

# The BRIDGE

Civil, Architectural and Environmental Engineering

Spring 2012 | Vol. 28



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MISSOURI  
S&T



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MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY



# Message from the chairman

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

Greetings from Rolla, Missouri! As you read through this issue of *The Bridge*, you will see lots of news regarding the many accomplishments of our faculty, students and alumni. While our faculty continue to be recognized by their peers for the excellent work they do, it might interest you to know that our faculty are also engaged in the scholarship of educational methods. These efforts are motivated by their desire to emphasize and enhance student learning.

For example, **Daniel Oerther**, the John and Susan Mathes Chair of Environmental Engineering, has modified CE 261 (Fundamentals of Environmental Engineering) by adopting blended learning as a means of course delivery, a flipped classroom as a pedagogical style, and mastery learning as a means of grading. Blended learning is a title given to any class that has at least some of its content provided through online means. The online format means that students have the ability to watch lectures when it's convenient, while online quizzes provide students with immediate feedback. In a flipped classroom, activities normally completed in the classroom and the material normally covered at home are switched. Oerther's students read the chapter, listen to a lecture, and complete quizzes and homework on material BEFORE they meet with the instructor for review. This approach encourages students to show responsibility for their own preparation, and allows the instructor to invest more of the classroom time discussing higher level concepts. Mastery learning is a means of meeting the various personal learning objectives of a diverse student population. Optional course activities, which are necessary to earn higher grades, are performed in optional class meetings. Thus, a classroom with 75+ students participating in a required course can be successfully reduced to a classroom of 20 or 30 students who wish to engage the optional material with detailed input from the instructor.

**Jeffery Thomas** has also completely changed the manner in which he teaches his Mechanics of Materials classes and assesses the performance of his students. Thomas accomplished this transformation by shifting his focus from what happens inside the classroom to how his students interact with course content outside of the classroom. Thomas developed modular, asynchronous videos and started experimenting with computer-based testing. Also following the tenets of a flipped classroom, he stopped giving traditional lectures and instead, encouraged students to spend lecture time working in groups and with him. Using Google Analytics, Thomas can now observe whether exam performance relates to usage levels on individual resources. He can also see which resources are the most popular, with both his students and with random visitors from around the globe. This past spring semester, each student averaged

over 60 hours of mental engagement, and last year, people from 3,300 cities used these same learning aids for a total of 12,000 hours — a great example of how Missouri S&T faculty reach out to those learning for the sake of learning as well as to those needing to earn a grade and move through a proscribed program of study.

**Timothy Philpot's** passion for the Mechanics of Materials course led him to develop two award-winning instructional software packages in the past 15 years: MDSolids and MecMovies. MDSolids ([www.mdsolids.com](http://www.mdsolids.com)) is an instructional tool that enables students to develop their problem-solving skills over a wide array of concepts. This software gives students instant feedback, custom visual results, intermediate results, and step-by-step commentary on the process of setting up and solving various problems so that students can develop their ability to think like engineers. MecMovies ([www.mst.edu/~mecmovie/index.html](http://www.mst.edu/~mecmovie/index.html)) uses a tutorial approach that features animation and three-dimensional rendering software to help students visualize forces, stresses, strains and deformations. It teaches in a clear, step-by-step approach using simple, straightforward language, and includes interactive features so that students can instantly try to apply concepts to similar problems. There are also games that break down simple, repetitive tasks that engineers frequently need into steps or skills that the student can master before moving on to more challenging problems. The success of MecMovies led Philpot to write a textbook which integrates the MecMovies instructional software within the traditional textbook format. The publisher (John Wiley and Sons) has developed an extensive online site for the book in their WileyPLUS product. Using database technology, WileyPLUS enables the traditional homework assignments to be replaced by online homework, which can provide students with instant right-or-wrong feedback, and suggestions for relevant book and/or MecMovies topics that can help build their understanding of the relevant concepts.

These are just three examples of how our faculty are working to improve the process of teaching our students. All our faculty work hard to foster deeper understanding of course concepts so that our students better understand how those concepts are relevant to our everyday world. By focusing on student learning, our faculty are emphasizing the quantifiable benefits that come from measuring that learning and the knowledge gained by the students.

Best wishes to all for an enjoyable summer, and if your travels take you near Rolla, please feel free to drop in and visit ... we'd love to see you!

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Photo by B.A. Rupert



Maurita Stueck  
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Photo by B.A. Rupert



Tim Wolfe was named the 23rd president of the University of Missouri System on Tuesday, Dec. 13, 2011. He began his duties in February. For more information about Wolfe, visit [umsystem.edu/president](http://umsystem.edu/president).

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#### 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.

