

The BRIDGE

Civil, Architectural and Environmental Engineering

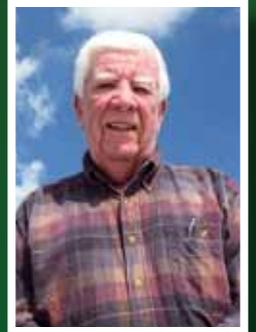
Winter 2015 | Vol. 35



The Nest Home

S&T's Solar House Design Team sets out to redefine the American housing market
page 4

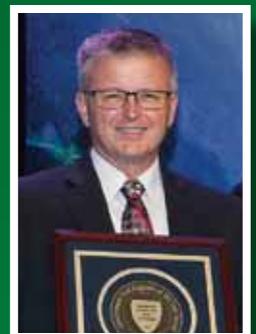
MISSOURI
S&T



A monumental anniversary ...
page 9



Academy awards Sneed ...
page 19



ASCE honors Holmes ...
page 22



Message

from the associate chair

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

I love a good sports analogy. Over the last year, we've certainly had a few shake ups and set backs in the front office and in the management of our team and organization, and not all is fully settled. Even though these distractions diverted some of our efforts on campus and beyond, I can say without a doubt that the team we put on the field (in classrooms, labs, etc.) has been productive, done their best and impacted many students as well as the engineering profession. We can often get mired by the way things should have gone after a fielding error or distracted by things happening on the field, but for me personally, reading this latest edition of *The Bridge* makes

me proud of 'our team' — from the most accomplished alumni and faculty to the best and brightest students.

Amazing things are happening on campus and from coast to coast. Students are helping design and construct the solar house and then transporting it to California (pg. 4). Our incumbent class of Academy members, with mind-numbing career accomplishments, are proving that S&T graduates are prepared to enter their profession geared for 'Hall of Fame-type' careers (pg. 16).

Please take a moment to look through our newsletter and truly appreciate

the events and accomplishments culminating with the story of **Dr. Robert Holmes**, an alumnus and current instructor, who received the 2015 Government Civil Engineer of the Year Award from ASCE (pg. 22) or the 'MVP of the Big Leagues' if you are sticking with this sports analogy.

I'd like to encourage you to engage in a few of our events in the coming year via our website or Facebook page. Visit campus during St. Pat's in March or attend the 2016 Stueck Lecture featuring Dr. Wayne Clough in April (pg. 23).

Great things are ahead for our team!

TWO NEW TEAM MEMBERS



Nicolas Ali Libre

Assistant teaching professor

Structural engineering

Ph.D. civil engineering, 2009
University of Tehran, Iran

Research interests:

- Computational mechanics and applied mathematics
- Meshfree numerical methods for partial differential equations
- Radial Basis Functions collocation method
- Ill-conditioned systems of linear equations
- Wavelet-based adaptive methods
- Advanced cement-based materials for sustainable construction
- Durability of cement-based materials in aggressive environments
- Rheological and mechanical properties of fiber-reinforced concrete
- Non-destructive evaluation of concrete properties



Hongyan MA

Assistant professor

Materials engineering

Ph.D. civil engineering, 2013
Hong Kong University of Science and Technology

* SIGNATURE AREA HIRE

Research interests:

- Hydration kinetics of (blended) cementitious materials
- Microstructural characterization and modeling of cement paste, interfacial transition zone and mortar/concrete
- Measuring and multi-scale modeling of transport properties of concrete
- Mechanisms and properties of novel construction/rehabilitation materials
- Magnesia-phosphate cement (MPC) and MPC-based functional materials
- Deterioration mechanisms of sea sand concrete and marine concrete structures
- Molecular simulation of C-S-H
- Acoustics-based NDT

MinerFest

MINER HOMECOMING FALL FESTIVAL

2015



Williams



Boswell

Department royalty

Missouri S&T Homecoming activities were held Oct. 23-24. **Aspen Williams**, (pictured above left), a senior in civil engineering from Rochester, Illinois, was voted first runner-up for Homecoming Queen and **Zach Boswell**, (pictured above right), a senior in civil engineering from Des Peres, Missouri, was voted second runner-up for Homecoming King.

Leading legend

LaWanda Jones of St. Louis received an Alumni Merit Award during the Miner Alumni Association's Legends Luncheon. Jones, senior project engineer at ABNA Engineering, earned a bachelor of science degree in civil engineering from Missouri S&T in 1991. She is pictured bottom right with **Jason Northern**, a senior development officer for university advancement at S&T.

DEPARTMENT ADMINISTRATION

Department Chair Open Position

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.

The BRIDGE

in this issue

10

Hybrid jacketing

Researchers are proving a new wrap-around jacket can protect bridge columns during extreme conditions.

15

Weathering the storm(water)

Katherine Bartels, a sophomore in environmental engineering, is studying the impact of different plants and soils on stormwater and the cooling effects that green roofs have on urban "heat islands."



LaWanda Jones, pictured right, with Jason Northern

Photo by Sam O'Keefe



The Crowd Favorite
 The 2015 Nest Home is a well-balanced blend of modular design, comfort and sustainability.

THE NEST HOME

Photos by Bob Phelan

Nature's next masterpiece earns fifth place

September 27, 2015
 Well, we made it to California! It's still hard to believe that we're here already. Everyone is so excited/nervous to see what's going to happen in the weeks to come.
 We met with Jeff and the crew last night to go over some details. It's awesome how much he believes in us and in our house. It was good that he reminded us that this competition is political, and if we don't do as good as we expected we should keep our heads up because we know we have one of the best houses.
 God, watch over this team. Please bless us and keep us focused, and help us to just do our best. We all spent so much time and effort into this house. Help us to not get discouraged and to keep a positive attitude.
 God Bless,
 Tyler

Tyler Jackson,
 Electrical Team Lead



The 2015 Missouri S&T Solar House Design Team set out to redefine the American housing market.

The Department of Energy's 2015 Solar Decathlon, held in Irvine, California, was a showcase of purpose-built, net-zero solar homes, that could even charge production electric vehicles for a truly sustainable lifestyle. Fourteen university offerings, ranging from a hurricane-resistant East Coast structure to a home capable of withstanding the fury of Tornado Alley, used location-specific construction techniques to bolster the marketability and appeal for any number of markets.

Not satisfied with boxy and boring copycat structures that are devoid of personality, this student group combined an overwhelming focus on sustainability and affordability with a secure, warm and slightly eclectic tone.

The Miners held first place through most of the contest with their strong performance in the home's energy management systems, but fell short in the subjective categories despite being wildly popular with Decathlon visitors. The Nest Home still earned the Miners fifth place overall — S&T's highest-ever ranking in the biennial event. Take your own tour of the Nest Home and judge for yourself ...



