the U.S. Congress to support fundamental research, education in science, technology, engineering and mathematics (STEM), and workforce development in areas related to the economy.

“The Transect project developed from observed vegetation changes in recent decades,” says, **Dr. Joel Burken**, professor of environmental engineering and director of the Missouri S&T Environmental Research Center. “USDA plant hardiness zone maps have moved up to 300 miles north in parts of Missouri, based on direct

observations. We look to employ remote sensing methods to assess vegetation stress and changes on a much broader scale and to help understand current impacts to Missouri’s forests and agriculture. Once changes are understood, we can help foresee future changes and help Missouri’s agriculture and conservations efforts to best respond.”

“We will develop robotic platforms to carry remote-sensing technologies to monitor the growth, development and environmental response of plants,” says, Dr. Zhaozheng Yin, assistant professor of computer science at Missouri S&T. “Then, vision and learning algorithms will be developed to analyze the long-term surveillance data so digital signatures of plants can be extracted and associated with genotypes and environment.” Participating institutions include all four University of Missouri System campuses — Missouri S&T, the University of Missouri-Columbia, the University of Missouri-Kansas City, and the University of Missouri-St. Louis — the Donald Danforth Plant Sciences Center, Washington University in St. Louis, Lincoln University, the Saint Louis Science Center and Saint Louis University. The project will draw on each institution’s research expertise in plant sciences, atmospheric and environmental sciences, bioinformatics engineering, social sciences, and or science outreach, and education. The project is made up of four interdisciplinary teams in the areas of climate, plant biology, community resilience and education/outreach.

“The collaboration among institutions as well as scientific disciplines will help drive the state’s research infrastructure and competitiveness,” says Hank Foley, executive vice president for academic affairs, research and economic development with the UM System and senior vice chancellor for research

and graduate studies at MU. “It also will provide opportunities to move research from the lab to the marketplace and thus spur innovation and entrepreneurship.”

“The Donald Danforth Plant Science Center is honored to play a major role in this pivotal endeavor,” said James Carrington, president of the Donald Danforth Plant Sciences Center. “By combining so much of our state’s research capacity and infrastructure in the atmospheric and plant sciences, the Missouri Transect will drive innovation, train a diversified workforce, and catalyze commercial development in areas that are so critical to Missouri’s future.”

The Missouri Transect will support workforce development in three areas: undergraduate and graduate education; bioinformatics training for women, minorities and people with disabilities; and job training.

“The Missouri Transect provides groundbreaking biotechnology tools for improving crop climate resilience and educating a workforce that understands the effects of climate change on plant adaptation,” says Kelvin Chu, program director at the NSF.

The National Science Foundation also provided Research Infrastructure Improvement awards to the U.S. Virgin Islands and four other states. NSF is an independent federal agency that supports fundamental research and education across all fields of science and engineering. In fiscal year (FY) 2012, its budget was \$7.0 billion. NSF funds reach all 50 states through grants to nearly 2,000 colleges, universities and other institutions. Each year, NSF receives about 50,000 competitive requests for funding, and makes about 11,500 new funding awards. NSF also awards about \$593 million in professional and service contracts yearly.



Record-setting heat in summer 2012 wreaked havoc on Missouri’s corn crops.

Electric company promotes Baker

The Empire District Electric Co., based in Joplin, Missouri, announced **Brent Baker**, CE'02, assumed the role of vice president of customer service, transmission and engineering effective March 1, 2015. In this capacity, Baker is responsible for the commercial activities of the company including all aspects of customer service and marketing, transmission and distribution engineering, system performance, land management and transmission operations, as well as compliance with FERC and NERC regulations. Baker joined the company in 2002. He has



Baker

held the positions of structural engineer, senior structural engineer, manager of construction design and director of customer service.

Baker currently serves as president of the Downtown Joplin Alliance. He also serves as a board member of Children's Haven of Southwest Missouri and the Republic, Missouri, Business and Industrial Development Association. He is the past president and state director for the Missouri Society of Professional Engineers Southwest Chapter and is an advisory committee member for Project Lead The Way. Baker is on the executive board of the Young Professionals Network of the Joplin Area Chamber of Commerce.