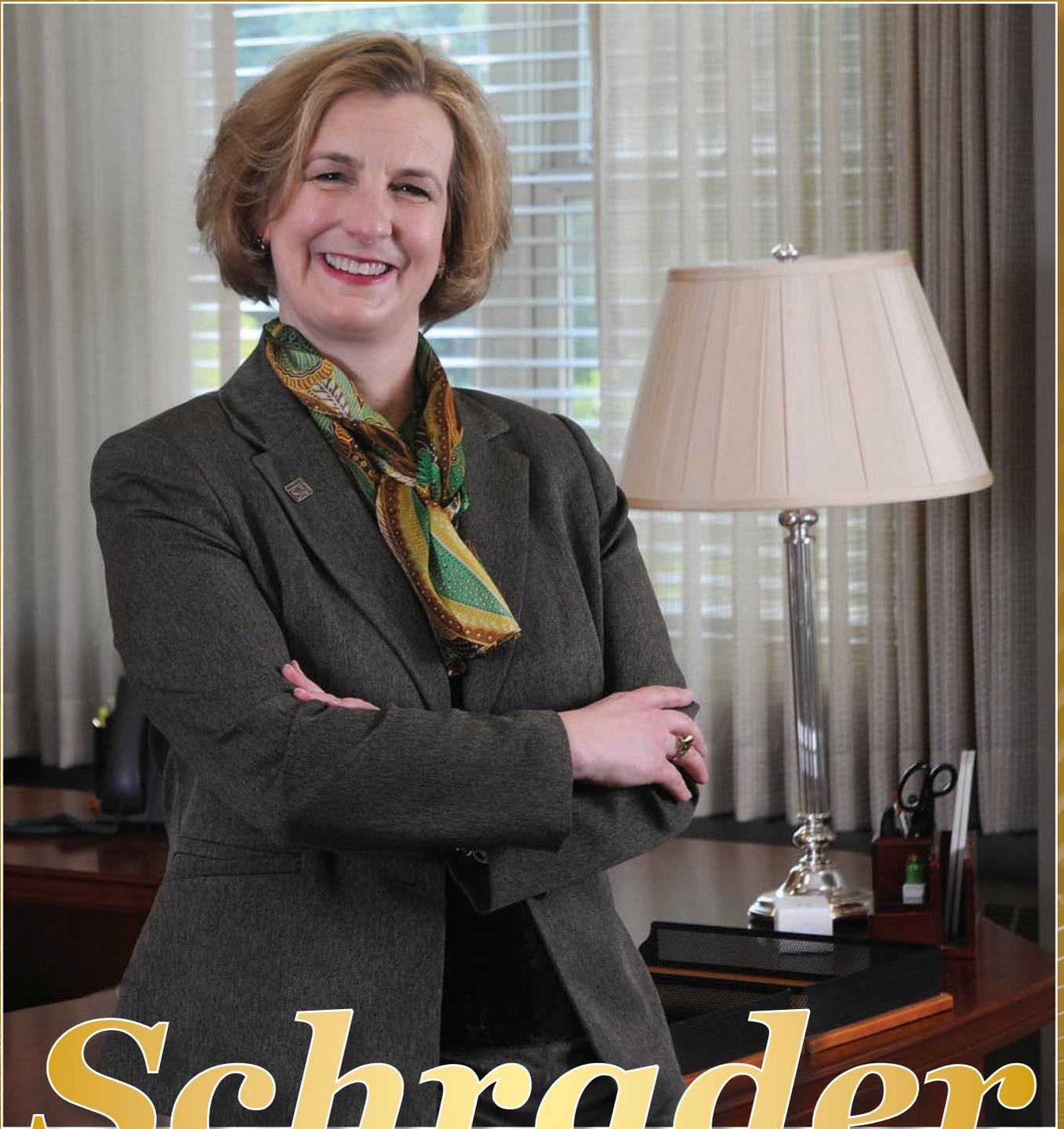
Graduate Program: Richard Stephenson, Ph.D., P.E.

##### Undergraduate Advising Center Director

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

#### CONNECT WITH US

You can reach us by: email ([care@mst.edu](mailto:care@mst.edu)) or mail (The Bridge, civil, architectural, and environmental engineering department, Butler-Carlton Hall, 1401 N. Pine St., Rolla, MO 65409-0030) or call 573-341-4461.



# *Schrader* takes the helm

By Andrew Careaga

Photos by B.A. Rupert

**Cheryl B. Schrader**, associate vice president for strategic research initiatives and former engineering dean at Boise State University, was selected as the next chancellor of Missouri University of Science and Technology, University of Missouri System officials announced Jan. 19, 2012. She began serving as chancellor on April 2.

“Cheryl has consistently been viewed as one of America’s best engineering teachers, and she’s also excelled in research and public service at the university, state, national and professional level,” said Tim Wolfe, who promised to finalize the chancellor’s search as a top priority shortly after accepting the university system presidency in December.

“Steve Owens and the chancellor’s search committee conducted an extraordinarily thorough search,” Wolfe added. “After hearing their recommendations and having the opportunity to meet and interview the finalists, I fully agree with them that Cheryl can best lead this institution with her expansive vision, considerable energy, deep dedication and creativity.”

In making the announcement, Wolfe underscored the university’s commitment to doing all it can to expand the number of students pursuing science, technology, engineering and math to make Missouri, and America, more competitive.

“Cheryl was able to grow undergraduate engineering enrollments by 60 percent over six years as dean of Boise State’s College of Engineering,” he said, adding that graduate enrollments also grew by 36 percent during that time. “Both student success and access were improved under her leadership, resulting in a higher quality, more diverse student body in undergrad, master and doctoral programs.”

He noted that funding for research grants and contracts more than tripled when she served as dean of Boise State’s College of Engineering, and Wolfe described her track record in academic and public service as extraordinary.

“She has been serving on the board of directors of the Discovery Center of Idaho and the board of directors of the Boise Valley Economic Partnership,” Wolfe said. “She’s advised a venture capital firm focused on aspiring technology firms in the Northwest, and she has secured



***“I choose to lead at institutions that are on the move. Missouri S&T’s legacy and potential is truly remarkable. I see an innovative, results-driven academic and administrative leadership team — and very bright, capable students.”***

***- Chancellor Cheryl B. Schrader***

industry partnerships for academic and research programs involving user facilities, laboratory naming opportunities, shared facilities and personnel, and credit and non-credit programs from certificate through doctorate. This important experience will help Missouri S&T continue its steep upward momentum.”

Wolfe added that Schrader is one of only a few women engineers who currently serve as university chancellors or presidents across the country.

### **‘Deeply honored’**

Schrader, age 49, told faculty, staff and students she is “deeply honored” to be selected as Missouri S&T next chancellor.

“I choose to lead at institutions that are on the move,” she said. “Missouri S&T’s legacy and potential is truly remarkable. I see an innovative, results-driven academic and administrative leadership team — and very bright, capable students.”

*(continued on the next page)*

Schrader is past president of the Institute of Electrical and Electronics Engineers (IEEE) Control Systems Society, which is focused on improving performance, safety, reliability and affordability across a wide range of complex systems, from smart grids, telecommunications, biological systems and robotics to transportation, process industries, aerospace and cyber-space worldwide.

She also continues to serve as a member of the ABET Engineering Accreditation Commission. This commission,

research involves developing and assessing innovative teaching approaches that promote learning across the “K through gray” educational spectrum and help students succeed in science, technology, engineering and math.

Schrader earned a bachelor’s degree in electrical engineering with a concentration in computers and communications from Valparaiso University in 1984; and master’s and doctorate degrees in electrical engineering from the University of Notre Dame in

1987 and 1991, respectively.

Her doctorate degree’s area of concentration was systems and control, with a minor in computers and mathematics.

## Academic background

While undertaking internships and consulting work at McDonnell Douglas Astronautics Co. in the early 1980s and Chimera Research in the early 1990s, Schrader began her teaching and research career at Notre Dame. After a short period as adjunct assistant professor at Rice in 1991, Schrader moved to the University of Texas at San Antonio where she rose to serve as a tenured professor in electrical engineering and served as associate dean in both a college of sciences and a college of engineering. In 2003 she became professor and dean of the

College of Engineering at Boise State. In January 2011, she accepted the position of associate vice president for strategic research initiatives in Boise State’s Division of Research and Economic Development.

