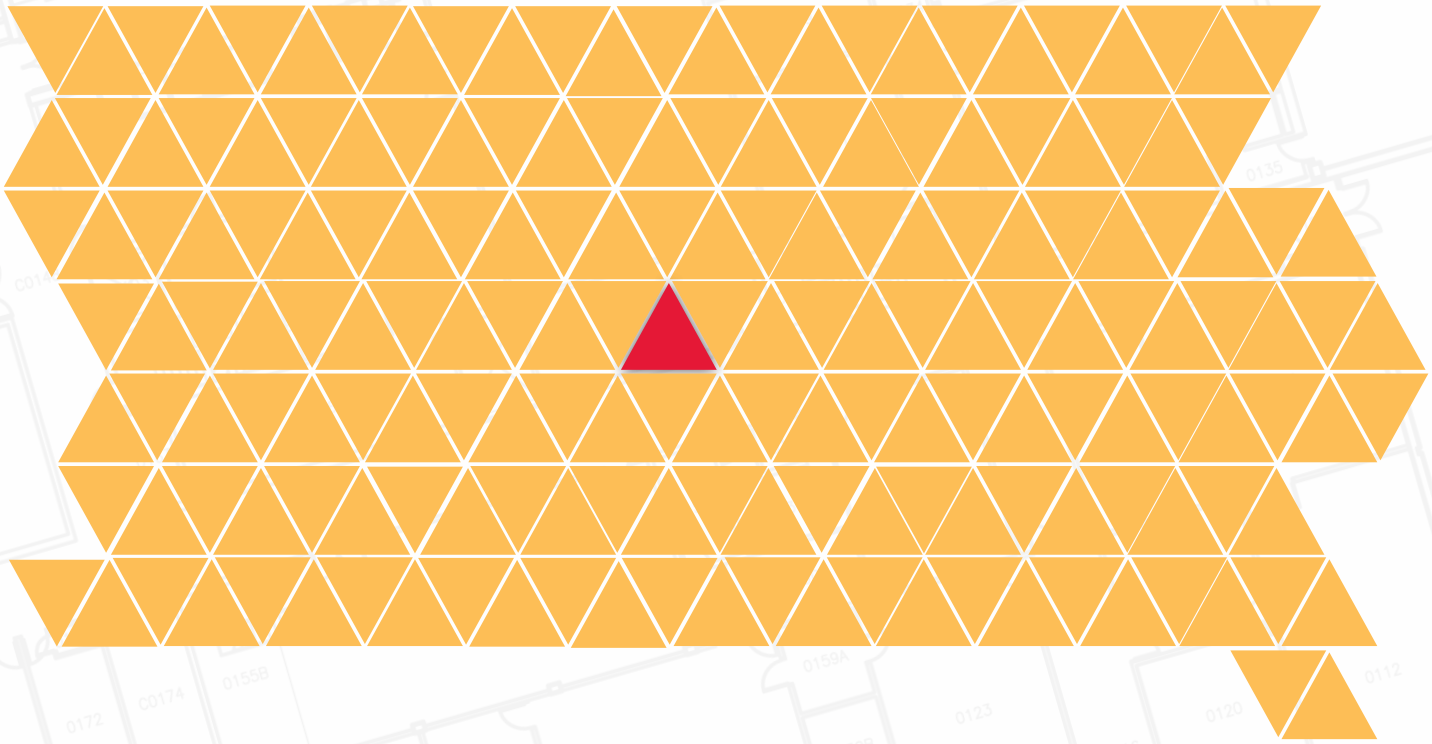
FOSTERING PARTNERSHIP



IOWA STATE UNIVERSITY

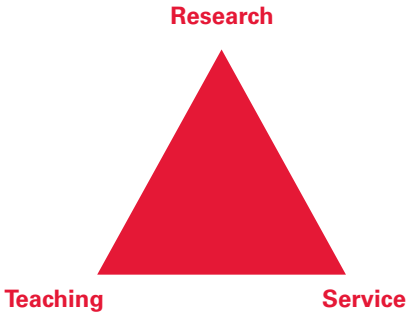
Department of Civil, Construction and Environmental Engineering

2014-2015 Annual Update

Let's continue to build our partnerships.

We foster partnerships because we all practice the power of teamwork. Throughout the last year, the Department of Civil, Construction and Environmental Engineering (CCEE) at Iowa State University has continued to strengthen its relationships through talented and dedicated students, faculty, staff, alumni and friends. Through you and all others who partner with us, we carry out the three-pronged, land-grant institution promise that Iowa State originated—research, teaching, and service. The 2014-2015 CCEE Annual Update describes how we carry out this promise through new and continued partnerships that positively influence Iowa, our nation and the world.

CCEE is proud of its students and alumni who constructed a major "front door" to Iowa State University—the Jack Trice Stadium South End Zone (page 4). This was a monumental project, literally and in scope, that required complex coordination and discipline under an unusually tight schedule. Thanks to the hard work of students and alumni, tens of thousands of Cyclone fans will enjoy an enriched game-day experience. Our legacy will live on in 61,000 filled seats and in the stories we will tell for many generations.



We celebrate recent accolades of our alumni (page 5), including several national and international honors. Among our alumni highlights are elected leaderships to the American Council of Engineering Companies, the National Council of Examiners for Engineering and Surveying, and the American Society of Indian Engineers and Architects. Each recognition is tied to many years of determined, collegial spirit that only Iowa State civil, construction and environmental engineers carry.

Several recent alumni launched the inaugural year of Civil, Construction and Environmental Engineering Graduates of the Last Decade (CCEE GOLD, page 6), which already has brought hundreds of alumni, students and faculty together. Their efforts have inspired many new kinds of partnerships.

We partner in many multidisciplinary research projects, serving Iowa and beyond. Learn how we develop state traffic solutions with the Iowa Department of Transportation (page 18), pioneer the world's tallest concrete wind towers (page 16), consult on eastern Europe environmental projects on behalf of the U.S. government (page 20), and much more. CCEE's innovative research has contributed to Iowa State's high global ranking as a university that received U.S. utility patents in 2014 (page 16).

We applaud faculty as they are awarded for teaching, research and service (page 8). Read about Senior Lecturer Jenny Baker's "40 under 40" recognition through Consulting-Specifying Engineer magazine, Associate Professor David Jeong's Distinguished Professor distinction by the Construction Industry Institute, and Senior Lecturer Marlee Walton's honor as American Society of Civil Engineers Iowa Section Outstanding Civil Engineer, among several others. We are lucky to have these folks advance civil, construction and environmental engineering in and out of the classroom.

Our students have excelled in what already are strong undergraduate programs. The National Electrical Contractors Association Iowa State Chapter won the 2014 ELECTRI International Green Energy Challenge, where Team Cyclone Energy earned runner-up in the poster component and construction engineering junior Maggie Holt won the Best Presenter Award. In June 2015, Iowa Gov. Terry Branstad awarded Associated General Contractors (AGC) Iowa State Chapter the Governor's Group Volunteer Award—a high honor attributed to AGC's selfless, unrelenting community service in Iowa and throughout the country.

Graduate students strengthen research programs with their own scholarship (page 11). Ka Lai Ng Puga, a Colombia native and geotech doctoral student, won a national asphalt paving scholarship and presented at an international conference in Spanish. A transportation graduate student team worked together to earn a Transportation Research Board Best Paper Award.

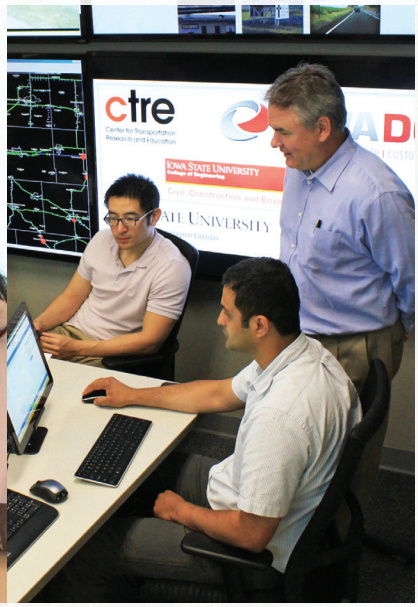
Partnerships develop for the goal of improving our quality of life, another tenet of Iowa State's land-grant-based education. We put science, technology, and human creativity to work.

The best part of our three-tiered promise is that it occurs every day, year-round, and in different ways. Read about what CCEE does every day at www.ccee.iastate.edu, or connect with us on Facebook, Twitter and LinkedIn (search terms on back cover). And, as always, feel free to contact me by email, phone, or letter to share your story.

Warm Regards,

Terry Wipf, Ph.D., P.E.
Chair, Department of Civil, Construction and Environmental Engineering
Pitt-Des Moines Professor in Civil Engineering
Iowa State University

Inside the CCEE **2014-2015 Annual Update**



Thank you

Building Jack Trice Stadium South End Zone

One of Iowa State University's largest construction projects had CCEE alumni and students at the helm.

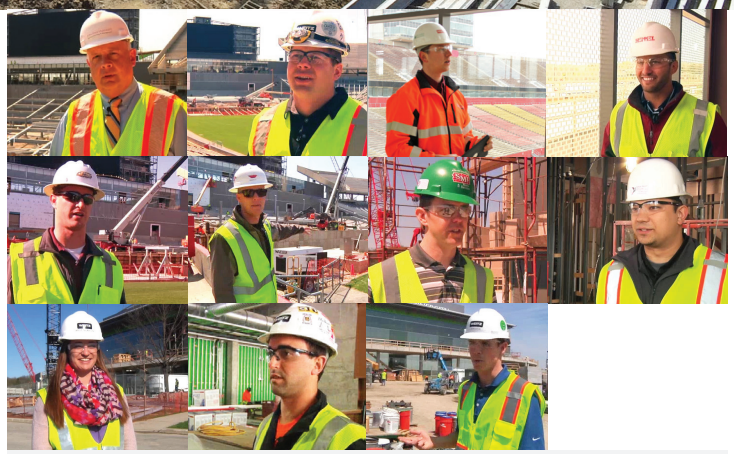
Many Iowa State civil and construction engineering graduates put their skills to practice on the Jack Trice Stadium South End Zone, a fast-paced, $37.4 million project that opened in August 2015.