The Empire District Electric Co. is an investor-owned, regulated utility providing electricity, natural gas and water service, with approximately 217,000 customers in Missouri, Kansas, Oklahoma and Arkansas. A subsidiary of the company provides fiber optic services. For more information visit www.empiredistrict.com.

NASA honors Schonberg for space debris work

Dr. William P. Schonberg, chair and professor of civil, architectural and environmental engineering at Missouri S&T, was selected to receive a NASA Engineering and Safety Council (NESC) Honor Award.

Schonberg and a group of colleagues who share a research focus in orbital space debris, received the NESC Group Achievement Award. The award recognizes a team of government and non-government personnel for outstanding accomplishment through the coordination of individual efforts that have contributed substantially to the success of NESC's mission.

The team, led by Michael Squire, principal engineer for NESC, was honored for their work in evaluating the risk from orbital debris to a satellite that will be launching in 2017 called the Joint Polar Satellite System (JPSS).

"Bill was an integral part of this team," says Squire. "He specifically analyzed the equations, known as ballistic limit equations, used to describe how well

certain materials and components resist micrometeoroid orbital debris damage. His findings may help JPSS choose more appropriate ballistic limit equations, which would improve the risk assessments."

The team evaluated two models that simulate the amount of space debris found in a given location in the Earth's orbit and compared those models to others. The team also examined factors that went into the risk assessments and how the accuracy of those assessments could be improved.

"The work done by this team will not only effect the JPSS Project, but will be important for all spacecraft flying in Earth orbit in understanding MMOD risk and risk predictions better," Squire says.

In addition to Schonberg and Squires, team members included Dr. Williams Cooke, NASA Meteoroid Environment Office; Dr. Steven Cornford, Jet Propulsion Laboratory; Scott Hull, NASA Goddard Space Flight Center;



Schonberg

Dr. Alan Jenkin and Dr. Glenn Peterson, The Aerospace Corp.; Donald Kessler, NASA Johnson Space Center (retired); Dr. Williams Vesely, NASA Headquarters; Dr. Joel Williamsen, Institute for Defense Analysis; Linda Burgess, Melinda Meredith and Christina Williams, Analytical Mechanics Associates; and Roy Savage, NASA Engineering and Safety Center.

57th Annual S&T Asphalt Conference

The department of civil, architectural, and environmental engineering conducted the 57th Annual Asphalt Conference on Dec. 9-10, 2014. Nineteen presentations were made, including those by departmental alumni **Brent Whitwell** ('05, '06), **Steve Jackson** ('07), **Dave Marshall** ('01), **Lori Greer** ('03), **Rick Holesinger** ('85, '11), **Joe Schroer** ('81), **Todd Miller** ('90) and **Pat Palmer** ('77). The conference was directed by **Dr. David Richardson** ('71, '73, '84). Attendance totaled 230.

Missouri Concrete Conference

The annual Missouri Concrete Conference was held on the S&T campus March 31-April 1, 2015. Twenty-two presentations were given, including ones by departmental alumni **Rick Holesinger** ('85, '11), **Brent Whitwell** ('05, '06) and **Todd Miller** ('90). The conference was directed by **Dr. David Richardson** ('71, '73, '84).

Superpave Short Courses

During the 2014-2015 season, five different types of certification courses were held at Missouri S&T: two Superpave QC/QA full certification short courses (five-day), two Superpave QC/QA re-certification short courses (two-day), one Binder Test course (one-day), three Aggregate Consensus Tests courses (one-day), and three TSR courses (one-day), for a total of 11 courses. Over 200 engineers, inspectors and contractors were certified. The courses were directed and taught by faculty member **Dr. Dave Richardson** ('71, '73, '84). Other instructors included **Steve Jackson** ('07) and **Mike Lusher** ('96, '04). Over 3,000 individuals have gone through the training and certification at S&T since 1998.