Schrader has earned numerous awards throughout her career, including: the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring from the White House (2005); the IEEE Education Society Hewlett-Packard/Harriett B. Rigas Award; the “Idaho Women Making History” Award; the Exemplary Online Course Award from WebCT; and several awards for best research papers and presentations. She also was named one of Valparaiso University’s Top 150 Most Influential People.



**Schrader with her husband Jeff and daughter Ella, age 5. The Schraders also have a son, Andrew, who is a mechanical engineering student at Valparaiso University. Schrader’s husband, Jeff, is chief legal counsel for the Idaho State Board of Education.**

which is dedicated to providing world leadership in stimulating innovation and excellence in engineering, today accredits 2,100 engineering programs at more than 400 colleges and universities.

“My volunteer work at ABET helps me connect engineering education to the profession in real ways and keeps students at the center of all we do at the university,” Schrader said.

“And as a person typically underrepresented in engineering, my interactions with students and programs around the world and in such a formative way has helped in broadening diversity.”

Schrader plans to continue the STEM education research she has pursued for a decade with over \$4.5 million in federal, state and foundation funding secured. This

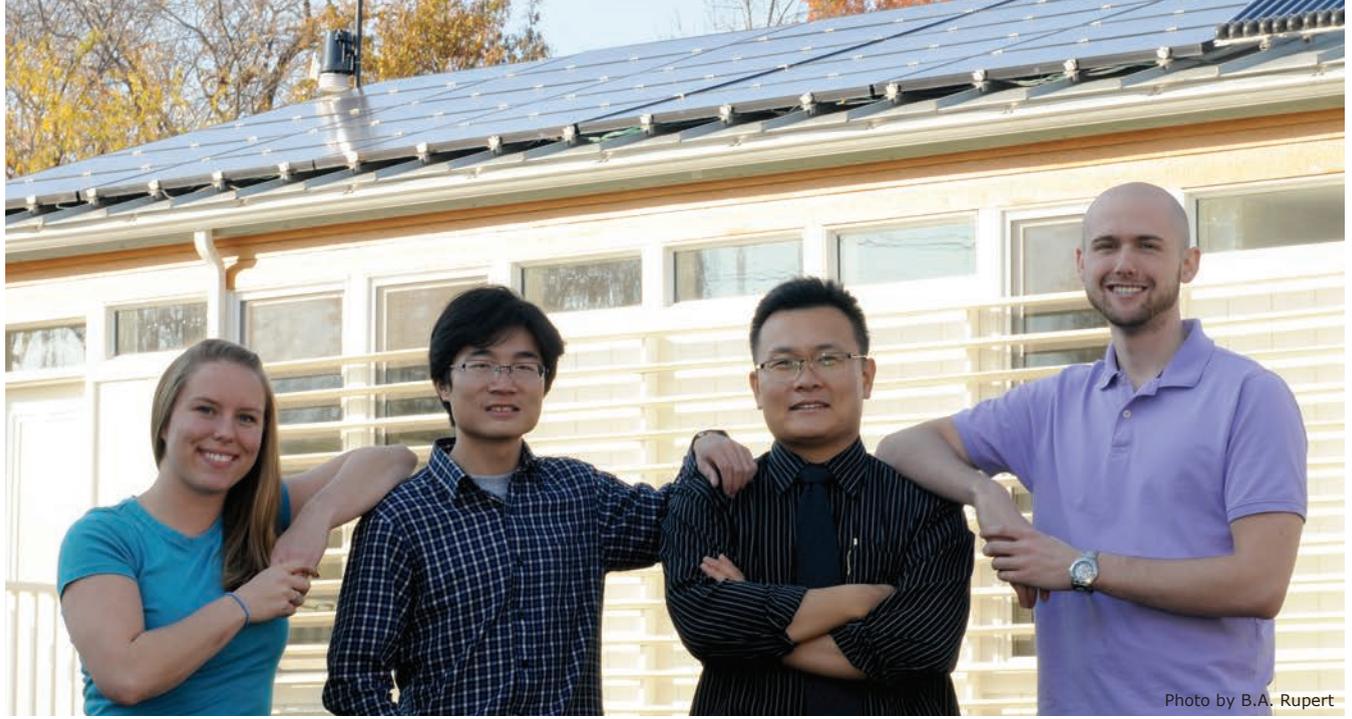


Photo by B.A. Rupert

Choi's team pictured from left to right: Annelise Smith, Chou Shen, Joon-Ho Choi and Lucas Laughery.

# The house of the future, *designed* at S&T today

By Lance Feyh

In the house of the future, built-in sensors will measure the weather outside and automatically adjust indoor air temperatures. Homeowners will be able to monitor the system with their smartphones.

Using a weather station funded by the Environmental Protection Agency (EPA) and installed at Missouri S&T's Solar Village, researchers began work this fall to make the home of the future the home of today, and save homeowners up to 40 percent in the cost of cooling their homes.

**Joon-Ho Choi**, assistant professor of civil, architectural and environmental engineering, is leading the project with funding from a P3 (people, prosperity, planet) grant from the EPA.

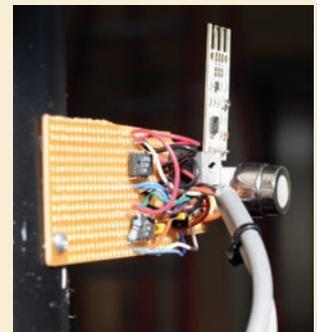
The team will install a small weather station — complete with wind turbine — outside one of the houses at the Solar Village. The weather station will measure the four main factors that impact indoor

climate — solar radiation, air temperature, humidity and wind — and communicate information to a computer inside the solar house.

Small sensors will be placed throughout the house to monitor conditions. The data will allow the house to control its own temperatures and conserve significant amounts of energy.

"It takes out the human factor," says Choi, who predicts that houses will one day be equipped with windows that open and close on their own, depending on weather conditions. "It will enhance human comfort while saving energy without additional cooling."

Choi's group will travel to Washington, D.C., to share their results and compete for an additional grant of \$90,000, which would enable them to take the design to real-world applications.



**"It will enhance human comfort while saving energy without additional cooling."**

— Joon-Ho Choi

# Building

By Mindy Limback

S&T researchers are exploring how high-density polyurethane foam could replace honeycomb structures.