Iowa State Athletic Director Jamie Pollard met with Dean McCormick (BSConE'81), director of construction and design services for Iowa State Facilities Planning and Management, shortly after Roy and Bobbi Reiman donated $25 million to the project in November 2013. "He came to me and said, 'We want to do it, and by the way, we want to have it open for football season 2015,'" McCormick said. "Probably my first though was: 'I don't know if that's even possible.'"

From a construction perspective, the fast-paced, 13-month schedule presented special challenges for engineers and workers. Ben Bunge (BSConE'05), project manager for The Weitz Company, represented Weitz as construction manager and coordinated the project's contractors. "We communicated early on in the aggressive schedule," Bunge said. "Doing the math, it's a lot of work being put in place in a very short order."

In his role, Bunge oversaw 15 prime contractors, 40 subcontractors, and about 200 construction personnel—nearly all based in central Iowa. "It's a big economic growth opportunity for central Iowa," Bunge said.

More than a dozen civil and construction engineering alumni—most of them graduates within the last 10 years—worked on the construction of the project. Engineers from many of the project's contractors and subcontractors graduated from Iowa State's CCEE programs (go to page 9 to see a list of the project's key CCEE alumni and their employers).



Top: Progress on the construction of Jack Trice Stadium South End Zone, photographed by Larry Cormicle on April 22, 2015. **Collage**: Nine alumni and two CCEE students (both graduated in spring 2015) were routinely on site monitoring construction.

Emerging construction management technologies enabled the team to complete the Jack Trice South End Zone well and on time. One of those approaches was going paperless. They implemented Virtual Design and Construction (VDC), through the coordinated use of BlueBeam, Revit and Navisworks software, to produce and communicate 3-D models for all building systems on the project.

Engineers can virtually dissect 3-D building components at any level. "It is better to plan it in the virtual world than the real world so you don't waste money on people and time fixing preventable

Continue at **JACK TRICE** on p. 9

Chase, Greenwood named to Construction Engineering Hall of Fame

Jerry Chase (PhDCE'83)

Don Greenwood (BSCE'76)

Two leaders—Jerry Chase and Don Greenwood—in the Iowa construction industry were named to the Iowa State University Construction Engineering Hall of Fame on April 24, 2015.

Chase (PhDCE'83) is an emeritus associate professor in Iowa State's construction engineering program. In 1977, Chase joined the construction engineering faculty. He loved teaching and advising. He brought new things to the growing program, including an Introduction to Quality Management undergraduate course and a Quality Management in Construction course for contractors throughout Iowa and the U.S. Chase also authored Associated General Contractors' manual on "Implementing Total Quality Management in a Construction Company." He retired from Iowa State in 1996.

Greenwood (BSCE'76) is the president of Burns & McDonnell's Construction Division, based in the company's world headquarters in Kansas City, Mo. He graduated in 1976 with a degree in civil engineering and joined a small, local construction company, where he spent more than a decade experiencing all critical aspects of managing a successful construction project. He joined Burns & McDonnell in 1994 as the first construction division employee and vice president of the Construction Group. In 2001, he became president of the group, and was named to the board of directors in 2005. Under Greenwood's leadership, the group has grown to more than 943 employee-owners. Greenwood is an Iowa State University Foundation Governor and in 2003 received the Professional Achievement Citation in Engineering from the College of Engineering.

The Construction Engineering Hall of Fame was established in 2010 to recognize individuals who have played a significant role in the construction industry and who have contributed to the ongoing success of the construction engineering program at Iowa State.

CCEE Alumni Adventures

www.ccee.iastate.edu/alumni-and-friends/alumni-stories

Raj Basavaraju (MSCE'01) was named the 2015 president of the American Society of Indian Engineers and Architects (ASIE).

Brian Bishop (BSConE'04) received the Gerald H. Jones Code Official of the Year Award from the International Code Council in September 2014.

Mike Conzett (BSCE'76, MSCE'78) was elected president-elect of the National Council of Examiners for Engineering and Surveying (NCEES) in August 2014.

Mark Kresser (BSCE'09) was named an Iowa STATEment Maker by the Iowa State University Alumni Association. He ran the entire Register's Annual Great Bicycle Ride Across Iowa (RAGBRAI) and raised $20,000 for the Iowa Veterans Home.

JoNette Kuhnau (BSCE'00, MSCE'01) was named on Engineering News-Record's (ENR) Midwest "Top 20 under 40." ENR says that Kuhnau has emerged as a leading go-to expert in traffic signal and light-rail transit in Minneapolis.

Peter Strub (BSCE'81) was elected chairman-elect of the American Council of Engineering Companies. He serves as chair-elect from April 2015-April 2016 then becomes chairman for the following year.

Tim Sullivan (BSConE'77) received the 2015 International Member of Distinction honor from the Grain Elevator and Processing Society (GEAPS). He was a GEAPS International Board Member from 2002-2005.

Jennifer Winter (BSCE'97) was named the first female public works director for the city of Cedar Rapids, Iowa, on March 23, 2015. She also is the chairwoman of the American Public Works Association's Center for Sustainability.

Ezgi Yurdakul (MSCE'10, PhDCE'13) won the 2014 American Concrete Institute Young Professional Essay Contest. Her essay addresses misconceptions about sustainability in concrete structures, bridges and pavements.

www.ccee.iastate.edu/GOLD

CCEE GOLD

Civil, Construction and Environmental Engineering Graduates Of the Last Decade

We are thrilled to celebrate the first year of Civil, Construction and Environmental Engineering Graduates of the Last Decade (CCEE GOLD)! Since October 2014, we have hosted three events that encourage networking among alumni, students, faculty and staff.

On Oct. 11, 2014, CCEE GOLD hosted the Kickoff Tailgater. Dozens of alumni, faculty, and students showed up for a fun day of bags, lawn golf, the CCEE prize wheel, and a HyVee-catered lunch. Congratulations to Nate (BSCE'10) and Karen Hardisty (BSCE'10), who won a Paul Rhoads-autographed football for winning the bags tournament.

CCEE GOLD has a similar tailgate event planned for Homecoming on Saturday, Oct. 31, 2015 (vs. Texas). Look for an announcement of this event and other upcoming activities at www.ccee.iastate.edu/gold.

CCEE GOLD partnered with department student organizations to host the first Recent Alumni Discussion Panel on Jan. 29, 2015. More than 100 students attended the event held at Howe Hall's Alliant Energy-Lee Liu Auditorium. Six recent alumni talked about what they have experienced, both personally and professionally, after they graduated. Featured panel members, pictured sitting from left, were AJ Barone (BSCE'12), Nate Hardisty (BSCE'10), John Puls (BSCE'07, MSCE'08), Joel Sikkema (MSCE'11, PhDCE'13), Allison Smyth (BSCE'10), and Gina Sundermann (BSConE'07). After the discussion panel, students met with alumni one-on-one over pizza and pop.

Nicole Schmidt (BSConE'09, MSCE'13) hosted several alumni at the CCEE GOLD Kansas City Kickoff to Summer, held at Char Bar in Kansas City's Westport District on June 23, 2015. Alumni from four different Kansas City area employers, including Burns & McDonnell, J.E. Dunn Construction, Turner Construction, and Terracon, attended. We also had representation from the Iowa State University Alumni Association Board of Directors in Craig Denny (BSCE'71, MSCE'73) and Schmidt. Future Cyclone Mia Schmidt was the youngest attendee—at seven months old!

2015-2016 CCEE GOLD Executive Committee

AJ Barone
Chair
(BSCE'12)
Iowa City, Iowa

Owen Berg
Co-Chair
(BSCE'08, MSCE'10)
Omaha, Neb.

Nicole Schmidt
Secretary
(BSConE'09, MSCE'13)
Kansas City, Mo.

Joel Sikkema
University Liaison
(MSCE'11, PhDCE'13)
Sioux Center, Iowa

Jen Jefferson
Member
(BSCE'07, MSCE'13)
Denver, Colo.

John Puls
Member
(BSCE'07, MSCE'08)
Omaha, Neb.

Kent Meyn, Chair
Construction Engineering Industry Advisory Council
Project Manager,
ACI Mechanical, Inc.
(BSConE'85)

It was another great year for the ISU **Construction Engineering Industry Advisory Council (ConE IAC)**. At the AGC-Construction Engineering Spring Awards Banquet, Dr. Jerry Chase (PhDCE'83) and Don Greenwood (BSCE'76) were inducted into the Construction Engineering Hall of Fame. Many thanks to Dr. Chase for positively impacting the lives of so many ConE students during his 19 years of teaching and advising. Likewise, thank you to Don for his industry leadership at Burns & McDonnell and for him, and his wife's, generous financial support of the CCEE department. The construction engineering teams finished first in the Heavy/Highway and Residential divisions at the Associated Schools of Construction Region IV Student Competition. And lastly, the ConE IAC is very proud of our AGC Student Chapter members who spent their Thanksgiving and Spring Breaks serving families in the Appalachian Mountains near Johnson City, Tenn. While attending the awards banquet, I asked one of the students why he, as a freshman, decided to participate in the service projects. He responded with, "Because I grew up in a family in need, I knew how much these families would appreciate our help." What a great heart in a future construction leader.