Wallace joins development team

We are pleased to announce that **Sue Wallace** has joined the Missouri S&T Office of Development as senior development officer for civil, architectural and environmental engineering.

Wallace has over 20 years experience in sales, marketing, advertising and public relations, with the last eight years of her career devoted to higher education



fundraising. Sue spent many years in the sales and marketing field during which time she held the position of manager for advertising and public relations with long distance provider McLeodUSA. She has held the position of director of marketing for the St. Louis County Fair and Air Show and director of annual giving for Fontbonne University in St. Louis.

Sue is originally from Iowa. Her bachelor's degree is in communication from the University of Iowa and her master's degree is in management from Fontbonne University in St. Louis. She is very proud of the fact that she was a "non-traditional"

student and chose to return to college after a lengthy hiatus. During the past four years, Wallace has been instrumental in forming a stronger alumni-giving foundation in the St. Louis area for the Kansas City-based Rockhurst University.

Wallace is involved with the Association for Fundraising Professionals (AFP), the Council for Advancement and Support of Education (CASE) and the St. Louis Planned Giving Council (SLPGC), where she is a current board member and was chair for the 2014 conference. Sue has held board member positions with the Wildwood YMCA, Junior Achievement (Iowa), the United Way Allocation Committee (Iowa), the West St. Louis County Chamber, and Cinema St. Louis. Sue has served on the CASE VI conference planning committee for four years.

Mays honored (continued from page 12)

a representative to the Universities Council on Water Resources and has served as a member and president of the council's board of directors. In June of this year, he received the American Society of Civil Engineers Julian Hinds Award "for his research on water resources and hydrosystems engineering, addressing optimization and risk/reliability analysis for their design, management and operation and his authoritative text and reference books that have had worldwide impact." Among his other honors,

he received a distinguished alumnus award from the department of civil engineering at the University of Illinois in 1999.

An avid photographer of ancient water systems around the world, he has published on this topic, including the book *Ancient Water Technologies*. His interests also include alpine skiing, fly fishing, scuba diving, welding and woodworking. He lives in Mesa, Arizona, and Pagosa Springs, Colorado.

Richardson named ACI Fellow

Dr. David Richardson, associate professor of materials engineering at Missouri S&T, has been named a Fellow of the American Concrete Institute (ACI).



Richardson, who is a member of numerous ACI technical committees and is past president of the Missouri chapter of the ACI, received the award in April at the ACI Concrete Convention and Exposition in Kansas City, Missouri.

ACI awards Fellow status to those who have “made outstanding contributions to the production or use of concrete materials, products and structures in the areas of education, research, development, design, construction or management.”

Richardson earned a bachelor of science degree in 1971, a master of science degree in 1973 and Ph.D. in 1984, all in civil engineering from Missouri S&T.

He is a registered professional engineer in two states, is a member of the American Society of Civil Engineers and is an ACI certification examiner.

Richardson has over 40 years of experience in construction materials, including positions with design and construction firms, departments of transportation, university education and research positions, as well as sole ownership of a commercial testing laboratory and partner in a consulting firm.

His research interests include the durability of concrete, the use of alternate sustainable materials in concrete and masonry, concrete strength and workability variables, mix design procedures, concrete reinforcement bonding, and concrete aggregate gradation optimization.

Sneed receives tenure, promotion



Dr. Lesley Sneed was granted tenure and promoted to associate professor of civil engineering in September.

Faculty honored for outstanding teaching

Thirty-six S&T faculty members received Outstanding Teaching Award for 2013-2014. The winners were recognized at a ceremony held in December. The Outstanding Teaching Award is given each year to faculty members by the Outstanding Teaching Award Committee, which bases its selections on student evaluations.

The following individuals from our department were selected for awards:

Gillis named Outstanding P.E.