**Jeffery Volz** (opposite page) and his students (clockwise from left) **Amanda Steele** of St. Joseph, Mo., a senior in civil engineering; **Matthew Hopkins** of Burfordville, Mo., a graduate student in civil engineering; and **Hesham Tuwair** of Tripoli, Libya, a doctoral student in civil engineering.

Photos by B.A. Rupert

# better bridges

With 17 percent of Missouri's bridges deficient and not enough resources available to repair and rebuild them, researchers at Missouri S&T are more determined than ever to develop innovative and inexpensive materials that can replace these relic structures.

"A common saying for civil engineers is that we could build bridges that last forever, but we can't afford them," says **Jeffery Volz**, assistant professor of civil, architectural and environmental engineering at Missouri S&T.

The majority of the nation's 600,000 bridges were built nearly 50 years ago using traditional materials, like steel, concrete and rebar. The structural integrity of these bridges, nearing the end of their lifespan, has been greatly reduced due to weathering, combined with wear from vehicle traffic and de-icing chemicals and reduced maintenance.

Over the last 15 years, newer designs have called for replacing the concrete and rebar with fiber reinforced polymers (FRP). Built with intricate honeycomb structures, glass carbon fiber bridge decks are strong, lightweight and corrosion resistant. Despite offering a longer life and lower maintenance costs, fiber reinforced bridges come with a higher price tag up front — nearly twice the cost of traditional structures — because the honeycomb structure is extremely expensive to construct.

That's where Volz sees an opportunity. Using a \$120,000 grant from the Missouri Department of Transportation

matched with a \$60,000 grant from the U.S. Department of Transportation, S&T researchers are exploring how high-density polyurethane foam could eliminate the need for the honeycomb structures. Sandwiched between FRP facings, polyurethane foam is often used in cars, planes and prefabricated buildings.

"We're using a formulation of polyurethane foam that can withstand compression beneath a truck wheel," he says. "By adding glass fibers to the polyurethane foam, we can get up to 1,000 psi."



Working on the project with Volz and his students are K. Chandrashekhara, Curators Professor of mechanical and aerospace engineering, and Victor Birman, professor of mechanical engineering and director of S&T's Engineering Education Center in St. Louis.

Built together in a factory, the sandwich deck panels could be shipped to site on trailers and are light enough that two workers could carry each panel. The team is completing their design and plans to test a prototype panel in the university's high-bay laboratory this summer. The lab can accommodate testing of full-size bridge components.

"The foam and FRP panels offer the same cost as concrete but could live forever," he says. "It should last until we have flying cars and don't need bridges anymore."

## Career Opportunities and Employer Relations rated a top 15 career center (The Princeton Review, 2011)



[career.mst.edu](http://career.mst.edu)

Missouri S&T has a reputation for hosting some of the largest and most successful career fairs in the Midwest, and this past year was no exception.

The Fall Career Fair, held Sept. 27, 2011, drew 210 employers, including 135 alumni. To celebrate, the Miner Alumni Association, along with Students Today, Alumni Tomorrow (STAT) and Engineers Without Borders, hosted a continental breakfast for all the recruiters.

The Spring Career Fair, held Feb. 21, 2012, saw a 17 percent increase in employers over last year, with 29 new companies being represented. S&T students visited with more than 500 recruiters (representing 178 employers from 29 states) in the hopes of landing a job, internship, or co-op opportunity.

Civil, architectural and environmental alumni in attendance at both fairs were:

- Keith R. Beers, CE'08
- Joshua Boeckmann, CE'09
- Thomas G. Durham, CE'71
- Rachel Fetters, EnvE'09
- Gerad Fox, CE'08
- Jessica A. Gibbs, CE'10
- Brett Goodman, CE'93
- Darleen Groner, CE'92
- Mark Alan Harms, CE'83
- Brittany Harrington, ArchE'10
- Timothy Hudwalker, CE'88
- Kyle L. Kammer, CE'10
- William P. Kirby, ArchE'08
- Angie Kolb, CE'96
- Hilary A. Kuehn, CE'11
- Lou Kuelker, CE'06
- Matthew McCray, CE'05
- Chet S. Parry, CE'08
- Terry Roberts, CE'82
- Joel A. Schrenk, ArchE'08
- Mathew Silver, CE'98
- Chriss D. Taegel, ArchE'06
- Aaron Trenshaw, ArchE'11
- Matthew J. Ward, CE'09

## TOP corporate partners

Missouri S&T benefits from partnerships with many corporations. But there are a select group of companies whose connection with the campus is unrivaled. These are the companies that hire our graduates, invest in the university and support research.

Recently, Missouri S&T's Corporate Relations Team, made up of senior campus leaders, selected S&T's 2011-2012 top corporate partners based on three years of data on four criteria: hiring, donations to campus, research expenditures and number of alumni employed.

### Twelve companies top the list:

- Ameren
- Anheuser-Busch
- The Boeing Co.
- Caterpillar
- Chevron
- Deere & Co.
- ExxonMobil
- General Electric
- General Motors
- Halliburton
- Monsanto
- Sprint Nextel

S&T appreciates these companies support and is proud of their partnership. To find out how your company can partner with S&T, contact Mary Bird at 573-341-6596 or [mbird@mst.edu](mailto:mbird@mst.edu).



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Missouri S&T Civil, Architectural & Environmental Engineering (CArE)

# Eric Showalter: course under construction



Eric Showalter's students used iPads to track construction projects in his Cost Estimating and Scheduling course.

Photo by B.A. Rupert

By Mary Helen Stoltz

## Old class:

**Eric Showalter**, associate teaching professor of civil, architectural and environmental engineering, has taught a construction management course called Cost Estimating and Scheduling for more than a decade. One semester-long assignment requires students to pick a construction site and keep a diary of everything that happens — from weather conditions to which subcontractors are on site and what work is being done. It gets them in the habit of observing and writing.

## New twist:

Last fall, instead of keeping a paper diary, his students tracked their progress on iPads using an app called Construction Superintendent.

## The gift:

**Robert “Bob” Brinkmann**, CE’71, CEO of Brinkmann Constructors, believed that S&T students should be exposed to new, high-tech approaches

to project management. He brought together a group of alumni and corporations with construction-based interests (see list at right) to donate 30 iPads to the S&T civil, architectural and environmental engineering department.

## Up next:

Showalter is using the iPads and Construction Superintendent in his senior design course. He’s teaching 70 students, 11 of whom are on the Missouri State University campus in Springfield. Each team of students is designing a water treatment plant from the ground up.

## In his words:

“I really appreciate this donation. It has great potential. We can do some really neat things in coming semesters ... There is so much to explore.”