ConE IAC Members

Dave Audino, Turner Construction
Ken Bonus, GC3
Timothy Becker, Kiewit
Douglas Clark, Peterson Contractors
Robert Cramer, Cramer & Associates
Beth Duyvejonck, Opus Design Build
Mike Espeset, Story Construction
Paul Francois, Pepper Construction of Ohio
Rich Greenlee, Engineering Partners Int'l
Mark Guetzko, Seedorff Holdings
Paul Higgins, The Beck Group
Larry Hopp (emeritus member), Creighton University
John Hovanec, Union Pacific Railroad
Michael King, Black & Veatch
Chad Layland, Baker Electric
Chris Lindhart, The Beck Group
Dean McCormick, Iowa State University
T. J. Meiners, Nelson Electric
Austin Meyn, J.E. Dunn Construction
Josh Miltenberger, Ryan Companies US
Greg Mulder, Iowa Department of Transportation
Cork Peterson (emeritus member), Peterson Contractors
Gene Postma, APi Group
Matt Ralston, Burns & McDonnell
Rick Schultze, ARCO Design Build
Ken Sorenson, M. A. Mortenson
Mike Tousley, The Weitz Co.
Stacy Zerr, The Waldinger Corp.

Ron Tekippe, Chair
Civil Engineering External Advisory Council
President, HGM Associates, Inc.
(BSCE'82)

The Civil Engineering External Advisory Council (CEEAC) met in April 2015 to continue our dialogue with staff and students. This dialogue is how the council expands its understanding of procedures, practices and improvements being made in the civil engineering program at ISU. Meeting highlights include: 1) council's adoption and amendment of bylaws which formally set term limits and terms of office for the council officers, 2) exciting discussion about increased enrollment, and 3) introduction of new staff members hired to deal with the growing enrollment. It is always nice for the council to interact with our staff in the civil engineering program. We then listened to presentations on three different research projects underway at ISU. There was discussion on how these research projects get started, partnerships that are formed, funding sources and conclusions. It was very interesting to see the cross section of research being undertaken and to learn about how much work goes on "behind the scenes" in getting these research projects off the ground. The council then broke into small groups and had discussions with several panels of graduating civil engineers. We discussed and asked for feedback from these students on topics like "What is ISU doing right?" and "What additional things should ISU be doing?". We also had some open discussion with the students to get their general input and thoughts.

CEEAC Members

William Anderson, CESB
Ben Biller, Burns & McDonnell
Robert Crandall, Black & Veatch
Craig Denny, Terracon
Matt Garber, Clapsaddle-Garber Associates
Paul Giroux, Kiewit
Mike Helms, Stanley Consultants
Les Kempers, GPRM Prestress
Sandra Larson, Iowa Department of Transportation
Jack McGuire, Boeing (retired)
Tammy Nicholson, Iowa Department of Transportation (CEEAC Past Chair)
Bob Paulsen, AE Guidance
Michelle Scherer, University of Iowa
Rick Tollakson, Hubbell Realty
Mike Vander Wert, Calhoun-Burns and Associates, Inc.
Red Voss, Black & Veatch (retired)
Scott Werner, EFCO Corporation (CEEAC Chair-Elect)
Terry Wipf, Iowa State University (CEEAC ex-officio)

Let's recognize recent faculty successes.

Jenny Baker
Senior Lecturer

Senior Lecturer Jenny Baker was named to Consulting-Specifying Engineer (CSE) magazine's "40 under 40" in May 2015.

CSE magazine's "40 under 40" recognizes 40 industry professionals age 40 and younger who stand out in all aspects of their lives, especially those who support the building industry within the engineering community. Baker dedicates many years of electrical building systems design experience to the construction engineering courses she teaches. For example, in CON E 353, Electrical Systems for Buildings, she combines the National Electrical Code and her industry experience to provide students the most hands-on, up-to-date practice for managing building electrical systems.

Beth Hartmann
Senior Lecturer

Senior Lecturer Beth Hartmann received the 2014 Iowa State University Award for Early Achievement in Teaching in September 2014.

This award recognizes faculty members who have demonstrated outstanding teaching performance unusually early in their professional careers. Since 2009, Hartmann has devoted countless hours of teaching preparation, classroom mentoring, one-on-one mentoring, and personal scholarship to model leadership for students, faculty and staff in the CCEE department and elsewhere. She co-manages CE 485 (CE and ConE Capstone), leads CON E 121/122 Construction Engineering Learning Community, and co-advises the nationally acclaimed ISU National Electrical Contractors Association Green Energy Challenge Team. Hartmann also pursues a PhD in civil engineering at Iowa State, focusing on construction management and leadership.

David Jeong
Associate Professor

Associate Professor David Jeong earned the Distinguished Professor Award from the Construction Industry Institute (CII) in August 2015.

CII honored Dr. Jeong for applying CII-sponsored research findings to his construction finance and business management courses. He is particularly interested in teaching students about the Engineering, Procurement and Construction sector, also known as EPC, within the construction industry. "This sector handles complex, multibillion-dollar capital projects in which many of our students' prospective employers thrive," Dr. Jeong said. Starting in the fall 2015 semester, he will offer an online course based on CII best practices.

Yelda Turkan
Assistant Professor

Assistant Professor Yelda Turkan was selected as an American Society of Civil Engineers Excellence in Civil Engineering Education (ASCE ExCEEd) Fellow to participate in the 2015 ASCE ExCEEd Teaching Workshop. The workshop was held at the U.S. Military Academy at West Point July 19-24, 2015.

The selection was made by ASCE's Committee on Faculty Development based on Dr. Turkan's promise for commitment to excellence in education and a willingness to serve as a future role model for teaching at Iowa State University. The ASCE ExCEEd Teaching Workshop was a 6-day program that provided engineering educators with an opportunity to improve their teaching skills. The workshop included seminars on several topics such as learning styles, communication skills and teaching with technology. The collaborative environment of the workshop ensured that participants improved their teaching skills substantially by the end of the course. By attending this workshop, Dr. Turkan advanced her knowledge on understanding student learning styles and setting clear learning objectives for her courses. She looks forward to applying skills she gained during the workshop to her classes.

Marlee Walton
Senior Lecturer

Senior Lecturer Marlee Walton was selected for the American Society of Civil Engineers (ASCE) Iowa Section Outstanding Civil Engineer Award in September 2014.

Walton was recognized primarily for her leadership as ASCE Iowa Section president from 2008 to 2009. In this role she developed a strategic plan as well as updated the group's constitution and bylaws. Her approach was aimed at ASCE Iowa Section member outreach, particularly enhancing communication among Iowa's 950 ASCE members. Membership partners engineering instructors, practicing engineers and corporate leadership throughout the state of Iowa.

Recent faculty/staff promotions and milestones

Dr. James Alleman and Dr. Say Kee Ong were recognized as Cerwick Faculty Professors in May 2015.

Dr. Halil Ceylan was promoted to professor (already tenured), effective Aug. 16, 2015.

Dr. In Ho Cho was named a Black & Veatch Building a World of Difference Faculty Fellow in August 2014.

Senior Lecturer Larry Cormicle was named the Weitz Faculty Fellow in November 2014.

Beth Hartmann was promoted to senior lecturer, effective Aug. 16, 2015.

Dr. Peter Taylor became director of the National Concrete Pavement Technology Center after serving as associate director since 2007.

Dr. Chris Williams was named the Gerald and Audrey Olson Professor in Civil Engineering in September 2014.

Continued from **JACK TRICE** on p. 4

mistakes," said Matt Tursi (BSCE'11), project engineer for The Weitz Company. "This cool advance in technology translates the design world to the built world."

Jason Knipp (BSConE'07), project manager for Henkel Construction, coordinated construction of what fans see as they enter the Sukup End Zone Club. He managed the finishes, which includes metal stud framing, drywall, carpentry, stairways, handrails, and other aesthetics. One notable feature is the grand staircase that is finished with a terrazzo platform. Other aesthetic finishes are two industrial-grade grain bins that hang over identical circular bars on the second floor of the Sukup End Zone Club. Each grain bin was constructed in one week within the club space.

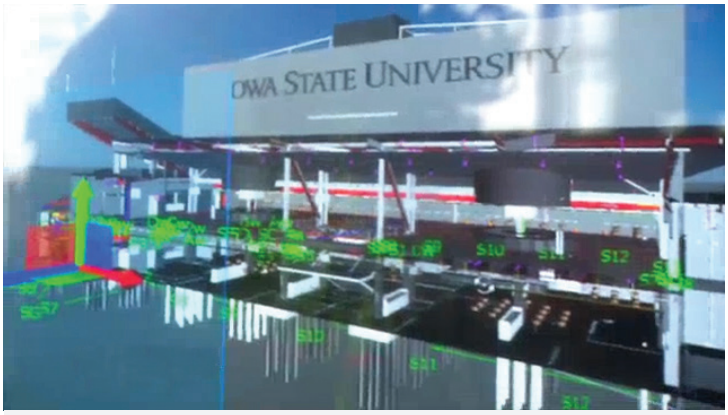
Ryan Catus (BSConE'11), project engineer for The Weitz Company, used VDC to manage the finishes, roofing, and masonry components of the south end zone construction. Catus grew up in Ames, so the project truly feels close to home. "It's my hometown, so it will be pretty cool to drive by when I'm older and say 'I helped build that,'" Catus said.

Austin Norberg (BSConE'09), project manager for Seedorff Masonry, Inc., managed masonry installation for four bathroom pods and east- and west-side veneers of the Sukup End Zone Club.

In addition to the south end zone enclosure, Jack Trice Stadium renovated its drainage system. Joe Winter (BSConE'14), project manager/estimator for J&K Contracting, and Grant Reimers (BSConE'13), project manager for Woodruff Construction, coordinated the installation of a new pump-lift drainage station. Winter coordinated excavation of the ditch for the new pump-lift station that Woodruff Construction built. This system replaced a pump station that was in Jack Trice Stadium's old southeast hillside seating, which now is section 27.

Students also contributed to the project. Lucas Baxter, a spring 2015 construction engineering graduate, tracked progress on VDC plans during his internship with Baker Electric. Kristin Larsen, a spring 2015 civil engineering graduate, updated electronic plans as an intern for The Weitz Company.

"This is a wow project," McCormick said. "The interest we see from Iowa State Athletics, the community, and the state makes this especially rewarding."