Quick Assembly
The Nest Home was rebuilt in two, eight-hour days.

Structure

Using three repurposed shipping containers, the Nest Home has a flexible, expandable structure that can be constructed and moved more economically than the team's previous houses. The team designed the house as a deconstructed triangle to provide a large, central living area and to keep it from being just another residential rectangle.

“The design makes it something that’s different. It’s not a square shaped building.”

— **Maddie Jung**
architectural engineering major from St. Louis



Mimicking nature

Yes, the Nest Home is a warm, cozy space, but that's not why it earned its name. Just as a bird's nest is constructed from various twigs, leaves and other salvaged items, the house was built of myriad locally repurposed materials. Its siding, made from 175 repurposed shipping pallets found around Rolla, added a more natural feel to the home's recycled steel structure. Recycled denim batting made up the interior insulation for soundproofing and comfort. The refinished kitchen cabinets even came from a St. Louis-area Habitat for Humanity ReStore. Carpet made from commercial fishing fleet nets added texture and even provided a new market for discarded nets that could inadvertently entrap fish and sea birds.



Bedroom Design
An earthy palette for a cozy and comfy retreat.



Counter Tops

Recycled colored glass embedded in the kitchen counter surface added a touch of whimsy.



High-tech living

Missouri S&T's solar houses typically incorporate the latest technology, and this year's home doesn't disappoint. For example, this year the team shifted away from the practice of using a common central inverter in favor of solar panels with built-in microinverters. The switch gives each panel the ability to perform to its maximum potential.

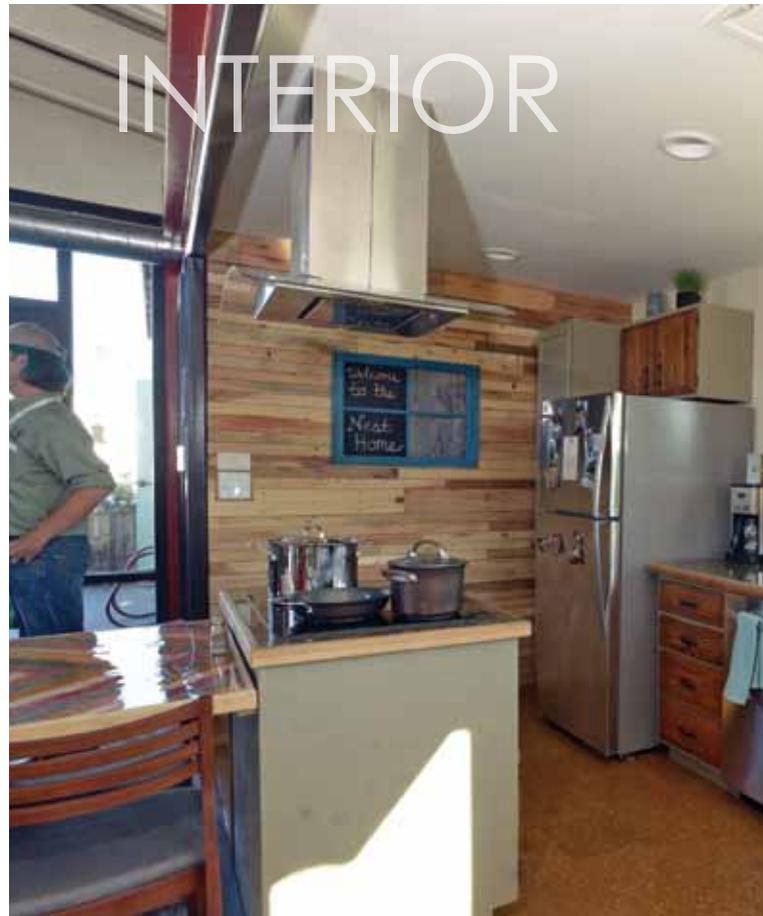
"If one solar panel goes out, we don't lose efficiency in the entire array," says Leann Krieger, an electrical engineering senior from Pevely, Missouri.

The new panels also give the house enough power to charge an electric vehicle like the Nissan LEAF.

"The whole point of the competition is to show that the homes are feasible to live in," Krieger says. "With more people considering the purchase of an electric car, this shows that the Nest Home meets that need as well."

The team also installed a home automation system to regulate the interior environment. The system manages everything from its lighting and home entertainment equipment to the home's heating and cooling.

"It uses a predictive algorithm to see what the weather will be like to save as much energy as possible," says Brandon Lile, a computer science senior from Leawood, Kansas. "We have a Raspberry Pi that communicates with a website I coded."



Safe Work

Students follow all OSHA regulations and receive safety and health training.



Electrical

A complete system check before the contests begin.



Perfect space for family

This year's solar house entry was designed for a growing family, a departure from previous plans. With two bedrooms, an office and an open-floor concept, the Nest Home was created to work for a couple with small children. By adding or subtracting recycled containers, residents could modify the house as needed.



Lighting

Even the dining room light fixture was made from a recycled well pulley.



“Everything from the architecture of the home, to the expandability of the home, to the systems in place are designed and implemented to provide comfort and convenience for the residents. Its adaptable nature makes it ideal for any stage of family life, from a full nest to an empty nest.”

— **Mary Puleo**, Project Manager
environmental engineering senior from St. Louis



More than a competitive entry

As usual, the solar house was packed up and transported to the competition site. The team — on purpose — used shipping containers because they didn't require special permits and the moving cost was far less expensive.

The team's entry was judged on a variety of factors, such as marketability, cost and energy production and consumption. Once the competition ended, the sixth solar house returned to Rolla as part of the campus' second solar community.

The newest home differs from the five previous structures in that it incorporates a greywater capture system — filtering water from the laundry, the bathroom sink and other non-contaminated sources to provide water for the vertical, wall-mounted hydroponic garden. This process reduces water usage and provides fresh produce for the residents.

Website → solarhouse.mst.edu



Wall of Plants

The gravity-fed, vertical garden uses filtered greywater to feed the plants.

The team

Empowering future generations to build a more sustainable world

Missouri S&T's Solar House Design Team provides students with opportunities to expand their knowledge and leadership skills regarding integration of architecture and technology with dwelling space design and function. They learn how to collaborate with others and gain hands-on experience in design and construction.