Dr. William Gillis, an adjunct instructor in civil engineering and managing engineer in the planning, design, and construction department at the University of Missouri-Columbia, was named the 2015 Outstanding Professional Engineer in Education by the St. Louis Chapter of the Missouri Society of Professional Engineers.

The award was presented in February during an awards banquet in St. Louis. Gillis earned a bachelor of science degree in mechanical engineering and a Ph.D. in engineering management from Missouri S&T. He also holds an MBA from Webster University. He is a registered Professional Engineer in Missouri, a certified project management professional, a certified professional engineering manager, a LEED AP with specialization in Building Design and Construction, and a Qualified Commissioning Process Provider.

Gillis has taught undergraduate and graduate courses in building systems, environmental controls, management of construction costs, project management, and practical concepts for technical managers. He serves as the advisor for the ASHRAE student chapter at S&T and the Mechanical Contractors Association of America (MCAA) student chapter at the University of Missouri.



Dr. Robert Holmes Jr., adjunct professor of civil engineering



Dr. Mary Koen, adjunct assistant professor of civil engineering



Dr. David Richardson, ('71), associate professor of civil engineering

Message from the Chair (continued from page 4)



► Faculty and Staff Morale

1999: Faculty and staff collaborations not very common, difficult to get cooperation from different groups in the department

2014: Good cooperation, unified sense of purpose, collaborative teaching and research activities

Benefit: Faculty and staff operate in a working and learning environment in which all are motivated to work toward achieving their full potential; alumni also motivated to contribute their time and talent, as well as treasure, to support the department's programs and initiatives; staff members in other parts of campus routinely seek employment opportunities in our department.

► Student Enrichment Opportunities

1999: Minimal

2014: Study Abroad and co-op program experiences and opportunities are plentiful and encouraged; plans being developed for required experiential learning curriculum component in accordance with Strategic Plan

Benefit: Student learning experience significantly enhanced; students who participate in such activities are more sought-after by employers and better prepared for industry leadership roles.

► Endowed Chair Positions

1999: 2

2014: 5

Benefit: Enhanced ability to recruit faculty leaders in five different fields to strengthen teaching and research programs.



► Operations, Policies and Procedures

1999: Some policies in place, mostly oral traditions

2014: A suite of written, well-articulated policies in place to guide department operations and decision-making, including (1) a revised promotion and tenure policy, (2) new promotion and tenure expectations guideline document, (3) new faculty workload policy that rewards high levels of scholarly productivity as well as teaching excellence, (4) new faculty sabbatical leave policy, (5) new graduate teaching assistant workload policy, (6) new post-tenure review policy as required by state law, and (7) policy governing department support of graduate students of newly hired as well as recently departed faculty members

Benefit: Renewed sense of purpose and cohesiveness in department operations, decision-making and policy applications.

► Rankings, Reputation and Visibility

1999: Undergraduate program well-known and respected; graduate programs not widely known or visible beyond the Midwest

2014: Numerous Memoranda of Understanding signed with departments in Europe, Asia, South America, etc. to facilitate exchange of students and faculty; also, Missouri S&T undergraduate civil engineering program was ranked 24th nationally by *U.S. News and World Report*

in 2004 – the first time that any undergraduate engineering program in the State of Missouri had been nationally ranked

Benefit: Increased interaction and collaborations with department and faculty around the world has led to a commensurate increase in the visibility and reputation of the department and its programs.



I would like to thank each and every one of you for your many efforts in support of our great department and its programs. It has been my pleasure to know you and to serve as your chair for these past 16 years — I wish you all health, happiness, and continued success in all your endeavors!