## iPad Donors

- **Brinkmann Constructors**
- **Bradley Hornburg**, CE’69
- **Landmark Contract Management Inc.**
- **Dick Arnoldy**, CE’69
- **ARCO Construction Co.**
- **John Mathes**, CE’67, MS CE’68
- **William Clarke**, CE’74, MS CE’79
- **Raymond Betz**, CE’66

## About the App

**Bob Brinkmann**, CE’71, **Bob Wacker**, CSci’77, and **Bryan Baehr** created the iPad app through their joint venture, Construction Centrics, and donated 30 apps.

# Helping East Africa

By Linda Fulps

**Dan Oerther** wants to help East Africans help themselves. He is working to bring clean water, food and income to an area that is suffering from the worst drought in decades.

As the John and Susan Mathes Chair of Environmental Engineering at S&T, Oerther has spent the last five years with his wife, Sarah, a registered nurse, working on projects to benefit the area.



**Dan Oerther in Tanzania**

“We’ve been working with the Luo tribe in Tanzania and are now starting projects with the same tribe in Kenya,” he says.

The Oerthers completed a water project in Kenya and returned to the country this past summer with **David Hackney**, a senior in civil engineering, to spend three weeks establishing the Pula

Cloud project there. This income-generating project is a collaboration with a doctoral student at the University of Cincinnati and Missouri EDGE, a company owned by Sarah Oerther. Pula Cloud provides villagers with computers so they can sort through 40,000 images from a medical database to narrow them down for a researcher.

“Computers can’t process these images like a human can,” says Oerther. “And the researcher doesn’t have time to go through all those images. We’d like to start a similar project in small communities near Rolla that need income generation as well.”

Another project in Kenya, the Nutrition Partnership, will teach animal husbandry to widows. “Widows will learn to raise chickens for eggs, and the meat will be given to the schools to improve nutrition,” says Oerther. The Oerthers will lend the funds for the chickens and associated capital, and have begun fundraising for a school lunch program.

Oerther is confident the projects in Kenya will be as successful as the ones in Tanzania. “The village in Tanzania now provides its own clean water,” he says. “The Roche Health Center we started has a full-time doctor and several nurses. Diarrheal diseases and childhood mortality are down, and the nutrition program has improved students’ health, academic performance and school attendance by 25 percent.”

## Carney receives Chancellor Medal

**John F. Carney III**, former chancellor of Missouri S&T, received the university’s Chancellor Medal during commencement ceremonies in May. The Chancellor Medal is given to individuals who have contributed to the well-being, growth and development of the university.

Carney became chancellor at S&T in 2005 and stepped down in 2011. He led the university through a series of changes, including a name change to strengthen the university’s reputation, a renewed emphasis on energy and environmental research and education, and an emphasis on gaining more private support.

Carney received his bachelor’s degree in civil engineering in 1963 from Merrimack College in North Andover, Mass., and a master’s degree (1964) and Ph.D. (1966) in civil engineering from Northwestern University in Evanston, Ill. He was also named professor emeritus of civil, architectural and environmental engineering during commencement.

## Saxer receives professional degree



**Saxer**

**Robert M. Saxer**, received a professional degree during commencement ceremonies this May. Saxer earned bachelor of science and master of science degrees in civil engineering from Missouri S&T in 1961 and 1962, respectively.

He specialized in the biological treatment of industrial wastes, working in the Chicago area on design, operation and sale of biological and chemical water purification process equipment systems. In the early 1980s, he joined AMCEC as project engineer for air pollution control. In retirement, Saxer designed a high-efficiency HVAC system for a 19th century stone church, tutored GED math, volunteers with Shriners Children Hospital in Chicago and helps build experimental private aircraft.

## Endowed faculty positions created

### Endowed professorship in construction management

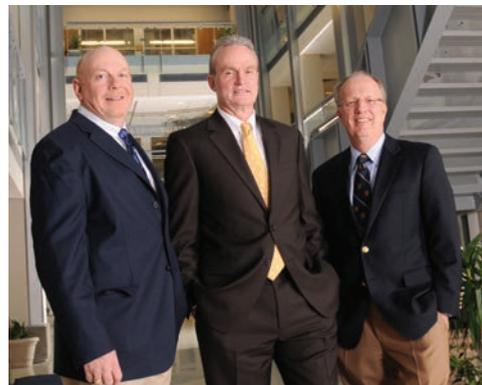
In 2008, **Michael D.**, CE'74, and **Barbara Hurst** and McCarthy Building Companies Inc, pledged \$1M to establish an endowed professorship in construction management. Their pledge, made during the Campaign for Excellence, has been fulfilled, and a search is underway to attract a senior professional with an established national and international reputation in the areas of construction, construction management and design-build.

Hurst retired as President and Chief Operating Officer at McCarthy in 2007 after working with the company for more than 33 years. He joined S&T's Board of Trustees this spring and has been a member of the Academy of Civil Engineers since 1997. He and Barbara are members of the Order of the Golden Shillelagh.

### Endowed professorship in flexible pavements

In 2005, members of the Missouri Asphalt Pavement Association (MAPA) formed the Missouri Asphalt Industry Advancement Program (MAIAP) to bring research, innovation and education in the asphalt industry to Missouri S&T. Members pledged to fund an endowed professorship at S&T in the flexible pavements area. In November this past year, the Missouri Asphalt Industry Advancement Program reached another milestone as members of the MAPA Research and Education Fund (REF) Board presented the final installment of the endowment to S&T. The next step in the process is to recruit and hire a world-class professor, whose teaching and leading-edge research will uniquely contribute to the ties between the asphalt industry and Missouri S&T.

For information on establishing an endowed fund, contact Paula McBurnett by phone at 1-800-392-4112, or by email at paulam@mst.edu.



### Construction Management

Pictured left to right: **Gary Amsinger**, **Derek Glanvill** and **Michael Hurst**



### Flexible Pavements

Pictured left to Right: **Chris Yarnell**, MAPA-REF Secretary-Treasurer; **Bill Schonberg**, chair, civil, architectural and environmental engineering; **Dave Richardson**, associate professor of civil engineering; **Larry West**, MAPA-REF President; **Dale Williams**, MAPA Executive Director

## Burken obtains BCEE certification

**Joel Burken**, associate chair and professor in civil, architectural and environmental engineering, obtained the title of Board Certified Environmental Engineer (BCEE) through the American Academy of Environmental Engineers (AAEE).