Below are team members from the civil, architectural and environmental engineering department:

■ **Courtney Chan**, senior civil engineering finance team

■ **Nichole Geiger**, ArchE'15 architectural engineering previous architecture team lead

■ **Brian Gifford**, CE'15 civil engineering previous director of construction & mechanical team lead

■ **Aron Johannsson**, sophomore architectural engineering drawings team

■ **Andrew Johnson**, sophomore civil engineering structures team

■ **Madison "Maddie" Jung**, junior architectural engineering drawings team lead

■ **Jennifer Nickel**, junior architectural engineering architecture team lead

■ **Samuel Onyemelukwe**, junior architectural engineering team member

■ **Mary Puleo**, senior environmental engineering project manager

■ **Taylor Rich**, ArchE'15 architectural engineering previous project manager & structures team lead

■ **Amy Schlaud**, senior architectural engineering drawings/architecture team

Faculty advisor:

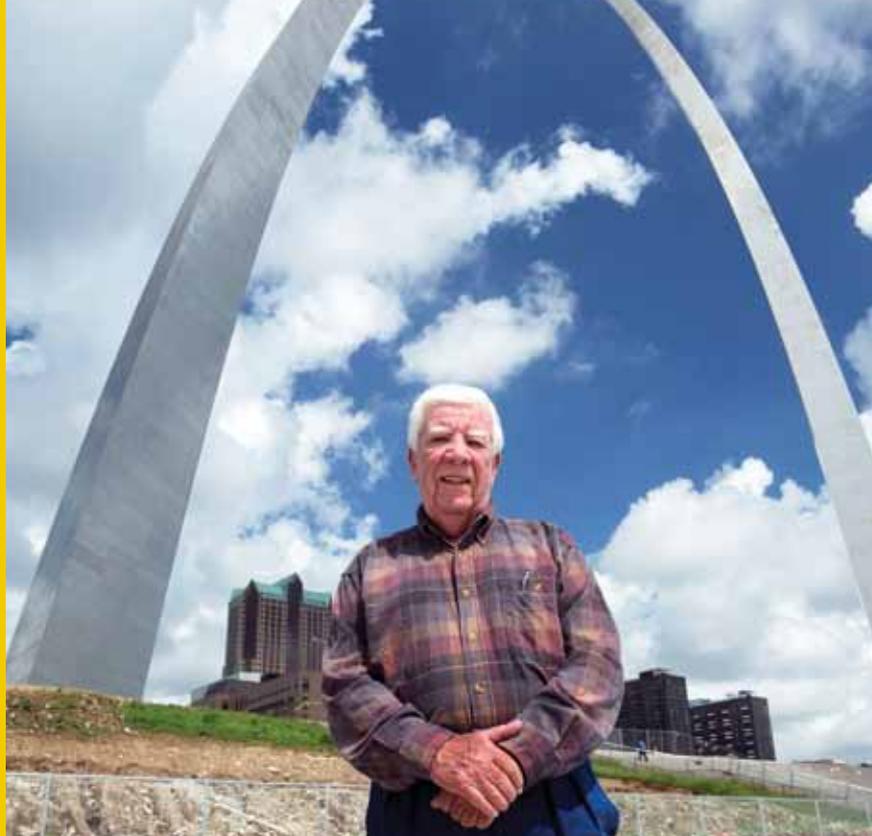
■ **Heath Pickerill**, lecturer civil, architectural and environmental engineering

Jack Wright

Reminiscing about the Arch on its golden anniversary

By Arielle Bodine

Photo by Sam O'Keefe



Jack Wright, CE'61

Jack Wright's first big job after college was in many ways monumental.

As an engineer for MacDonald Construction, the company that was awarded the contract for construction of the Gateway Arch in March 1962, Wright played an important role in creating the "Gateway to the West," which celebrated its 50th anniversary this year.

The 630-foot-tall Arch is made up of 142 double-walled triangular sections that are covered in quarter-inch-thick stainless steel. The keystone triangular section that connects the north and south legs was put into place on Oct. 28, 1965. It opened to the public in June 1967.

Wright, who earned a bachelor of science degree in civil engineering at Missouri S&T in 1961, worked on surveying and helped ensure quality control throughout the project. He says that the \$13 million project was not just a job, it was a learning experience for everyone involved.

"There was an overarching schedule," Wright says. "But, anytime you have a one-of-a-kind project, you schedule the best you can and you learn things as the project evolves. There's no template or past work that you can use to help you with a project like this."

Wright says everyone working on the project knew the Arch was special, but its significance wasn't clear.

"In that time, we were just happy to have jobs," he says. "It wasn't just another project, but I don't think the workforce viewed it as the celebrity it's become."

Wright is proud of his work on the Arch, and he visits every year — on Builders' Day, which was held on Wednesday, Oct. 28, this year.

There's no template or past work that you can use to help you with a project like this."

— Jack Wright, CE'61

"Once a year, everyone who worked on the Arch gets together to reminisce and we sign posters and talk with people," Wright says. "I feel like a rock star when I get to sign them."

Today, Wright, a member of the Missouri S&T Academy of Civil Engineers, owns Ladue Building and Engineering, a construction consulting firm.

HYBRID JACKETING

Creating the ULTIMATE COVER for bridge columns

BEYOND ITS SIMPLE LOOK AND EASILY ACQUIRED MATERIALS, THE HYBRID JACKET IS LIGHTWEIGHT, COST-EFFECTIVE AND CAN BE IMPLEMENTED IN HOURS — RATHER THAN WEEKS OR MONTHS.

Just as a great coat with the right layers can protect a person from subzero temperatures, Missouri S&T researchers are proving that hybrid jacketing can protect a bridge column in extreme conditions following an earthquake.

This clothing line for bridges — a thin cold-formed steel sheet wrapped around an earthquake damaged reinforced concrete column — might help save bridges from collapse and reopen bridges faster following a seismic event, the research team says. Surrounding the sheet are pre-stressing strands that overlap to create continuous reinforcement. The strands are more than accessories; when used together with the sheet, the hybrid jacket turned out to be effective in “restoring structural behavior of the damaged column to prevent bridge collapse.”

And, the researchers — **Dr. Genda Chen** and his Ph.D. student **Mostafa Fakharifar** — may not find themselves on the cover of an Eddie Bauer catalog, but they are finding fame in the bridge world with their research gaining national or international attention in the May 2015 issue of *Equipment World Magazine*.

Beyond its simple look and easily acquired materials, the hybrid jacket is lightweight, cost-effective and can be implemented in hours — rather than weeks or months.

“It’s like a classic tailored coat,” says researcher Chen. “Good form and function are always in style — especially when they are effective.”