— **William P. Schonberg**, Professor and Chair
Rolla, Missouri, March 2015

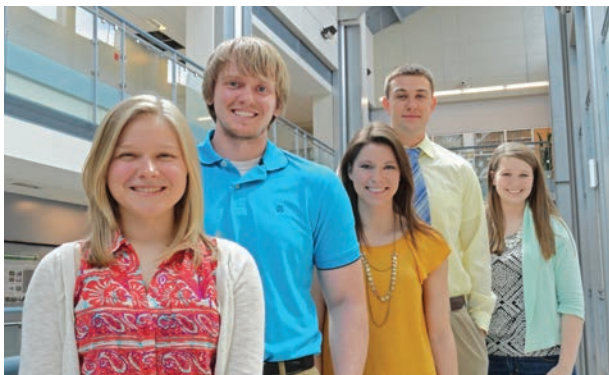
Three years and counting

By **Dr. Joel G. Burken**,
Associate Chair

As we finalized plans for Vision 2020 three years ago this month, we knew little about how the plan would unfold, or how things would materialize. Now, still more than a year from the half-way point, we can see clear progress and can put a number of accomplishments in the “done” box. “Done” is particularly satisfying when seeing the impact on our students, alumni and colleagues, and when thinking about the LONG-term benefit we are expecting.

In this update, I want to celebrate two specific programs that will secure some of our talent and provide mechanisms for considerable advancement of our faculty and students, a.k.a. “future alumni.”

First, the Greenberg Scholars Program is up and running! Greenberg Scholars will endeavor to complete a combined B.S. and M.S. in five years, including sponsored research at a national level. The first five scholars are pictured below. They are current students undertaking undergraduate research projects that will transition and become their graduate research. Greenberg Scholars will also be expected to complete competitive proposals for national fellowships and awards, hopefully teaching them to aim high for



Greenberg Scholars, pictured from left to right, Sarah Jemison, Christopher Moore, Alexis Lee, Michael Janke and Katherine Bartels.

national accolades early in their careers while concurrently bringing more of a spotlight on S&T. The program is also supported by Greenberg Scholarship funds, made possible by the philanthropic contributions of **Aaron and Zelda Greenberg**. Aaron, CE’50, was an avid supporter of MSM/UMR/S&T — in fact, he helped guide many St. Louis youth to Rolla. I am sure he’d approve of our plan to offer even greater challenges to some of our most talented students. A fellow alumnus **Dick Arnoldy**, CE’69, MS EMgt’73, said, “Aaron was always a tough reviewer

of plans, and if you were a Rolla graduate he was always a little tougher and expected more of you.” Maybe this is another way Aaron is still “expecting a little more” from our future graduates, too.

We also are proud to announce **Dr. Lesley Sneed** as the Bryan A. and Jeanne Stirrat Faculty Scholar and **Dr. Mohamed ElGawady** as the Francisco M. Benavides Faculty Scholar.

The excellent contributions of these faculty and the example they set are exemplified by these new titles.

While we have more young talent on the way up that are also deserving, these

awards connect the excellence of our alumni and the expectations we have for our future departmental leaders. The Benavides and Stirrat Faculty Scholar awards help us to showcase faculty talent and the Greenberg Scholars Program helps us to exemplify excellence in our current students (and attract future generations of S&T civil, architectural and environmental engineers, too!).



Sneed and ElGawady

In our initial plans, we had also set out to enhance some of our research expertise areas, which aligned well with campus efforts a year later to define signature areas. With a good head of steam, department faculty were able to lead or be highly involved in two of the four areas designated as campus “Best in Class” research efforts. Advanced Materials for Sustainable Infrastructure and Smart Living are the two areas that will most impact our department. In each area a group of cluster hires will be made to span multiple departments, all with a focus on the thematic research area, regardless of department. The first hires in the sustainable infrastructure area should be in place this fall. These hires also will benefit from our advanced and enhanced facilities once the Advanced Construction Materials Laboratory (ACML) is constructed. This will also advance another one of our Vision 2020 goals.

While multiple efforts on multiple fronts are well under way, we still have much work to do and many great things to accomplish if we are to reach our lofty vision for 2020. As always, we welcome your participation and input!

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Email your news to: care@mst.edu

 Printed on Recycled Paper



Beads, buddies and blarney



Proud Miners gathered in March
for the 107th Best Ever St. Pat's
and for the dedication of
Hasselmann Alumni House.