Engineers used Virtual Design and Construction, which generates 3-D models of a structure, to manage construction of the Jack Trice Stadium South End Zone. *Image captured from CCEE video*

CCEE alumni who worked onsite at the construction of Jack Trice Stadium South End Zone

Lucas Baxter (BSConE'15), Project Engineer Intern, Baker Electric

Bill Bruce (BSConE'12), Project Engineer, The Weitz Company

Ben Bunge (BSConE'05), Project Manager, The Weitz Company

Blake Carolan (BSConE'13), Project Manager, Neumann Brothers

Ryan Catus (BSConE'11), Project Engineer, The Weitz Company

Jason Knipp (BSConE'07), Project Manager, Henkel Construction

Kristin Larsen (BSCE'15), Project Engineer Intern, The Weitz Company

Dean McCormick (BSConE'81), Director of Design and Construction Services, Facilities Planning and Management, Iowa State University

Luke Miller (BSConE'09), Project Manager, A.J. Allen Mechanical

Austin Norberg (BSConE'09), Project Manager, Seedorff Masonry

Grant Reimers (BSConE'13), Project Manager, Woodruff Construction

Matt Tursi (BSCE'11), Project Engineer, The Weitz Company

Joe Winter (BSConE'14), Project Manager/Estimator, J&K Contracting

INTERNATIONAL ENGAGEMENT

Doug Gransberg, professor and Donald F. and Sharon A. Greenwood Chair in Construction Engineering, has provided project delivery training for the past two years at the Panama Canal expansion. *Photo courtesy of Doug Gransberg*

INSPIRING THE NEXT ENGINEERING GENERATION

CCEE grad students Anmol Pakhale (standing in middle, wearing light blue), Adam Miller (second from right), and Zhao Cheng (standing right) lead Story County elementary school students in an ISU Extension/Story County 4-H Elementary Engineering Program on bridge-building in November 2014. *Photo courtesy of Zhao Cheng*

Students of the National Electrical Contractors Association-ISU chapter gear up for an outreach event at Sawyer Elementary School (Ames, Iowa). *Photo courtesy of ISU NECA*

CCEE grad student Firas Al-Shalabi introduces high school students to civil, construction and environmental engineering.

Jordan Creek Elementary School (West Des Moines, Iowa) sixth-graders mix concrete mortar at the Portland Cement Concrete and Materials Research Lab on April 30, 2015. *Photo courtesy of Jordan Creek Elementary School*

Michael Colby

CE junior studies Singapore water issues in Singapore

While a love of traveling and experiencing new cultures encouraged civil engineering junior Michael Colby to study abroad in spring 2014, the four engineering classes he took in Singapore gave him a glimpse into what he wants to do with his future.

Colby's favorite class focused on water issues in Singapore, an island that covers 277 square miles and inhabits more than five million people. To put the dense population of the island in perspective, the state of Iowa is more than 56,000 square miles and has a population of three million people.

The crowding in Singapore forced the country to be innovative when it came to managing its water supply. Colby learned about how the country's water agency focused on clean water delivery and wastewater treatment to deliver clean water to Singapore's inhabitants. "The whole experience really broadened my knowledge about the area I want to study," Colby said.

Colby also enjoyed traveling around Southeast Asia and experiencing new cultures. He made many friends in Singapore and Malaysia and found it interesting to compare the different lifestyles.

In the future, he plans to continue his interests in water remediation and wastewater treatment, including working abroad to discover ways to reuse and treat dirty water. "I want to learn more about water remediation so when I travel, I have something to offer. Clean water is a scarce resource, and I want to help solve that problem."

Abby Peterson, Engineering College Relations writer, contributed to this story.

Grad students thrive in research and practice.

Graduate Student Enrollment, Fall 2010-2014

60 PhD students enrolled in Fall 2014

20 Rank among U.S. public civil engineering programs

57 Publications in 2014-2015 where CCEE grad student is listed as first author

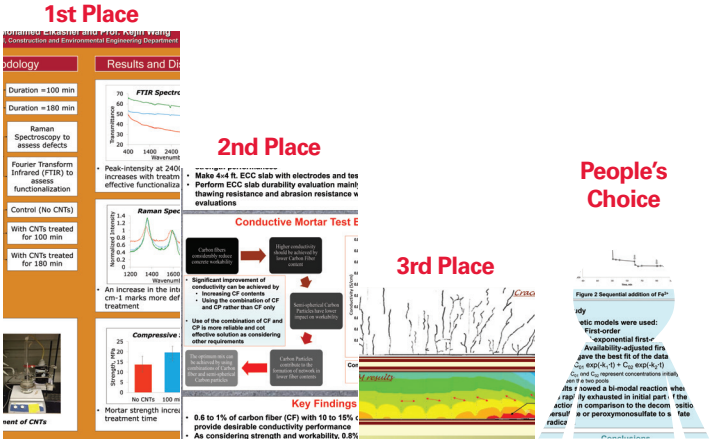
Geotech doctoral student Ka Lai Ng Puga received the David R. Jones national asphalt scholarship from the Association of Modified Asphalt Producers on Feb. 18, 2015. In August 2014, she presented her research in Spanish at the 9th International Conference of Asphalt, held in Colombia. *Photo courtesy of Ka Lai Ng Puga*

A group of transportation graduate students earned a Transportation Research Board Best Paper Award in January 2015 based on research relating automobile crashes and highway lane widths. *Photo courtesy of Peter Savolainen*

Julia Anderson-Lee, a doctoral student who dual majors in math and civil engineering, was named to the 2015 Women Impacting ISU Calendar. She has demonstrated leadership in ISU's Enhancing Diversity in Graduate Education and Mathematicians of Color Alliance, among other groups.

Geotech doctoral student Mohamed Elkashef earned the Outstanding Oral Presentation Award and Research Award at ISU Graduate and Professional Student Senate's Research Conference, held April 2, 2015. He presented on acid modification of carbon nanotubes to improve their dispersion in concrete.

Top posters of the 4th Annual CCEE Graduate Research Showcase and Poster Competition

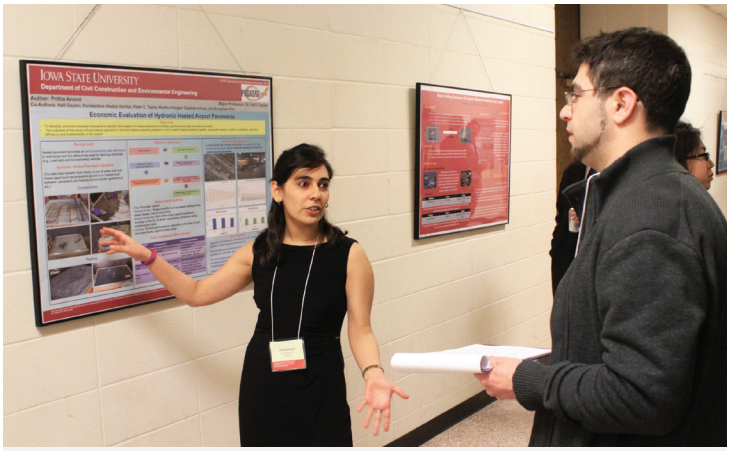


Mohamed Elkashef
Acid-treated carbon nanotubes and their effects on mortar strength

Alireza Sassani
Mix design development of electrically conductive concrete

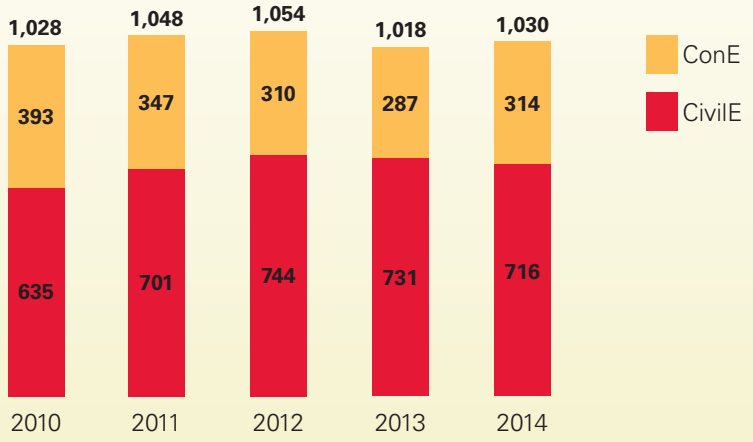
Zhengyu Liu
Evaluation of the need for longitudinal joints in bridge decks on dual structures

Guyu Shi
Sulfate radical oxidation of 2, 4-D using iron activation of persulfate and peroxymono-sulfate



Geotech master's student Pritha Anand (left) discusses her research poster on the economic evaluation of hydronic heated airport pavements. Anand and 24 other CCEE grad students presented at the 4th Annual CCEE Graduate Research Showcase and Poster Competition, held Dec. 2, 2014, in Town Engineering Building. Each poster was judged by a 12-member group of CCEE faculty, graduate students, and Iowa State University Institute for Transportation engineer Skylar Knickerbocker (BSCE'12). Attendees voted for People's Choice Award.

Undergraduate Enrollment, Fall 2010-2014



UNDERG

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Civil **Construction**

ISU wins Green Energy Challenge

Team Cyclone Energy won the 2014 ELECTRI International/ National Electrical Contractors Association (NECA) Green Energy Challenge on Sept. 28, 2014. They developed an energy retrofit plan, which also garnered a Best Presenter Award and second place prize for poster, for ISU's Memorial Union. *Photo courtesy of NECA*

Iowa State's ASCE Steel Bridge Team was runner-up of the ASCE Midwest Steel Bridge Competition, held March 7, 2015, in Thunder Bay, Ontario. They advanced to nationals in Kansas City, where they placed eighth in bridge design and 27th overall. *Photo courtesy of ISU ASCE Steel Bridge Team*

Two ConE student teams won the residential and heavy-highway divisions of the Associated Schools of Construction Region IV Student Competition, held in Nebraska City Oct. 23-25, 2014. Students earned runner-up honors in the commercial and design-build divisions. *Photo courtesy of David Jeong*

Spring 2015 CE graduate Ryan Betters was sworn in as a U.S. Navy Civil Engineer Corps officer on Feb. 27, 2015. Betters was an exemplary student who studied abroad in several countries, reinstated a campus fraternity, served as an ISU Admissions ambassador, and much more.