Photos submitted



Damaged column



Sheet metal wrapping



Prestressing strands application

Gift provides matching fund opportunities for new lab

A \$3 million gift from **James A. Heidman**, CE'65, through his estate, is providing an opportunity for donors to double their support for a new research initiative on campus. The gift provides a dollar-for-dollar match for all donations to the Advanced Construction and Materials Laboratory, a \$6 million project. The premier lab facilities will bolster Missouri S&T's infrastructure education and research, serving as a hub for initiatives conducted under the university's Advanced Materials for Sustainable Infrastructure signature area.

"Our strengths in sustainable infrastructure research and structural engineering education are well-known, and with this additional investment we will be able to integrate significant improvements in advanced materials development and accelerated construction methods to achieve even greater prominence," says **Dr. John J. Myers**, associate dean of the College of Engineering and Computing. "Thanks to Mr. Heidman's generous gift and the support of other alumni and industry partners, the ACML will help us realize our long-term vision of developing safer, longer-lasting civil infrastructure," adds **Dr. Kamal H. Khayat**, Center for Infrastructure Engineering Studies director and the Vernon and Maralee Jones Professor of Civil Engineering.

Heidman was a retired lieutenant colonel in the Army and former staff engineer with the U.S. Environmental Protection Agency. He lived in Mountain Home, Ark., prior to his death on March 20, 2014

For more information about the ACML or to take advantage of this matching gift opportunity, contact **Sue Wallace** at 573-466-3202 or email wallacesue@mst.edu.

Lusher honored by international organization

Mike Lusher, a Ph.D. candidate and lecturer in civil engineering, was recently awarded best paper/oral presentation for his work titled, "Guayule plant extracts as recycling agents in hot-mix asphalt with high reclaimed binder content," in the Natural Rubber and Resins Division during the 2015 Association for the Advancement of Industrial Crops (AAIC) Conference. This year's conference Industrial Crops: Research to Commercial Application was held Oct. 18-22 in Lubbock, Texas. AAIC is an international, nonprofit educational and scientific organization established to encourage and promote the activities of those involved in the production, processing, development, and commercialization of industrial crops and products derived from industrial crops.

BURKEN AWARDED PRESIDENT'S AWARD FOR SERVICE



Provost Robert Marley, pictured left, surprises Dr. Joel Burken with the award.

Dr. Joel Burken, professor and associate chair of civil, architectural and environmental engineering at Missouri S&T, was awarded the 2015 UM System President's Award for Service.

Missouri S&T **Provost Robert Marley**, on behalf of the UM System, surprised Burken with the award. The service award was one of 10 presidential awards presented in 2015 that specifically recognized faculty for distinguished service and exceptional contributions for achieving the goals of one of the four University of Missouri campuses or the UM System.

Burken joined the S&T faculty in 1997 as an assistant professor in the Department of Civil Engineering. Since that time, he has served on more than 20 university and department committees, as president of the Association of Environmental Engineering Science Professors, as a founder and vice president of the International Phytotechnologies Society, as chair of the campus promotion and tenure committee, and routinely serves as master of ceremonies and host for campus recruitment events.

"I remember Joel's service on the department's curriculum committee at a time when numerous changes were debated and needed to be implemented," wrote one nominator. "His leadership and hard work resulted in the creation of not only a more streamlined curriculum for our students, but one that was also responsive to alumni and employer feedback and needs."

Burken was formally recognized by the UM System during an awards celebration held in June.

Our Ocean Conference delegate: unlocking climate resilience

World leaders and ocean advocates gathered Oct. 5-6 in Valparaiso, Chile, to share in a common commitment to protect the oceans. As part of the United States delegation, **Dr. Daniel Oerther**, the John A. and Susan Mathes Chair of Environmental Engineering at Missouri S&T, helped launch the Caribbean Ocean Assets Sustainability facility (COAST).



“COAST is a project that I started working on at the State Department earlier this year as a Jefferson Science Fellow,” Oerther says. “It’s a parametric insurance product for Caribbean countries that

helps to protect food security and nutrition by promoting climate smart food security best practices.”

How does insurance help people to have more food? Oerther explains, “When you drive better, you pay less for your car insurance because you are less likely to be in a

wreck. COAST works in a similar way. When a Caribbean country adopts best practices that reduce the exposure of their fisheries industry to the devastation of tropical cyclones, a.k.a. hurricanes, the countries end up with more sustainable fishing practices and greater food and nutrition security.”

With endorsements from three Caribbean bodies — the Caribbean Regional Fisheries Mechanism, the Caribbean Network of Fisherfolk Organizations and the Caribbean Disaster Emergency Management Agency — the vision that has been embodied in the COAST product aims to contribute to meeting the G7 leaders’ declaration to “increase by up to 400 million the number of people in the most vulnerable developing countries who have access to direct or indirect insurance coverage.”

Oerther joined U.S. Secretary of State John Kerry and others in Chile as part of the second Our Ocean Conference. A life-long supporter of the ocean, Kerry hosted the first Our Ocean Conference in Washington, D.C., last year.

Keynote and research results delivered at conference on advances in cement-based materials

Two Missouri S&T civil engineering students and one faculty member attended the Cements 2015 Conference: 6th Advances in Cement-based Materials, hosted in July, at Kansas State University in Manhattan, Kansas.

Dr. Dimitri Feys, assistant professor of construction materials engineering, delivered the keynote address titled, “Rheology: A Powerful Tool to Predict Concrete Pumping Pressure.” The presentation showed how theories from fluid mechanics, rheology (which is the flow of complex materials) and concrete technology can be combined to study the flow behavior of concrete in pipes. The efficiency of science to predict pumping pressure of concrete has been demonstrated, improving on the practical guidelines for pumping of concrete and giving scientists and practitioners different options to reduce pumping pressure without modifying the final performance of concrete.

Aida Margarita Ley Hernandez, a master’s student in civil engineering, presented her research results and conclusions titled, “Influence of Mix Design Parameters on Dynamic Segregation of Self-Consolidating Concrete.” **Sarah Vanhooser**, a senior in civil engineering and

member of the research group noted, “It was interesting to see the variety of research being conducted in cement and concrete and to hear people talk about new ideas. I enjoyed networking with students and professors from other campuses.”

The American Ceramic Society (ACerS) Cements Division organized this year’s conference. The technical program covered cement chemistry and nano/microstructure, alternative cementitious materials, rheology and advances in self-consolidating concrete (SCC), smart materials and sensors, advances in material characterization techniques, durability and lifecycle modeling, and advances in computational material science and chemo/mechanical modeling of cement-based materials.

To learn more about the society, visit their website at ceramics.org.



Pictured from left to right: Sarah Vanhooser and Aida Margarita Ley Hernandez

MORRISON TRACKS CHEMICAL LEVELS IN HUMAN SUBJECTS



AIR



WHERE WE STARTED



DAYS

Last spring at the Technical University of Denmark (DTU)

CHEMICAL STUDIED: phthalates

(pronounced 'thal-'lāt')

A family of chemicals used in plastics and many other products.