The American Academy of Environmental Engineers was founded in 1955 with the purpose of serving the public by improving the practice, elevating the standards and advancing public recognition of environmental engineering through special certification. Each Board Certified Environmental Engineer has met standard prerequisites and has also passed written and oral examinations and reviews by an admissions panel of the Academy. The Academy's certification program is accredited by the Council of Engineering and Scientific Specialty Boards.

This certification was formerly called the Diplomat of Environmental Engineering.

## Volz receives teaching award

**Jeffery Volz**, assistant professor of civil, architectural and environmental engineering, received the Outstanding Teaching Award for 2010-2011. He was recognized at a ceremony held in November on campus. The Outstanding Teaching Award is given each year to faculty members by the Outstanding Teaching Award Committee, which bases its selections on student evaluations.

# Geothermal project to cut energy usage by half

By Andrew Careaga

By the time a geothermal energy project at Missouri S&T is completed in 2014, the campus annual energy use will be cut in half and its carbon footprint reduced by 25,000 metric tons per year.

University officials broke ground on the project Tuesday, April 17, by drilling a hole in one of the geothermal well fields north of Butler-Carlton Civil Engineering Hall.

Missouri S&T's geothermal energy system will replace the university's aging coal-fired power plant, which was constructed in 1945. The system is also one of the most comprehensive ever undertaken by a college or university, says Missouri S&T Chancellor Cheryl B. Schrader.

"Several campuses have created small-scale geothermal systems to provide energy for a residence hall — or perhaps to a few buildings on campus," says Schrader. "But only a

few other campuses in this nation have ever attempted to construct a system on a campuswide scale."

In 2010, the University of Missouri System Board of Curators approved Missouri S&T's plan to construct the geothermal system. Initially, the system is expected to save more than \$1 million annually in energy and operational costs, but that savings is expected to grow to \$2.8 million a year.

The project will also eliminate a backlog of about \$26 million in deferred maintenance costs for the aging power plant. Those costs include the replacement of boilers, steam lines and other antiquated infrastructure.

The geothermal system will also reduce Missouri S&T's environmental impact. It is expected to reduce S&T's carbon dioxide emissions by 25,000 metric tons per year — roughly the equivalent of the greenhouse gas emissions of 4,600 passenger vehicles a year, Schrader says.

The system will also reduce Missouri S&T's water usage by about 10 percent, or 8 million gallons per year.

Construction of the geothermal system will officially begin in May with the drilling of ground-source wells around campus. Pipes will be installed in the wells and connected to create closed geothermal loops. Water will be circulated through the loops from three campus geothermal plants that will be constructed as part of the project.

The system will allow energy to be stored in and reclaimed from well fields around campus. Approximately 600 wells will serve the three campus geothermal plants. Drilling will begin in May and continue through the summer.

The geothermal plants will be housed in Emerson Hall, McNutt Hall and a future building that will be constructed in 2013 and 2014. That building, James E. Bertelsmeyer Hall, will house S&T's chemical and biological engineering department.

Each of the three plants will contain heat pump chillers, supplemental cooling towers and gas-fired boilers to provide geothermal energy to surrounding areas of campus.



**Missouri S&T Chancellor Cheryl B. Schrader, assisted by mascot Joe Miner, prepares to flip the lever on a drill to break ground for S&T's geothermal energy project. When completed in 2014, the geothermal energy system is expected to reduce campus energy usage by 50 percent.**



## Earth Day 2012



The 11th annual Rolla Earth Day celebration was held Friday, April 20, at Missouri S&T. This year's theme was "Saving Tomorrow's World Today" and featured interactive energy displays from the Saint Louis Science Center, live entertainment, poster and trash art displays, games and more.



**“Several campuses have created small-scale geothermal systems to provide energy for a residence hall — or perhaps to a few buildings on campus, but only a few other campuses in this nation have ever attempted to construct a system on a campuswide scale.”**

**— Chancellor Schrader**

Once the geothermal project is completed in 2014, it will provide heating energy to 15 campus buildings as well as cooling energy to the campus chilled-water system, which serves much of the campus. Stand-alone equipment will be housed in the remaining campus buildings that currently are heated by steam from the power plant. Heat exchange units will heat and cool Butler-Carlton Civil Engineering Hall, increasing its efficiency and monitoring its electrical use.

Energy audits over the past five years helped initiate the new system. The audits are part of many campus efficiency efforts. The next phase planned for the civil engineering building is to install new lighting with energy efficient fixtures.

Upon completion of the geothermal project, the power plant boilers will be decommissioned.

The project is funded through the sale of \$32.4 million in revenue bonds, approved by the curators in November 2010. The university plans to repay the debt over 30 years through savings from the project.

## Oerther selected to attend NAE symposium

Daniel Oerther, the John and Susan Mathes Chair of Environmental Engineering at Missouri S&T, was one of 65 of the nation's "most innovative young engineers and educators" selected to take part in the National Academy of Engineering's third Frontiers of Engineering Education symposium.

Initiated with a class of 45 faculty in 2009, the third symposium was held Nov. 13-16 in Irvine, Calif. During the event, Oerther and his peers shared ideas about innovations linking teaching (i.e., the activities of teachers) and learning (i.e., the knowledge of the students).

Oerther's presentation entitled, "Sustainable Development as a Holistic Transdiscipline to Improve Learning in the Affective Domain," integrated his interest in sustainable development with his professional expertise spanning the fields of engineering, nursing and architecture.

"Of course, engineers must be competent in their core disciplines," offers Oerther. "But, they must also be proficient in the professional skills such as ethics, teamwork and communication. These skills reside in the emotive and motivational parts of learning, and hands-on activities in the complex arena of multidisciplinary sustainable development provide one of the best forums to practice these skills in my opinion."

# New Jones Chair



**Kamal H. Khayat, the new Vernon and Maralee Jones Chair of Civil Engineering**

**Kamal H. Khayat** is the new Vernon and Maralee Jones Chair of Civil Engineering. He was also named director of the Center for Infrastructure Engineering Studies and the Center for Transportation Infrastructure and Safety at Missouri S&T.

Khayat specializes in the development of high-performance cement-based materials for structural applications and rehabilitation projects. He focuses on self-consolidating concrete and high-performance concrete behavior.

One of the first priorities on Khayat's list is to cultivate partnerships with other leaders in the transportation field and to work closely with personnel at the Missouri Department of Transportation to find novel and cost-effective technical

solutions to enhance the state's transportation infrastructure.