Spring 2015 CE graduate Andrea Dvorak was featured on the 2015 Women Impacting ISU Calendar. Her leadership in Women in Science and Engineering, Habitat for Humanity, and several other activities led her to be only one of 12 faculty, staff, and students named to the honor.

Spring 2015 ConE graduate Brandon Mai received the 2014 Design-Build Institute of America Distinguished Student Leadership Award. The honor recognizes his leadership in the DBIA ISU chapter, especially when ISU won the DBIA Midwest Student Competition in May 2014. *Photo courtesy of Brandon Mai*

Three CCEE students were named ISU Learning Communities Exemplary Peer Mentors on April 8, 2015. Honorees were spring 2015 ConE graduates Joe Hahn (pictured center) and Peter von Qualen (pictured left), as well as CE senior Tyler Wilson. *Photo courtesy of Jenny Parr*

GRADS IN &EE

Environmental Engineering

7 **top-5 national competition finishes** from August 2014-June 2015

335 **companies** at Spring 2015 Engineering Career Fair

x2 **likelihood that students** with co-op/internship experience **will get jobs at graduation** versus students with no professional experience

98 percent B.S. **job placement** within 6 months of graduating

Toby Cruz: Guam native, NASA intern, Air Force ROTC cadet, civil engineering student

May 2015 civil engineering graduate Toby Cruz experienced a notable internship and extracurricular activities while pursuing his bachelor's degree at Iowa State University.

Soon after completing final exams in December 2013, Cruz completed a NASA internship application and gathered faculty recommendations within one weekend. One month later, NASA offered him two internships during summer 2014. He accepted the Rotorcraft Aeromechanics internship, held at NASA's Ames Research Center in Moffett Field, Calif.

Cruz learned that he was one of 50 students, chosen from about 5,000 applicants nationwide, to pursue the NASA internship. He also learned that he was the only civil engineering major in a group of aerospace engineering and mechanical engineering majors. Six Iowa State students were chosen.

The Aeromechanics Branch, within NASA's Aeronautics Office at Ames Research Center, conducts research activities that directly support civil competitiveness of the U.S. helicopter industry and the vertical lift requirements of the Department of Defense.

NASA tasked Cruz to produce solutions for an aircraft air intrusion problem at Ames Research Center. Problems arose when air blast from NASA airplanes and helicopters intruded from the tarmac to adjacent buildings. Cruz worked with engineers and state-of-the-art software to propose three solutions: 1) plant trees to slow down air blasts between the tarmac and area buildings, 2) build blast walls to deflect air blasts, and 3) reorient aircraft on the tarmac so air blasts would intrude on non-building areas. "It was rewarding to solve practical problems with a NASA research team—beyond the textbooks," Cruz said.

Cruz also was a cadet squadron commander at Iowa State's Air Force ROTC. This role helped Cruz develop strong leadership skills, communication, and professionalism. He said the Air Force ROTC guided him to aeronautical interests within civil engineering: "I determine the structures of aircraft design, spacecraft design, and composites used within those structures."

Cruz was born and raised in Guam. While he grew up, education and society encouraged students to pursue engineering, particularly civil engineering. In 2012 he moved to Iowa State to pursue a civil engineering degree. "I see my life as an unfinished puzzle. The puzzle is unclear now, but as I collect the right pieces, everything will fit and make sense," Cruz said.

Cruz graduated in May 2015 with his civil engineering degree.

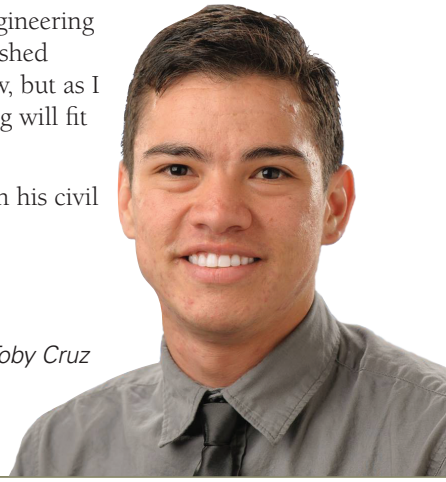


Photo courtesy of Toby Cruz

Outstanding Graduating Seniors of 2014-2015

Carlie Mander, Fall 2014, CE
Currently a Master's student in CE at ISU

Jacob Schaefer, Fall 2014, ConE
Currently a Mechanical EIT at Bluestone Engineering

Sasha Weir, Spring 2015, CE
Currently an Assistant Structural Engineer at Burns & McDonnell

Andrew Reynolds, Spring 2015, ConE
Currently a Project Engineer at Ames Construction

Iowa governor honors AGC for community service

Iowa Gov. Terry Branstad and the Iowa Department of Transportation selected students of the Iowa State University Associated General Contractors (AGC) Chapter to receive the Group Governor's Volunteer Award.

Iowa Gov. Terry Branstad presents construction engineering senior Dan Carlson, who represents AGC Iowa State Chapter, with a 2015 Governor's Group Volunteer Award on June 8, 2015. *Photo courtesy of Iowa Department of Natural Resources/Volunteer Iowa*

They were honored at a recognition ceremony on June 8, 2015, at Southeast Polk High School in Pleasant Hill, Iowa. Construction engineering senior Dan Carlson, who led AGC students on their 2015 Spring Break trip to rebuild Johnson City, Tenn., accepted the award on AGC's behalf.

Andy Reynolds, a spring 2015 construction engineering graduate, is the outgoing president of AGC Iowa State Chapter and facilitated AGC community service projects in the 2013-2014 academic year. "It is an honor to receive this award not only for the acknowledgement of our service efforts, but also for the advancement of the people and organizations we serve," Reynolds said.

Since 2012, the AGC Iowa State Chapter has partnered with Appalachian Service Project to rebuild houses in flood-damaged Johnson City, Tenn. In the last several years, AGC Iowa State Chapter also rebuilt homes in Joplin, Mo., Moore, Okla., Mississippi Gulf Coast, and Cedar Rapids, Iowa. Throughout the years, hundreds of students have spent Spring Break and Thanksgiving Break applying teamwork and construction engineering solutions to rebuilding some of America's devastated communities.

When they don't road-trip to building sites, the AGC Iowa State students contribute to Ames-based community organizations, such as the Mary Greeley Medical Center, Boys & Girls Club of Story County, and Ames Community School District, to name a few. "We have been fortunate to have, year after year, generous, committed, and energetic students involved with this organization," Reynolds said. "Service is at the core of ISU-AGC."

The Governor's Volunteer Awards program was created in 1982, with inaugural awards presented in 1983. The program has grown from a small program only available to state agencies to its present function of providing all Iowa nonprofit, charitable, and government organizations with a non-competitive, easy, and low-cost way to honor local volunteers with a prestigious state-level recognition award. The program is coordinated by the Iowa Commission on Volunteer Service, which is responsible for planning, development, and improvement of the awards nomination process, guidelines, and procedures.

AGC Iowa State Chapter students, clad in mud and rain gear, rebuild homes in Johnson City, Tenn., during their 2015 Spring Break. Community service like this garnered AGC the 2015 Iowa Governor's Group Volunteer Award. *Photo courtesy of ISU-AGC*

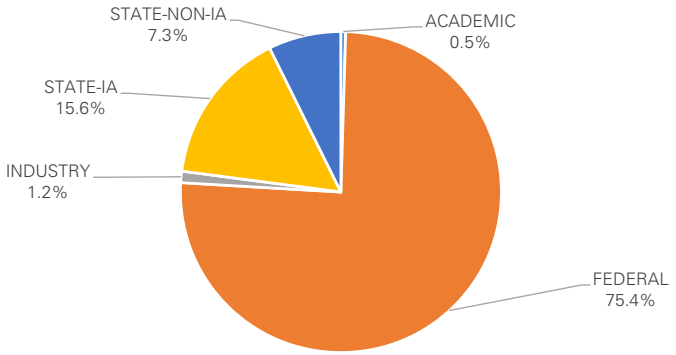
CCEE research serves Iowa and beyond

CCEE Research Active Funding and Projects, FY2015

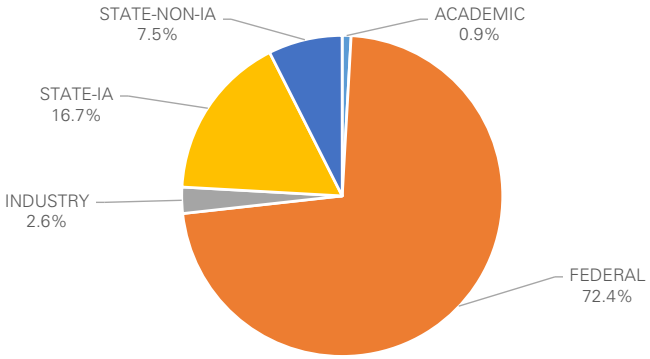
Type of Sponsor	Proportion of All Funding*	Proportion of All Projects*
State, Iowa	15.6%	16.7%
Federal	75.4%	72.4%
State, Non-Iowa	7.3%	7.5%
Industry	1.2%	2.6%
Academic	0.5%	0.9%

*Proportions are rounded to nearest one-tenth percent (total proportion may exceed 100.0%)

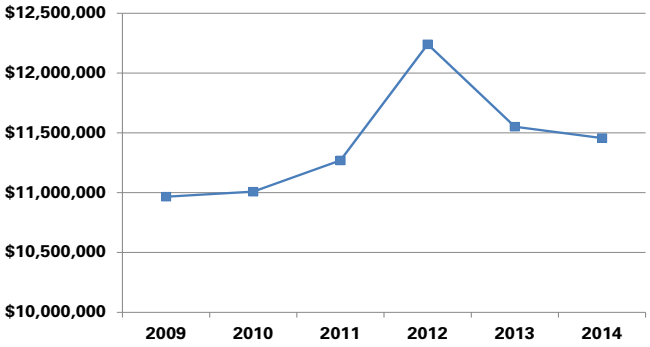
CCEE Research Active Funding By Type of Source, FY2015