BODY BURDEN

Determining how much our clothing and our built environment contributes to the total amount of these chemicals absorbed into our bodies.

**DISCOVERY
MADE**

600%

We "breathe" 600 percent more plasticizers through our skin than through our lungs.

A SECOND CHEMICAL STUDY

DAYS

This past summer at the Technical University of Denmark (DTU)



CHEMICAL STUDIED:
nicotine

BLOOD

**QUESTION
RAISED**



Does nicotine on our clothing contribute to the uptake through our skin?

Stay tuned! Results are coming soon.

RESEARCH IMPACT

Skin uptake of indoor chemicals is of growing concern.

Dr. Glenn Morrison, professor of environmental engineering at Missouri S&T, is leading the charge to understand and control your exposure to these pollutants.

air → to clothing → to skin → to blood

Science News Magazine's online article → www.sciencenews.org/article/air-pollutants-enter-body-through-skin

Schonberg lectures on space debris in West Indies

Photo submitted



Dr. Bill Schonberg, a professor of civil, architectural and environmental engineering, spoke about space debris at the University of the West Indies in Trinidad. Several students from the Our Lady of Fatima High School Astrophysics Club listened in on his talk. They are shown above with Schonberg, pictured left, and the school principal.

Wang and Liu receive CAPEES Best Paper Award

Dr. Jianmin Wang, associate professor of civil, architectural and environmental engineering, and **Dr. Guoqiang “G.Q.” Liu**, assistant research professor of civil, architectural and environmental engineering, received the 2015 Chinese-American Professors in Environmental Engineering and Science (CAPEES) Best Paper Award, for their publication “Long-term low DO enriches and shifts nitrifier community in activated sludge,” which was published in 2013 in *Environmental Science and Technology*. Their research impacts sustainable wastewater treatment and reuse.

CAPEES is an academic organization with members in North America, Europe and Asian countries.

Visit www.capees.org for more information.

BIG BEAM TEAM FINISHES SIXTH IN NATION

A team of civil engineering students from Missouri S&T finished sixth in the nation in a “big beam” competition.

The Missouri S&T team finished sixth overall in the nation in the 2015 Big Beam Contest, an annual collegiate competition sponsored by Precast/Prestressed Concrete Institute (PCI). A team from the University of Notre Dame won the national event.

Teams in the competition design an 18-foot-long, pre-stressed and pre-cast concrete beam, which is then tested and evaluated for predicted structural behavior, including member strength, cracking load, section ductility and cost. Student teams fabricate the beams with the help of PCI producer members. The Missouri S&T team worked with Coreslab Structures Inc. of Marshall, Missouri.

S&T members of the Big Beam Team are **Hayder Alghazali** and **Eli Hernandez** of Rolla, Missouri; and

Kaylea Smith of Blue Springs, Missouri. All three are graduate students in civil engineering at Missouri S&T. Hernandez served as the team leader this year.

Dr. John J. Myers, professor of civil engineering and associate dean for academic affairs in the College of Engineering and Computing at Missouri S&T, serves as advisor to the team.



Pictured from left to right: Advisor Dr. John Myers, Eli Hernandez, Hayder Alghazali and Kaylea Smith.

“This year’s team continued the successful track record in this PCI competition that takes what we learn in a traditional classroom format and extends it to a real world fabrication application and then the laboratory for performance evaluation,” says Myers. “I’m very proud of this group of students. This type of experience is what makes Missouri S&T graduates highly sought after

by employers. We greatly appreciate the involvement and sponsorship of Coreslab Structures (Missouri), who the team worked with on the beam production, as well as the assistance received here on campus.”

Weathering the storm (water)

by Greg Katski

For **Katherine Bartels**, environmental engineering is all about balance. “It is finding the best solution for humans and the environment without sacrificing one for the other,” she says.

Bartels follows this mantra in her current research project. She studies the volume and quality of stormwater saved from runoff by the green roof on top of Missouri S&T’s Emerson Electric Co. Hall.

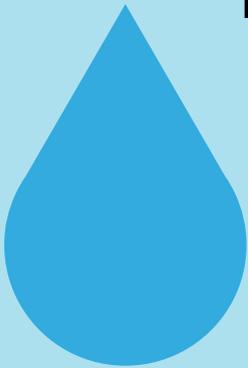
The green roof features 16,000 plants arranged in the shape of a shamrock. Most of the plants growing on the roof are a variety of sedum and all were chosen for their ability to thrive in direct sun and wind with limited water. The roof is divided into three sections, each covered with different roofing materials, which allow S&T researchers to compare the water runoff control, water quality and thermal properties of each material.

Bartels, a sophomore in environmental engineering from Independence, Missouri, started the experiment last summer as part of the Opportunities for Undergraduate Research Experiences (OURE) program, and plans to continue her research until she graduates. **Dr. Joel Burken**, professor of civil, architectural and environmental engineering and director of the Environmental Research Center for Emerging Contaminants, directs the research.

Bartels says that although the green roof absorbs a significant amount of stormwater, the stormwater that is washed out has much higher concentrations of nitrogen and phosphate than a typical black roof. When excessive nitrogen and phosphorous levels end up in local waterways, 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.

So now, Bartels is researching how much ground soil is necessary on a green roof to fully absorb the

(continued on page 20)



Academy of **Civil Engineers**

8

Eight new members were inducted into the Academy of Civil Engineers during a ceremony held in April. The academy honors the following civil engineers for their contributions to the profession, leadership and involvement with Missouri S&T.

inducted

Randy Dreiling



Randy Dreiling of St. Louis, vice president and senior structural engineer for Design Nine Inc., earned a bachelor of science degree in civil engineering from Missouri S&T in 1981. During the last 20 years, Dreiling has been an active supporter of the St. Louis section of the Miner Alumni Association, serving in

nearly all committee and officer positions, and organizing section activities and events, including the annual Section Scholarship Fundraising Golf Tourney, held every June, which routinely has 100 participants. In 2014, he received the association's Frank H. Mackaman Volunteer Service Award. Dreiling has served as president of the Engineers' Club of St. Louis, was a member of the Miner Alumni Association Board of Directors from 2000 through 2012, serving as director, assistant secretary and vice president, and is a member of the American Railway Engineering Association, serving on the committee for seismic design. He also has served with Missouri Society of Professional Engineers in many local chapter committee and officer positions, including chair of MSPE's Professional Engineers in Private Practice board.