Khayat earned his Ph.D. in civil engineering from the University of California at Berkeley. Prior to arriving at S&T this past fall, Khayat was director of the Center of Excellence on Concrete Infrastructure Engineering at the Université de Sherbrooke in Canada. He was also head of the Integrated Research Laboratory on Materials Valorization and Innovative and Durable Structures at Sherbrooke.

**Vernon, CE'53, and Maralee Jones** endowed the chair in 2006 after making numerous contributions to Missouri S&T. Vernon Jones is the former president of The Williams Company, an energy and communications company in Tulsa.

## Myers appointed to bridge performance program

**John J. Myers**, associate professor of civil and architectural engineering, was appointed to serve an initial three-year term on the Federal Highway Administration's (FHWA) Long-Term Bridge Performance Program (LTBP) ETG Advisory Committee as an expert in the field of bridge durability and preservation. The LTBP was launched by the FHWA's Office of Infrastructure Research and Development as a major strategic initiative to serve as a 20-year undertaking with the global objective of collecting scientific quality data from the nation's highway bridges, as critical node-points of the highway transportation network. The data and information collected in this program will provide a more detailed and timely picture of bridge health, improve knowledge of bridge performance and ultimately promote the safety, mobility, longevity and reliability of the nation's highway transportation assets.

Since joining S&T in Spring of 1999, Myers has been deeply involved in the performance of advanced concrete materials and composites for infrastructure

applications, particularly bridges. His work at both S&T and at the doctoral level has involved the implementation of advanced materials into a number of in-situ demonstration bridges working with state and local agencies such as MoDOT and TxDOT on bridge instrumentation and monitoring. Myers will serve on this expert task group as one of two academicians, along with two consultant member experts and three DOT member expert representatives. This group will serve the Transportation Research Board (TRB) of the National Academies and advise FHWA on program activities related to defining data collection for bridge durability and preservation, refinement of bridge deterioration models and life-cycle cost models, as well as the development of a long-term bridge health index.

More information concerning the FHWA Long-Term Bridge Performance Program may be found at <http://www.fhwa.dot.gov/research/tfhrp/programs/infrastructure/structures/ltpb/>.

## Bayless receives Alumni Alliance honor

**Jerry Bayless**, associate professor of civil, architectural and environmental engineering at Missouri S&T, was one of seven individuals honored recently by the University of Missouri Alliance of Alumni Associations and Extension for outstanding service.

Bayless received the 2011 Presidential Citation Award for outstanding alumni service to Missouri S&T during an event held Nov. 18 at the Clinton Club in Columbia, Mo.



**Jerry Bayless, pictured with Joe Miner, gives a "thumbs up" for alumni service.**

Known as "Mr. S&T," Bayless has served in numerous roles at Missouri S&T during his more than 50 years on the faculty, including chair of civil engineering and associate dean of the school of engineering.

A member of the Missouri S&T faculty since 1959, Bayless served as assistant to the chair of the civil engineering department for many years and as freshman advisor and transfer student advisor. In

1986, he was promoted to assistant dean of engineering and was named associate dean in 1990. During his career, he has held summer positions with the Missouri Highway Department and the U.S. Army Corps of Engineers. In 2004, Bayless received the Missouri S&T Chancellor Medal. He has also received the Alumni Merit Award.

## Faculty members receive awards



**Chen**



**Morrison**



**Richardson**



**Thomas**

Four civil, architectural and environmental faculty members received the Faculty Excellence, Achievement, Research or Teaching Award for 2011. Each award winner received a \$1,000 stipend funded by industry and alumni contributions. An awards ceremony was held on Tuesday, Feb. 7.

Receiving the 2011 Faculty Excellence Award was **Glenn Morrison**, associate professor, environmental engineering; receiving the 2011 Achievement Award was **Jeff Thomas**, assistant teaching professor, mechanics; receiving the 2011 Research Award was **Genda Chen**, professor, structural engineering; and receiving the 2011 Teaching Award was **David Richardson**, associate professor, materials engineering.

## LaBoube named to 'Power List'



**LaBoube**

*Structural Engineering and Design Magazine* named **Roger LaBoube**, CE'70, MS CE'73, PhD CE'77, to its 2011 "Power List." Each year, the magazine recognizes 10 leaders in the structural engineering sector for developing solutions to some of the world's toughest problems. LaBoube, an expert in cold-formed structural steel, is a Curators' Teaching Professor emeritus at Missouri S&T. He is also director of the Wei-Wen Yu Center for Cold-Formed Steel and director of the Kummer Student Design Center at Missouri S&T.

## Advisor of the year

**Rick Stephenson** was honored as the Outstanding Advisor of the Year at an awards breakfast hosted by Student Life on April 23, 2012. At the breakfast Chancellor Schrader recognized the voluntary contributions of all S&T student organization advisors.

## Limmer authors winning paper: Trees tell story of contaminants



**Limmer**

**Matt Limmer**, a Ph.D. student in environmental engineering, authored a winning paper submitted to the Student Paper Competition for the Eighth International Conference on Remediation of Chlorinated and Recalcitrant Compounds. The paper, entitled “Long-Term Monitoring of Chlorinated Solvents in Trees: Seasonal Variations in Concentrations,” describes a novel technique for measuring groundwater contaminants in planta. Using this technique, the

researchers were able to understand seasonal fluctuations in tree contaminant concentrations, which will lead to better estimates of contaminant removal by plants. Co-authors include **Amanda Holmes**, a freshman in environmental engineering, and **Joel Burken**, a professor of civil and environmental engineering at Missouri S&T.

The Battelle-sponsored conference will be held in Monterey, Calif., May 20-24, 2012. The conference is the largest international conference in the U.S. on groundwater remediation and more than 1,500 scientists, engineers, regulators, and other environmental professionals representing universities, government site management and regulatory agencies, and R&D and manufacturing firms from around the world are expected to attend.

## Oerther inducted as honorary member of nursing society

The honor society of nursing, Sigma Theta Tau International, recognized **Daniel B. Oerther**, the John A. and Susan Mathes Chair of Environmental Engineering, as one of five honorary members inducted at the organization's convention held Oct. 28-Nov. 2 in Dallas.

STTI is an organization of 130,000 nurses representing 60 countries with the objectives of recognizing superior achievement, developing leaders, fostering professionalism, encouraging creativity and strengthening commitment to the ideals and purposes of the profession of nursing.

“Nurses and engineers share a common professional holistic approach to global problem solving and protecting community health,” says Oerther. Nurses are natural collaborators with engineers, and I'd like to see more faculty at S&T engage nurses as partners in promoting sustainable health.”