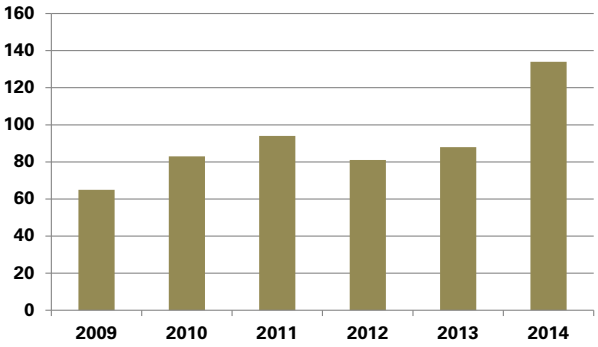
CCEE Research Active Projects By Type of Source, FY2015



Total CCEE Research Expenditures, FY2009-FY2014



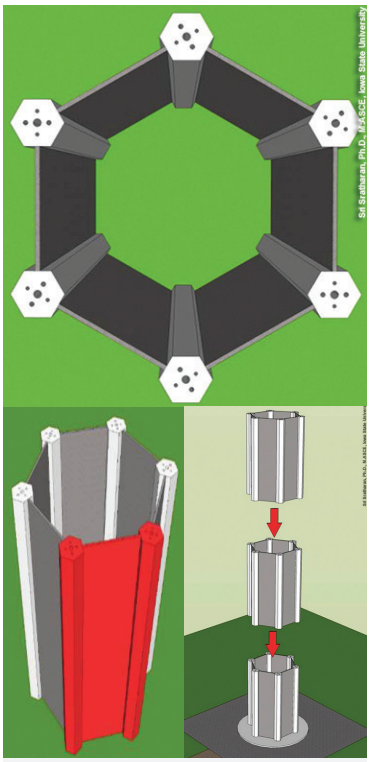
Total Peer-Reviewed Journal Papers by CCEE Researchers, CY2009-CY2014



Research Faculty†

†Tenured, Tenure-Track, and Non-Tenure-Eligible Research faculty as of March 2015

Sritharan earns $1M DOE grant on taller wind towers



Illustrations of Hexcrete concrete wind turbine tower design.
Images courtesy of Sri Sritharan

The U.S. Department of Energy has awarded Iowa State engineers $1 million to study how high-strength concrete can be used to build taller wind turbine towers.

"I think this will revolutionize wind energy," said Sri Sritharan, Iowa State University's Wilson Engineering Professor in Civil, Construction and Environmental Engineering. "We won't need to transport these big tubular towers on the highways and we'll harvest energy where it's needed."

Dr. Sritharan said concrete towers have several advantages over today's 80-meter steel towers. They can reach beyond 80 meters, providing energy companies with access to the faster and steadier winds at 100 meters and higher. They increase the amount of time turbines are productive. They allow wind energy harvesting in regions of the country where favorable winds are only above 100 meters and demand for energy is high. And, they contribute to the reduction of wind energy costs by reducing the production and transportation costs of towers.

The energy department project will build on Dr. Sritharan's earlier work to develop and test concrete wind turbine towers. The tower technology, called Hexcrete, uses precast and easily transportable components to build hexagon-shaped towers from concrete panels connected to concrete columns.

Dr. Sritharan and former graduate student Grant Schmitz tested full-size tower segments and connections last year. The tests found the concrete technology could be designed to handle the load expected for taller towers at extreme conditions.

And so Dr. Sritharan thinks concrete towers can do a lot for the wind energy industry and for the American economy: "If used for the entire height," he wrote in a project summary, "the Hexcrete concept will eliminate transportation challenges and engage a well-established U.S.-based precast concrete industry in the wind tower business, thereby greatly reducing reliance on foreign steel and increasing the job market in the U.S."

In addition to the energy department's 18-month grant, the wind tower project will be supported by a grant of $83,500 from the Iowa Energy Center and $22,500 of in-kind contributions from Lafarge North America Inc. of Calgary, Alberta, Canada. The project's industry partners also include the Siemens Corporation's Corporate Technology center in Princeton, N.J.; Coreslab Structures (OMAHA) Inc. of Bellevue, Neb.; and BergerABAM of Federal Way, Wash.

Mike Krapfl, communications specialist for Iowa State University News Service, contributed to this story.

CCEE researchers contribute to high ISU world ranking for patents

Three of the 31 U.S. utility patents Iowa State University received in 2014 came from CCEE faculty researchers. Each substantial accomplishment has contributed to Iowa State being named No. 70 in the world for universities that received U.S. utility patents in 2014.

Wilson Engineering Professor Sri Sritharan was awarded U.S. Patent No. 8,881,485 on Nov. 11, 2014, for his concrete wind turbine tower system. The wind turbine tower includes a plurality of hexagonal-shaped or other shapes of vertical columns comprised of a concrete composition and a plurality of panels, each of the panels extending between adjacent vertical columns. The patent also states that a wind turbine tower reaches a height of at least 100 meters.

Richard L. Handy Professor David White received U.S. Patent No. 8,672,666 on March 18, 2014, for his work on a polymer mortar composite pipe material and manufacturing method.

Chris Williams, the Gerald and Audrey Olson Professor in Civil Engineering, received U.S. Patent No. 8,696,806 on April 15, 2014, for asphalt materials containing bio-oil and methods for production of bioasphalt.

Sri Sritharan
Wilson Engineering Professor

"Wind turbine tower system"
U.S. Patent No. 8,881,485

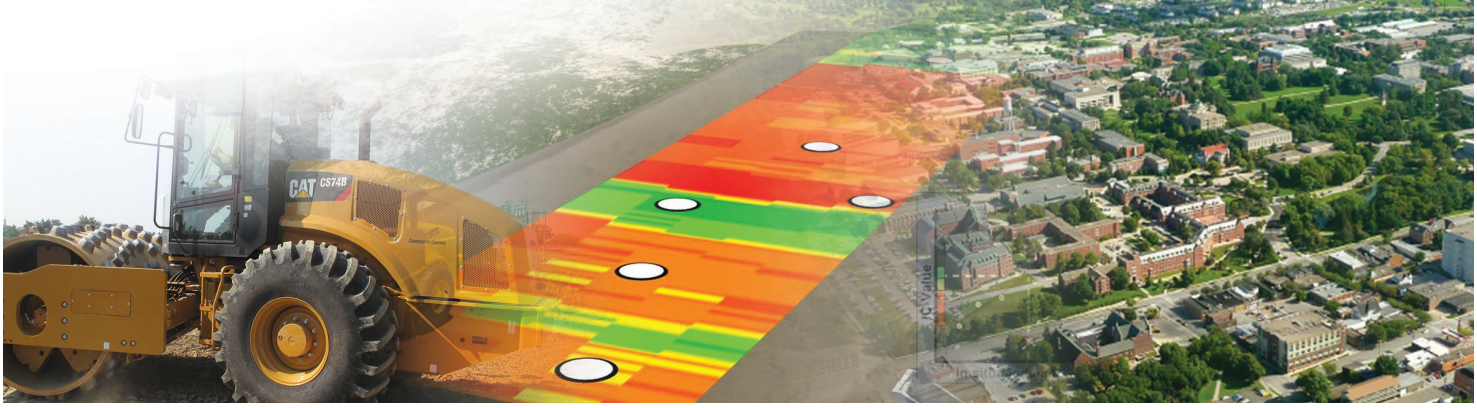
David White
Richard L. Handy Professor

"Polymer mortar composite pipe material and manufacturing method"
U.S. Patent No. 8,672,666

Chris Williams
Gerald and Audrey Olson Professor

"Asphalt materials containing bio-oil and methods for production thereof"
U.S. Patent No. 8,696,806

Learn more about Iowa State's other 2014 inventions and the report on 2014 world university U.S. patent rankings at http://www.inside.iastate.edu/article/2015/06/18/patent.



Iowa State hosts first-ever conference on autonomous, robotic construction of infrastructure

More than 100 engineers, professors, and project administrators from throughout Iowa, the U.S., and the world gathered at Iowa State University June 2-3, 2015, for the inaugural Conference on Autonomous and Robotic Construction and Infrastructure (CARCI).

Construction technology experts discussed knowledge and practice in advancing autonomous and robotic-guided equipment that improves construction productivity, quality, reliability and safety. Twenty-six representatives from a dozen universities, government agencies, and construction technology groups in Iowa and throughout the world presented.

David White, Richard L. Handy Professor of civil, construction and environmental engineering and director of the Center for Earthworks Engineering Research (CEER) at Iowa State, helped lead the conference. "I think that many new and exciting discoveries are on the horizon," White said. "Our next step will be to continue to develop newly forged relationships and seek input from international organizations and industry in terms of research opportunities and future conferences."

Miroslaw J. Skibniewski, A. James Clark Chair Professor in the Department of Civil and Environmental Engineering at University of Maryland, led the keynote speech on the development of robotics used for road construction and maintenance.

Researchers and administrators from Iowa State University, the Iowa Department of Transportation, Caterpillar, Inc., and the U.S. Army Engineer, Research and Development Center collaborated to plan the conference. CARCI sponsors included Caterpillar, Inc., the Iowa Department of Transportation, the Midwest Transportation Center (MTC) at Iowa State University Institute for Transportation, the Iowa State University Department of Civil, Construction and Environmental Engineering (CCEE), and the Center for Industrial Research and Service (CIRAS) at Iowa State University.

Organizations that led workshop sessions

École Polytechnique Fédérale de Lausanne, Switzerland

Federal Highway Administration

Georgia Institute of Technology

Iowa State University

John Deere Intelligent Solutions Group

Mississippi State University

Peterson Contractors, Inc.