Diane Heckemeyer



Diane Heckemeyer, chair of construction and civil technology at the State Technical College of Missouri in Linn, earned a bachelor of science degree in civil engineering from Missouri S&T in 1986. After graduating, she worked for the Missouri Department of Transportation until 2005 as area engineer and senior estimating engineer before being named the state design engineer in 2001. Heckemeyer was named the Missouri Breaking Traditions Post-Secondary Educator of the Year for 2014 and in 2013 was named a Chapter Honor Member of Missouri S&T's Chi Epsilon chapter. She was named the American Public Works Association Missouri Chapter's professional engineer of the year in 2012, and was the 2009 recipient of the National Women in Construction's Crystal Vision Award. Heckemeyer and her husband, Roger, live

in St. Elizabeth, Missouri, with their two daughters. Their oldest daughter, Kelly, is a civil engineering student at S&T and plays catcher on the Lady Miner softball team.



Karin M. Jacoby

Karin M. Jacoby, senior counsel at Husch Blackwell in Kansas City, earned a bachelor of science degree from Missouri S&T in 1985. She earned a masters of public administration and a juris doctorate, both from the University of Missouri-Kansas City in 1999 and 2006, respectively. Jacoby has spent most of her career in water resources, waterways, flooding and levees. She founded SPICA Consulting in 2009 as an engineering firm focused on flood risk management. In 2013 she began practicing law and now provides legal services to clients in the Midwest and South. She is involved in development of the nation's policy on flood protection, serving as a member of the congressionally established National Committee on Levee Safety, and co-authoring with the National Academy of Sciences Levee Committee a report to FEMA with recommendations for the National Flood Insurance Program. Since 2001, she has been the executive director of the Missouri and Associated Rivers Coalition, a non-profit advocating for more beneficial use of water and related land resources. She received the Commander's Award for Public Service from the Army Corps of Engineers and the Kansas City Industrial Council's Progress Award for Improving Waterways. Jacoby has addressed students in Missouri S&T's civil engineering department and in 2014 was the Chi Epsilon's Chapter Honor Member.

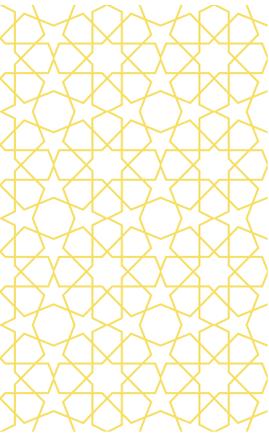




Steve Meyer



Steve Meyer, director of environmental services for the city of Springfield, Missouri, earned a bachelor of science degree in civil engineering from Missouri S&T in 1975. For Springfield, he has served as superintendent of streets and public grounds, assistant director of environmental services, and, since 2011, the director of environmental services. In that position, Meyer is responsible for leading and managing the city's sanitary sewer collection system and its two wastewater treatment plants, stormwater management, solid waste collection and disposal, and maintaining compliance with the city's MS4 permit. His department is also responsible for coordinating citywide sustainability practices. He is a member of the Water Environmental Foundation, American Society of Civil Engineers, American Public Works Association, Missouri Society of Professional Engineers and the Institute of Transportation Engineers and is on the board of the National Association of Clean Water Agencies.



Allen G. Minks



Allen G. Minks, geotechnical department manager for Terracon Consultants Inc. in St. Louis, earned bachelor of science and master of science degrees in civil engineering from Missouri S&T in 1981 and 1983, respectively. Minks has spent his career in the geotechnical field with firms such as McClelland Engineers, Shannon & Wilson and SCI Engineering. Active in the American Society of Civil Engineers since his days as a student, he has held every office in the St. Louis section and served as president in 2007-2008. Minks is a Fellow of ASCE, is the recipient of the St. Louis Section's Professional Recognition Award in 2012 and the ASCE National Edmund Friedman Recognition Award in 2013. He has taught a Missouri Society of Professional Engineer-sponsored geotechnical professional engineer refresher course for over 10 years, serves on the city of Florissant, Missouri, Planning and Zoning Commission and is a member of SAVE Coalition, which performed building inspections in Joplin, Missouri, after the 2011 tornado.



Charles E. Powell



Charles E. Powell, owner of CEPCO LLC in Ozark, Missouri, earned a bachelor of science degree in civil engineering from Missouri S&T in 1971. He worked for Brown & Root in Houston and London, then returned to the Springfield, Missouri, area where he worked for consulting engineering firms including Anderson Engineering, ET Archer and Scott Consulting Engineers. In 2006, Powell formed CEPCO LLC, a consulting firm that does forensic building investigations for insurance companies and attorneys. He also provides structural engineering services for governmental agencies. He has been active at the local and state level of the Missouri Society of Professional Engineers and the American Society of Civil Engineers, serving as state and chapter president of MSPE and section president of ASCE. He is a SAVE Coalition Structural Inspector 1 and a member of the Missouri State Emergency Management Agency Task Force.





Dr. David Richardson

Dr. David Richardson, associate professor of civil engineering at Missouri S&T, earned bachelor of science, master of science and Ph.D. degrees in civil engineering from Missouri S&T in 1971, 1973 and 1984, respectively. He owned his own consulting firm for 22 years, working in Texas and Arkansas, before selling it. In 1984, Richardson became the area head for construction and construction materials and has taught those courses at Missouri S&T. He has received 17 teaching awards plus numerous advising and faculty awards, including the Missouri S&T Civil Engineering Academy's Faculty Achievement Award. He has published research papers, conducted 180 short courses and directed 60 asphalt and concrete conferences, providing continuing education to engineering professionals and technicians. Dr. Richardson is a Fellow in the American Concrete

Institute, has chaired national ACI technical committees and has been president of the state ACI chapter.



Dave Wisch



Dave Wisch, a Fellow at Chevron Corp. in Houston, earned bachelor of science and master of science degrees in civil engineering from Missouri S&T in 1975 and 1977, respectively. He started his career in offshore engineering with Texaco and today is Chevron's global technical authority in civil, structural and marine engineering. Wisch is the engineer of record for the first U.S. offshore platform to undergo a certified verification agent (CVA) certification and provided engineering oversight for the world's deepest self-standing structure. He has worked for more than 30 years in industry standards development for API and ISO. He chaired the API Committee on Offshore Structures and led the U.S. delegation to ISO's Offshore Structures Standards Committee. After hurricanes Ivan, Katrina and Rita, he led an API task force to develop consensus interim industry standards for mooring of floating drilling vessels in less than 90 days. While a student at S&T, Wisch was the Miner's placekicker and was an officer in the American Society of Civil Engineers Student Chapter.

Academy Awards

The following individuals received awards from the Missouri S&T Academy of Civil Engineers during a ceremony held in April.