Oerther's international efforts brought life-saving clean drinking water, sanitation and access to health care to more than 100,000 villagers in Guatemala, India, Kenya and Tanzania. His collaborative partnerships have been recognized by the American Academy of Environmental Engineers, the International Water Association, the Institute for Public Health and Water Research, the National Council of Architectural Registration Boards, the National Science Foundation and the U.S. Department of State Fulbright Program.

## Annual Conferences

### GeoMo Conference

The annual GeoMO Conference was held in April. Krishna Reddy, professor of civil and environmental engineering and director of the Geotechnical and Geoenvironmental Engineering Laboratory at the University of Illinois, Chicago, discussed recent advances in geoenvironmental engineering toward sustainable waste management and pollution control and remediation.

### Concrete Conference

The annual Missouri Concrete Conference, directed by department faculty member **Dave Richardson**, '71, was held in April. Twenty-five presentations were given, including ones by departmental alumni **Randy Hitt**, '87, **Larry Taber**, '00, '01, **Rick Holesinger**, '85, **Brent Whitwell**, '05, '06, **Bill Stone**, '84, and **Vicki Woods**, '89.

### Asphalt Conference

The 54th Annual Asphalt Conference was held in December. Twenty-three presentations were made, including those by alumni **Dennis Bryant**, '83, **Steve Jackson**, '07, **Jason Blomberg**, '97, **Joe Schroer**, '81, and **David Yates**, '95. The conference was directed by **Dave Richardson**, '71.

**To view conference photos  
visit our department  
facebook page.**

# Environmental **biotechnology** **expert** presents lecture

**Bruce Rittmann**, an international leader in assessing microbial communities, spends his time motivating his “many little friends” to do what he wants through engineering and biotechnology applications. In a lecture at S&T, Rittmann discussed ways his interdisciplinary research improves conditions around the world and is leading to new ways to clean up pollution, treat water and wastewater, capture renewable energy and improve human health.

“Making research meet practice in environmental biotechnology” was the title of Rittmann’s lecture that was presented Friday, April 20, in the Gunther Lecture Hall.

Rittmann, director of the Swette Center for Environmental Biotechnology at the Biodesign Institute at Arizona State University and also a Regents’ Professor in the School of Sustainable Engineering and Built Environment, discussed how microorganisms can provide society with many valuable services, such as improving water quality and producing renewable energy. The talk illustrated how environmental biotechnology creates innovative microorganism-based systems by combining engineering tools with a deep understanding of the microorganisms. The outcome is a set of services that will make human society more sustainable in the future.

Rittmann was named an International Water Association Fellow, American Association for the Advancement of Science Fellow and an ASU Regents’ Professor, and is a National Academy of Engineering member. He has also won the Arizona BioIndustry

Association 2009 Award for Research Excellence, American Society of Civil Engineers 2009 Simon W. Freese Award, 1994 National Water Research Institute’s Clarke Prize for Outstanding Achievement in Water Science and Technology, and the Huber Research Prize from American Society of Civil Engineers.

The lecture was presented as part of the Neil and Maurita Stueck Distinguished Lecture Series for civil, architectural and environmental engineering at S&T. The series is made possible by a fund established by Maurita Stueck to bring additional outside perspectives to S&T students, and to honor her late husband, Neil Stueck, a 1943 civil engineering graduate.



**Watch a video about Rittmann by scanning this QR code with your smart phone.**



Pictured left is **Bruce Rittmann**, director of the Swette Center for Environmental Biotechnology at Arizona State University and **Maurita Stueck**, donor of the Distinguished Lecture Series.



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Civil, Architectural and Environmental Engineering  
211 Butler-Carlton Hall, 1401 N. Pine St.  
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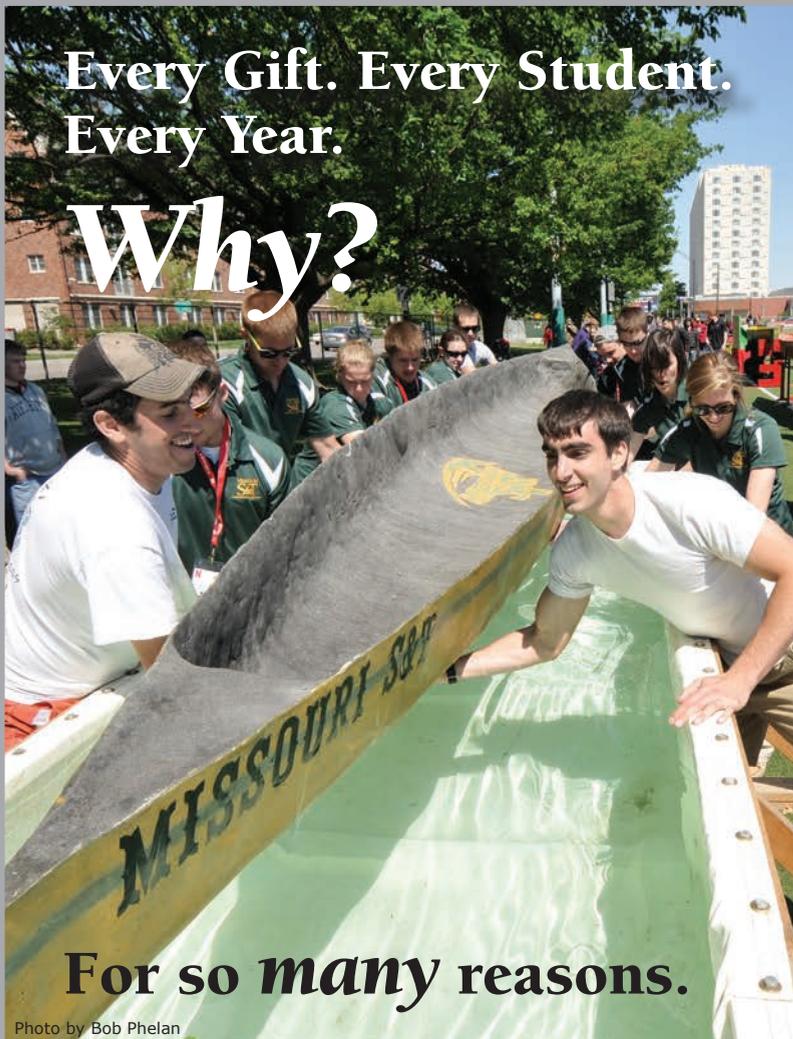
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