U.S. Army Engineer Research and Development Center

University of Central Florida

University of Illinois at Urbana-Champaign

University of Maryland

University of Michigan

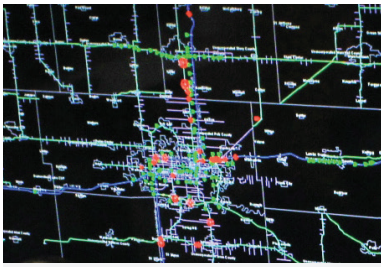
Top Row, from left: Professor Miroslaw Skibniewski from the University of Maryland delivers the conference keynote. ISU Professor David White presents on terrestial laser scanning roughness assessments. ISU doctoral student Fangyu Guo presents a case study on 3-D modeling. Bottom row, from left: ISU Assistant Professor Yelda Turkan presents on bridge structural condition assessment using 3-D modeling. Assistant Professor An Chen (left) and Clinician Pavana Vennapusa present on applicability and limitations of 3-D printing for civil structures. *Photos courtesy of ISU Institute for Transportation*

Traffic Operations Lab partners CCEE, InTrans, Iowa DOT

Many Iowa State University students, faculty researchers, and engineers at the Iowa Department of Transportation (Iowa DOT) have partnered to develop traffic solutions for Iowa's highways.

Neal Hawkins, director of the Center for Transportation Research and Education and adjunct lecturer of civil, construction and environmental engineering at Iowa State, and Mike Jackson, state traffic operations engineer at the Iowa DOT, have led the development of the Traffic Operations Laboratory. The state-of-the-art teaching and research laboratory, which opened in October 2014 at Iowa State's Institute for Transportation, tracks real-time sensor and video data—big data—using highway cameras and traffic sensors.

Four 70-inch TV screens, each capturing an element of Iowa highway data fed by a fiber optic connection, comprise the south wall of the lab. On the north wall, an interactive whiteboard inspires formal instruction or closer inspection of a highway traffic issue. Every 20 seconds, researchers non-invasively track 31,000 miles of Iowa highway traffic from driver cell phones, truck sensors, other vehicles that contain GPS devices, and highway cameras. An interactive black map showcases all major traffic issues throughout Iowa, like a sharp reduction in average traffic speed in a given location, in real time. Seventeen computers store many terabytes of data, which researchers analyze to produce and recommend traffic operations solutions to Iowa DOT engineers. A meeting space fit for a dozen-plus can be adjusted for classroom, research, or visitor use.



Red dots indicate sudden reductions in average speed at given locations. Screen captures the greater Des Moines area.

Iowa State's Department of Civil, Construction and Environmental Engineering (CCEE) is an integral component of the lab. "Without faculty and students, we cannot grow and innovate," Hawkins said.

Two additional key participants in developing and conducting research through the lab include CCEE Associate Professor Anuj Sharma and Skylar Knickerbocker (MSCE'12). Additional Traffic Operations Laboratory faculty researchers include CCEE Assistant Professor Jing Dong and CCEE Associate Professor Peter Savolainen. A team of 18 Iowa State students across civil engineering, computer science, and architecture disciplines also participate in research activities.

A research team analyzes real-time Iowa highway traffic data. Pictured, from left, are doctoral student Chenhui Liu, postdoc research associate Yaw Adu-Gyamfi, doctoral student Tingting Huang, doctoral student Shuo Wang, Associate Professor Anuj Sharma, and Neal Hawkins, director of the Iowa State University Center for Transportation Research and Education.

Iowa State executes a wide variety of Iowa DOT projects through the Traffic Operations Laboratory. "We facilitate faculty and staff research for Iowa DOT operations support," Hawkins said. "The lab was developed to accommodate and provide real time data for teaching graduate-level traffic operations classes."

Since October 2014, researchers have ensured data quality and reliability. Graduate students are instrumental in this key step toward implementation. For example, first-year transportation doctoral student Tingting Huang evaluates sensor data trends. Chenhui Liu, a third-year transportation doctoral student, analyzes traffic signal control.

The next step will be to use solutions. Sinclair Stolle, the 511/traveler information program engineer at the Iowa DOT, uses lab-based solutions to facilitate mobile and online communication to highway drivers.

Driver notification is the Iowa DOT's top priority as it implements Iowa State-based recommendations. "Our goal is to refine, improve, and enhance Iowa traffic operations for the benefit of the Iowa taxpayer," Jackson said.

Cho applies Euler-Bernoulli beam theory to tiny robots

In Ho Cho
Assistant Professor

In Ho Cho, assistant professor and Black & Veatch Building a World of Difference Faculty Fellow, has partnered with Jaeyoun Kim, associate professor of electrical and computer engineering and Ames Laboratory associate, and recent electrical and computer engineering doctoral graduate Jongwook Paek on the development of a microrobotic tentacle. Cho applied the Euler-Bernoulli beam theory, which in this case relates geometric properties of a highly flexible polydimethylsiloxane (PDMS) robotic arm to an ingeniously placed hump at the base of the arm. "This prime location of the hump allows more spirals, which allows the robot to handle microscale objects," Cho said. The robot has potential biomedical applications, including surgery.

A microrobot holds an ant. *Photo courtesy of Jaeyoun Kim*

Bipolymers plant opens at BioCentury Research Farm

The industrial-scale pilot biopolymers plant being built at the BioCentury Research Farm is set for an August 2015 completion.

The plant, which is a collaboration among the Department of Civil Construction and Environmental Engineering (CCEE), the Department of Chemical and Biological Engineering (CBE), and industry partners (most prominently Argo Genesis Chemical, a subsidiary of Seneca Petroleum), houses two main processes.

"One process is to turn soybean oil into a monomer, and then the second part is to turn that monomer into a polymer," says Eric Cochran, associate professor of chemical and biological engineering and one of the leads on the project.

Cochran and Chris Williams, the Gerald and Audrey Olson Professor in the CCEE department, started planning for the plant with their research team in August 2013.

After the finalized process flow diagram was completed, they moved on to the computer-aided design, or CAD, mock-up of the whole facility. The 3-D CAD design was approved in September 2014, then its location was prepared for construction and assembly.

The modules that will carry out the chemical processes were constructed in St. Louis and then driven to Boone in April 2015 on flatbed trucks almost too large to fit on the highway.

Once all of the parts had been brought up, a crane was on site to lift the modules off of the trucks and place them. "It was really windy that day, so getting everything placed perfectly was impossible," said Cochran. "There was a couple-week setback because if you have to move something even six inches one way and it weighs 80 tons, you can't just get the crane back out there because of the expenses."

A chemical processing module is installed on June 10, 2015, at the new BioCentury Research Farm biopolymers plant.
Photo by Jeni Maiers/Center for Crops Utilization Research

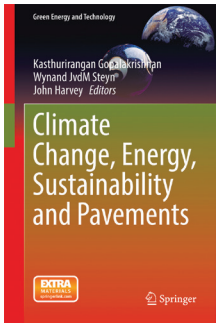
A public open house for the biopolymers plant takes place Aug. 26, 2015, 3:00-5:00 p.m. at the BioCentury Research Farm in Boone.

Caroline Arkesteyn, Engineering College Relations writer, contributed to this story.

Gopalakrishnan co-publishes textbook on sustainable pavements

Kasthurirangan 'Rangan' Gopalakrishnan
Research Associate Professor

CCEE Research Associate Professor Kasthurirangan "Rangan" Gopalakrishnan recently edited a textbook on pavement sustainability. Co-editors include John Harvey (University of California-Davis) and Wynand Steyn (University of Pretoria, South Africa) with individual chapters contributed by several colleagues. The book, titled "Climate Change, Energy, Sustainability and Pavements," dives in to pavement systems and their relationship with climate change, energy, and sustainability. It is a great tool for those studying, researching, teaching, or working with sustainable pavement systems. The book, published by Springer-Verlag, is organized in such a way that educators could use the book for teaching a senior-level or graduate-level course on sustainable roadways and sustainable airport pavements.

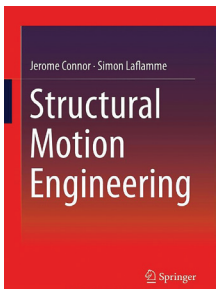


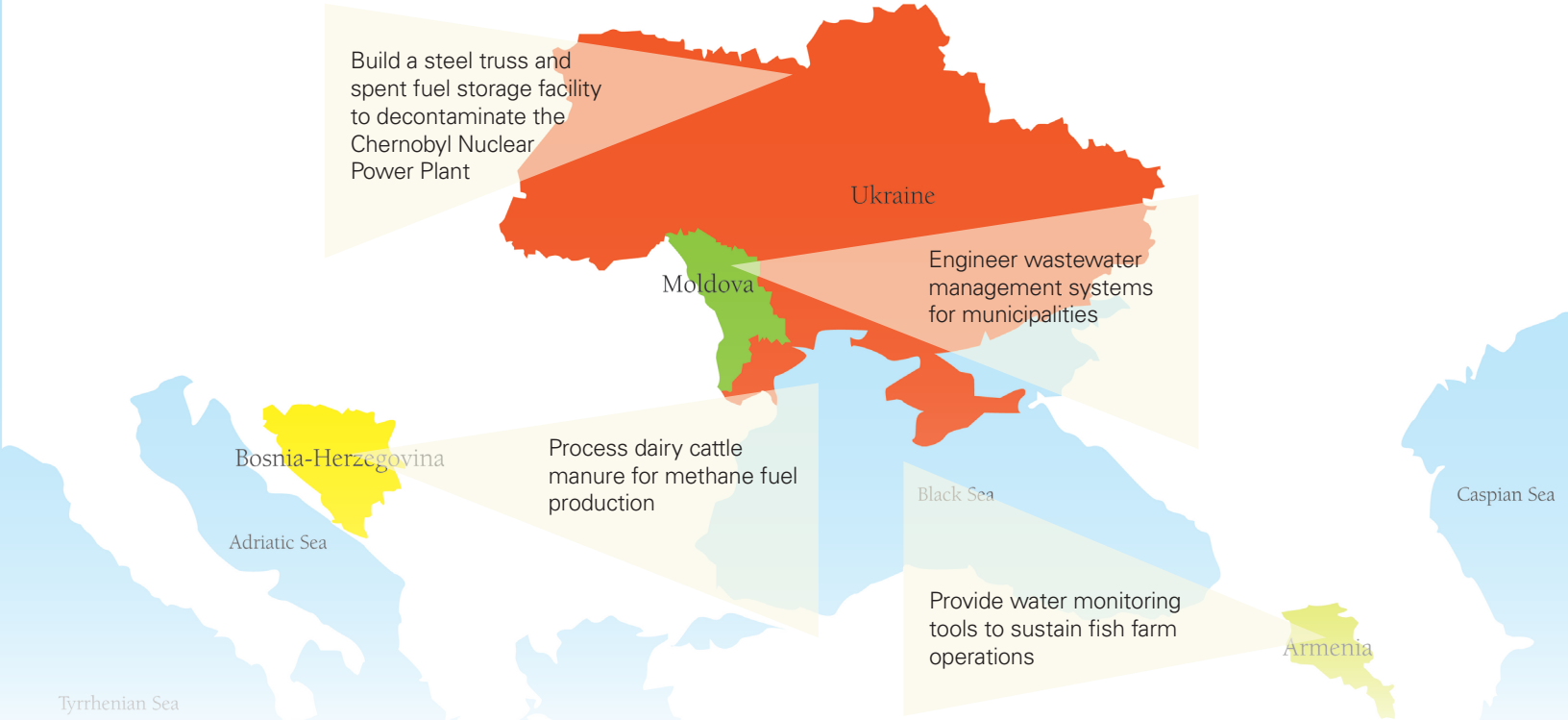
Laflamme co-authors textbook on structural motion engineering