**Joseph H. Senne Jr.
Faculty Achievement**

Dr. Lesley Sneed



**Exemplary
Young Alumni**

**Lt. Col.
Scott S. Preston**



**Neil Stueck
Outstanding Senior**

Rebecca Jacobsen



**Outstanding
Staff Member**

Joann Stiritz

Weathering the storm(water) continued ...

stormwater and minimize the amount of nutrients in the runoff. She is also studying the cooling effect that green roofs have on urban “heat islands.” An urban heat island is a city or metropolitan area that is significantly warmer than its surrounding rural areas due to human activities. That project was initiated by **Madison Gibler**, a graduate student who plans to complete her master’s degree in May.

“What our research does is maximize the water source potential to cool the urban heat islands, but minimize the amount of nutrients in the runoff,” Bartels says.



Katherine Bartels, a sophomore in environmental engineering, studies the volume and quality of stormwater saved from runoff by S&T's green roof.

Once a month, Bartels tests the rainwater on the green roof. She uses small plots of soil to trap the stormwater, and then filters it through plastic tubes to paint buckets where the runoff can be extracted and tested for nitrogen and phosphate. Some of the plots feature sedum plants. Others are just covered with rocks and soil. By testing varying plots, Bartels can get an idea of the impact different plants and soils have on the stormwater.

She presented her research to the state’s top legislators in Jefferson City on March 10 as part of the annual Undergraduate Research Day at the Capitol.

Bartels was also just accepted into the Aaron and Zelda Greenberg Scholars Program in the civil, architectural and environmental engineering department, in which students work with faculty advisors to develop a program of independent research study that will weave through both bachelor’s and master’s degree programs.

Bartels says she has always known that she wanted to channel her love of science into an environmentally focused career.

“I remember in elementary school reading about the polar ice caps melting. Then I saw a picture of a polar bear swimming in the ocean and my heart broke,” she says. “That’s when I knew I wanted to do anything I could to help the cause. When you’re passionate about something, you develop skills you might not have had.”

Bartels’ passion for developing clean water took root in high school, where she first learned about diverting stormwater runoff using rain gardens and green roofs in her environmental science class.

Bartels says her teacher used a low-lying recreation field with poor drainage as an example.

“I said, ‘Why don’t we build one?’” says Bartels.

Her teacher agreed, and the class built the school’s first-ever rain garden.

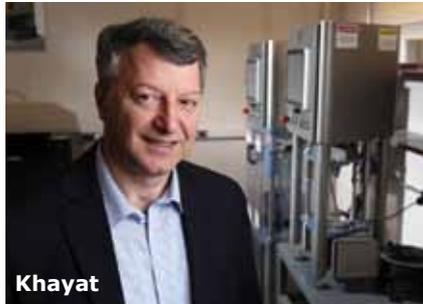
“It’s still there,” Bartels says. “And it’s a good feeling to say that.”

Bartels is treasurer of Missouri S&T’s Water Environment Federation (WEF) student chapter and an active member. The student organization is involved in environmental cleanups, and does float trip and sinkhole trash pickups at least once a year. The organization also monitors the water quality of Beaver Creek in southern Phelps County for the Missouri Department of Natural Resources, taking water quality samples twice a year, and makes presentations at local primary schools.

Bartels hopes to work for the Environmental Protection Agency some day, maybe testing and improving water quality.

Khayat named RILEM Fellow

Dr. Kamal Khayat, the Vernon and Maralee Jones Professor of Civil Engineering and director of the Center for Infrastructure Engineering Studies at Missouri S&T, has been named a Fellow of RILEM, the International Union of Laboratories and Experts in Construction Materials, Systems and Structures.



materials in 1989 from the University of California at Berkeley, where he also earned a bachelor of science degree in civil engineering in 1982, a master of science engineering degree in construction engineering and management and a master of science degree in structural engineering in 1984 and 1985, respectively.

“The award of a RILEM Fellowship is a rare honor,” says RILEM president Mark Alexander. “It is given for exceptional contributions to the work of RILEM and includes aspects such as scientific contributions and developmental contributions.”

Khayat is one of only 64 named Fellows in the RILEM organization.

Khayat is the RILEM regional convener for North America in the Development Advisory Committee. He chaired six RILEM or RILEM co-sponsored conferences, and will chair the SCC (self-consolidating concrete)

2016 conference in May 2016 in Washington, D.C.

He specializes in the development of high-performance cement-based materials for structural applications and rehabilitation, particularly focusing on self-consolidating concrete (SCC) and the behavior of high-performance concrete (HPC). Khayat’s pioneering work in the area of SCC, starting in 1991, has contributed to its acceptance worldwide.

Khayat earned a Ph.D. in civil engineering with an emphasis in

Before his appointment at S&T in 2011, he served as director of the Center of Excellence on Concrete Infrastructure Engineering and head of the Integrated Research Laboratory on materials valorization and innovative and durable structures at the Université de Sherbrooke in Canada. In 2008, he was named the National Science and Engineering Research Council (NSERC) chair on high-performance flowable concrete with adapted rheology in 2008, a consortium of 17 industrial partners from Canada and the United States who are working to develop a new generation of construction materials.

Oerther earns State Department award

Dr. Daniel B. Oerther, the John A. and Susan Mathes Chair of Environmental Engineering at Missouri S&T, was recognized with a Meritorious Honor Award from the State Department. The citation states it is for Oerther’s “outstanding leadership and attention to detail in helping to launch a public-private initiative to promote food security and climate resilience via an innovative insurance

product — the Caribbean Oceans and Aquaculture Sustainability facility (COAST).”



According to the State Department, the Meritorious Honor Award is presented to groups or individuals in recognition of a special act or service, or sustained outstanding performance. Nominations initiated in Washington, D.C., are submitted to the appropriate area awards committee for final action and the award consists of a certificate signed by the assistant secretary or an official of equivalent rank for domestic employees or by the chief of mission at the post level.

Oerther served in Washington, D.C., as a science and technology policy adviser in the Office of Secretary of State through the Jefferson Science Fellowship from the U.S. National Academies.



Dr. Robert Holmes, pictured center, receiving his award.

Holmes named Civil Engineer of the Year

Dr. Robert R. Holmes, an adjunct professor of civil, architectural and environmental engineering at Missouri S&T and a U.S. Geological Survey hydrologist, received the 2015 Government Civil Engineer of the Year award on Oct. 13 in New York.

Established by the Government Engineers Division of the American Society of Civil Engineers (ASCE), the award recognizes distinguished civil engineers employed in public service for significant engineering contributions.