Simon Laflamme
Assistant Professor

CCEE Assistant Professor Simon Laflamme and his former Massachusetts Institute of Technology thesis supervisor, Professor Jerome Connor, recently co-authored a textbook on structural motion engineering.

The book, aptly titled "Structural Motion Engineering," reviews formulas and theory based on several topics: calibration of the stiffness of structural columns and beams, passive damping systems, active damping systems, and semi-active damping systems to control for structural motion. The strength-based approach, which considers load capacity of a structural system, is a traditional design method; however, with progress in construction techniques and materials, structures are becoming more flexible, and structural motion (from wind and earthquakes, for example) is becoming a critical, often governing aspect in design.





Prof. Alleman consults abroad as Jefferson Fellow

Prof. Alleman advises on four eastern Europe environmental projects with U.S. State Department, USAID

Armenia. Bosnia-Herzegovina. Moldova. Ukraine. Jim Alleman, Cerwick Faculty Professor of Environmental Engineering at Iowa State University, provides his environmental engineering expertise to these countries as a way of implementing, in part, key U.S.-eastern Europe policy.

Alleman is one of 13 U.S. university professors to complete a 2014-2015 Jefferson Science Fellowship. The Jefferson Science Fellow Program was founded in 2003 to engage American academic science, technology, engineering and medical communities in the formulation and implementation of U.S. foreign policy. The National Academies (including the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council) administers the program in partnership with the U.S. Department of State and the U.S. Agency for International Development (USAID).

Alleman serves as a senior science adviser for civil, construction, and environmental project focus elements within USAID's Bureau of Europe and Eurasia. He advises on issues in four eastern Europe locales: Chernobyl, Ukraine; Ararat Region, Armenia; Telenesti, Moldova; and Bosnia-Herzegovina. Projects pertain to economic security, energy safety, environmental quality, and energy security in said regions.

Chernobyl, Ukraine

Forty-two donor countries have partnered to safely shelter and deconstruct the world's largest nuclear disaster—the 1986 Chernobyl Nuclear Power Plant explosion near Pripyat, Ukraine.

Professor Jim Alleman stands at the edge of the Chernobyl 30-Kilometer Exclusion Zone in August 2014.
Photo courtesy of Jim Alleman

An enormous steel truss arch, reaching 360 feet high, 853 feet wide, and 541 feet long, will enclose the nuclear plant for the coming century. The arch and interim spent fuel storage facility on site is expected to be completed in November 2017.

Alleman contributes to an engineering oversight team that has monitored arch construction since September 2010. In particular, Alleman reviews monthly site monitoring reports as a USAID representative and joined a U.S. Department of State construction

contract review team based in Kiev, Ukraine. At the same time, Alleman also tracks the construction status of the interim spent fuel storage facility, where 20,000 used nuclear fuel assemblies will be cut, dried, and fitted into protected storage containers.

Ararat Region, Armenia

Alleman also advises on water conservation in Armenia's Ararat Valley, which lines the country's southern border with Turkey. In just the past few years, water consumption by Armenia's rapidly growing fish farming industry has created an unsustainable demand on their artesian groundwater source. "This pressurized, cold aquifer is clean and rich in oxygen, making it ideal for growing high-value trout and sturgeon, but the current water demand simply cannot be sustained," Alleman said.

USAID considers the innovative use of micro-hydro energy generation technology to tap into the artesian pressure head for local energy recovery. The energy solution addresses both assessment and technology strategies intended to advance sustainable public and private sector water abstraction. USAID's Global Development Lab identified the project as one of four global Mission Signature Effort studies under their Science, Technology, Innovation and Partnership (STIP) initiative platform.

Collectively, new strategies will be explored for reducing water demand while at the same time harvesting energy within Armenia's important fish farming industry. Alleman said that industrial fish business owners must consider three water issues: temperature, level of dissolved oxygen, and the level of ammonia released by fish. While the current ample water supply negates these issues, fish operation managers must consider these elements when conserving water. "We hope to provide fish business owners with the tools and concepts they can use on site to monitor water temperature, oxygen level, and ammonia," Alleman said. "If any of these elements are not controlled, most of the fish they want to grow will die."

Telenesti, Moldova

Moldova is a small, densely populated country landlocked between Ukraine and Romania. Moldova's decades-old municipal water/wastewater systems have suffered from "years of under-investment and lack of funds for systematic maintenance, resulting in significant, but unplanned disinvestments," according to a 2000 report generated by the Organization for Economic Cooperation and Development (OECD) and presented to the Moldovan government. The report also said that "raw water sources have become more polluted, ill-maintained water treatment plants are no longer able to meet water quality standards, and most wastewater treatment plants operate de facto with mechanical treatment only."

Alleman participates in the design evaluation of an upcoming wastewater treatment system in Telenesti, a city of 8,100 located within the Telenesti District of Moldova. He will evaluate reactor engineering features, expected influent and effluent qualities, and contractual guarantee criteria. According to USAID, the project has four goals: 1) improved management of public sewerage services provided to 11,300 inhabitants where the project is implemented; 2) improved conditions for investment in the region due to improved infrastructure; 3) reduced pollution in the Ciulucul and Raut rivers by stopping sewage drainage into the river, and 4) improved energy efficiency and reduced energy costs for the city. Telenesti's chief industry is agriculture, particularly wheat, oat, corn, sunflower, canola, grape, apple, peach, and plum.

Bosnia-Herzegovina

Bosnia-Herzegovina must achieve certain agricultural requirements, particularly increasing the production and efficiency of agricultural commerce and lowering costs to customers, in order to join the European Union (EU). In 2009, USAID and the Swedish International Development Cooperation Agency financed the Fostering Agricultural Markets Activity (FARMA) project to allow Bosnia-Herzegovina to work toward this goal.

The main goal of this project was expanding environmentally sustainable production and processes. Alleman consulted on an energy recovery method that processes dairy cattle manure into methane, a fuel used for farm operations. He advised during the last year of the project, which concluded in May 2015.

On June 1, 2015, the EU implemented a Stabilization and Association Agreement for Bosnia-Herzegovina, which moves the country one step closer to EU accession.

Putting Iowa State University in context

Alleman's 12-month appointment as a Jefferson Science Fellow expires in August 2015. He will continue to be a resource to the U.S. State Department and USAID for five more years. While Alleman's engineering efforts are apolitical, he recognizes that his work contributes to America's diplomatic efforts in eastern Europe. "These experiences have provided a unique opportunity to broaden and deepen my awareness of global policy issues relative to science and engineering," Alleman said.

Since 2004, USAID and the U.S. State Department have selected an annual group of top university researchers. Alleman is the second Iowa State faculty member to serve on the elite

Continue at **ALLEMAN** on p. 23

Professor Jim Alleman (back row, standing third from left) poses with U.S. Secretary of State John Kerry (back row, wearing blue tie), members of the U.S. Department of State staff, and other 2014-2015 Jefferson Science Fellows at the Harry S. Truman U.S. Department State Building in Washington, D.C., on May 20, 2015. *Photo courtesy of Jim Alleman*

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CCEE Alumni Reunions

19th Annual ConE Reunion, Oct. 9, 2014, Exile Brewing Company, Des Moines

CCEE Our Town Alumni Reception, Aug. 28, 2014, Shive-Hattery, West Des Moines

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research team. Max Rothschild – C.F. Curtiss Distinguished Professor of Agriculture and Life Sciences, M.E. Ensminger International Chair, and co-director of the Global Food Security Consortium – worked with USAID from 2011 to 2012. Alexander King, former director of The Ames Laboratory and current director of the Critical Materials Institute at The Ames Laboratory, was a Jefferson Science Fellow from 2005 to 2006 as a Purdue University faculty member.

Alleman has been a professor in the CCEE department since 2005. In 2005 he completed a Fulbright Research Scholar appointment in Xania, Greece. He served as the CCEE department chair from 2005 to 2011. Prior to Iowa State he held faculty appointments at Purdue University and the University of Maryland. He received his bachelor's and master's degrees in civil engineering from the University of Notre Dame and later earned a doctorate in environmental engineering from the same institution. Prior to pursuing his doctorate, Alleman served as a U.S. Army environmental engineer officer from 1972 to 1975.■

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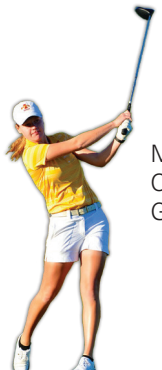

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