Holmes is the national flood hazard specialist and coordinator at the USGS headquarters, serving as the senior advisor on flood science and response. He has been with the USGS for nearly 28 years, having served in various positions including director of the USGS Illinois Water Science Center.

“Dr. Holmes is an established expert in the fields of sediment transport, river mechanics, hydraulics and modeling, and provides expertise in complex streamflow ratings,” said Shawna Erter, president of the American Society of Civil Engineers in St. Louis. “He works across the nation both as an expert and as an instructor.”

Holmes also is active in academic education, serving as an adjunct assistant professor at the University of Illinois at Urbana-Champaign since 2006 and as an adjunct professor at Missouri S&T since 2008. The courses he has taught include environmental field methods, fluid mechanics and water resources engineering.

Holmes serves on numerous advisory committees, including the American Society of Civil Engineers, Environmental and Water Resources Institute, American Geophysical Union, International Hydrological Science Association and the American Water Resources Association.

He earned bachelor of science and master of science degrees in civil engineering from Missouri S&T in 1987 and 1989, respectively. He also holds a Ph.D. in civil and environmental engineering from the University of Illinois.

“It was always clear to me that we were dealing with a special human being,” said Marcelo García, director at Ven Te Chow Hydrosystems Laboratory and Holmes’ former professor at Illinois. “Looking back, I am very happy that I took him on as one of my graduate students.”

Holmes has contributed greatly to water resources engineering and flood hazards management at the USGS through his civic and humanitarian efforts in public service, say his USGS colleagues.

“Bob’s colleagues throughout the USGS and at several other agencies and organizations can attest to his dedication, leadership and energy,” said William Werkheiser, associate director for water at the USGS. “He continues to be a vital part of our team at the USGS and an important leader in the water science and engineering community.”

In memory: John Lindon Best



Dr. John Lindon Best, former professor of civil engineering at Missouri S&T, passed away Oct. 6, 2015.

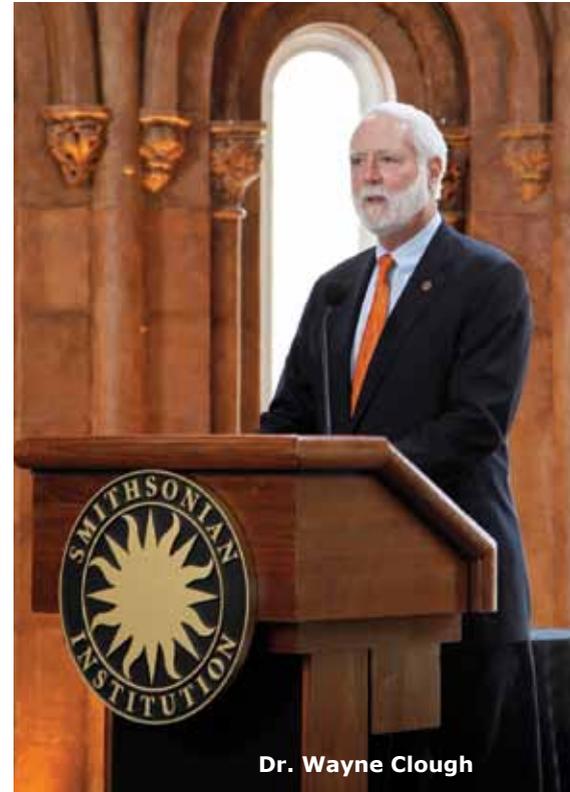
After graduating from high school in 1943 in Ellsimore, Mo., Best enlisted in the U.S. Army. He served his country as a demolition expert and as an artillery support specialist during the Battle of the Bulge and was honorably discharged in 1946. After his discharge, Best put his engineering abilities to good use and obtained a master's degree in civil engineering from Missouri S&T in 1957. He then attended Vanderbilt University to earn his Ph.D. in civil engineering. After graduation, he accepted the position of professor at S&T, teaching various classes within the department for 36 years until his retirement in 1991. During his time on campus, Best received the Outstanding Teacher of the Year Award four times and he chaired the department for two years. His gift was to take complex concepts and explain them in a manner that students could understand.

After his retirement, Dr. Best continued living in Rolla. He was a member of the Missouri S&T Academy of Civil Engineers and Order of the Golden Shillelagh and was actively involved in Eastern Star and the Shrine Clown Association. In November of 2014, Best moved back to the Kansas City area to be closer to family.

Former Smithsonian Secretary to speak at Missouri S&T

The Civil, Architectural and Environmental Engineering Department and its Academy of Civil Engineers is excited to announce that **Dr. Wayne Clough** will visit Missouri S&T on Friday, April 22, 2016, to present the Stueck Distinguished Lecture.

Now president emeritus of Georgia Institute of Technology, Clough is the immediate past secretary of the Smithsonian Institution, where he led and presided over the world's largest museum for six years. Clough also served as president of Georgia Tech for 14 years. He earned a Ph.D. in civil engineering from the University of California-Berkeley. He is the recipient of two Norman Medals (ASCE), 12 honorary degrees and is a former member of the National Science Board.



Dr. Wayne Clough

Dr. Clough's lecture is being presented as part of the Neil and Maurita Stueck Distinguished Lecture Series for Civil, Architectural and Environmental Engineering at S&T. This 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 of the university.

Previous Stueck lecturers have included:

- **Dr. Gene Corley**, who led the federal investigation into the 9/11-collapse of the World Trade Center's twin towers, as well as the principal investigator of the 1995 bombing and collapse of the Murrah Federal Building in Oklahoma City.
- **Dr. Marc Edwards**, the Lunsford Professor of Civil Engineering at Virginia Tech and a McArthur Fellow.
- **Dr. Henry Petroski**, the Alexandar Vesic Professor of Civil Engineering at Duke University and prolific author on topics of design, success and failure and the history of engineering and technology.
- **Dr. Bruce Rittman**, Director of the Swette Center for Environmental Biotechnology, Arizona State University.
- **Dr. Ken Hover**, Professor of Civil and Environmental Engineering at Cornell University and Past President of ACI.



MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY
Civil, Architectural and Environmental Engineering
211 Butler-Carlton Hall, 1401 N. Pine St.
Rolla, Missouri 65409-0030

NONPROFIT ORG
U.S. POSTAGE
PAID
ROLLA MO
PERMIT # 170

Connect with us.
Email your news to: care@mst.edu

 Printed on Recycled Paper

— *Stueck* —
DISTINGUISHED
LECTURE SERIES 2016

Dr. Wayne Clough

Former secretary of the Smithsonian Institution
and president emeritus of Georgia Tech

SAVE THE DATE
Friday, April 22

See page 23 for more information.

