

Innovative



Inspired



Impactful



2019
The Year
In Review

The Ira A. Fulton Schools of Engineering at Arizona State University Offers



25 undergraduate programs and 44 graduate programs in its six schools:



School of Sustainable Engineering and the Built Environment

Ram Pendyala, Director



School of Computing, Informatics, and Decision Systems Engineering

Sandeep Gupta, Director



School Of Electrical, Computer and Energy Engineering

Stephen Phillips, Director



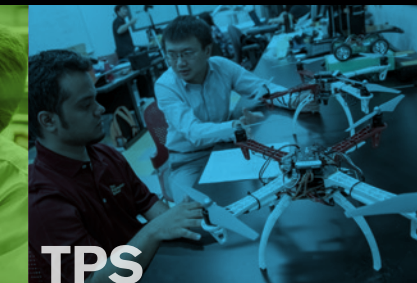
School for Engineering of Matter, Transport and Energy

Lenore Dai, Director



School of Biological and Health Systems Engineering

Marco Santello, Director



The Polytechnic School

Leila Ladani, Director

ASU named #1 in innovation for 5th consecutive year.

#1 in the U.S. for innovation

ASU ahead of Stanford and MIT

— U.S. News & World Report, 5 years, 2016–2020



Research Centers



National Science Foundation Engineering Research Centers (ERCs)

Center for Bio-mediated &

CBBG

Bio-inspired Geotechnics



NEWT

Center for Bio-mediated and Bio-inspired Geotechnics (CBBG) – Lead, ASU

Nanotechnology Enabled Water Treatment Systems (NEWT) – Partner, ASU

Additional Research Centers

- Arizona Center for Algae Technology and Innovation (AzCATI)
- Center for Environmental Security (CES)
- Center for Negative Carbon Emissions (CNCE)
- Center for Teaching Old Models New Tricks (U.S. Department of Transportation University Transportation Center) (TOMNET)
- Metis Center for Infrastructure and Sustainable Engineering
- National Center of Excellence on SMART Innovations
- Swette Center for Environmental Biotechnology
- Water & Environmental Technology Center (WET)



School of Sustainable Engineering and the Built Environment

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Tempe, AZ 85287-3005

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ssebe.engineering.asu.edu

Director

Ram Pendyala

Editor

Judy Reedy

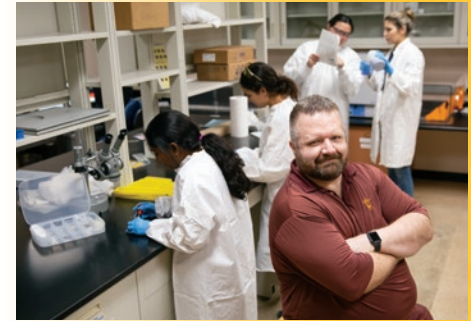
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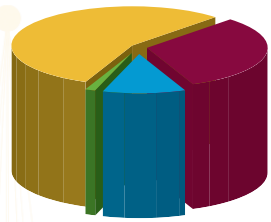
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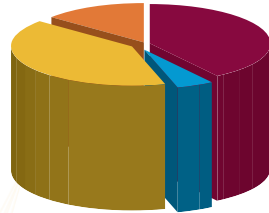
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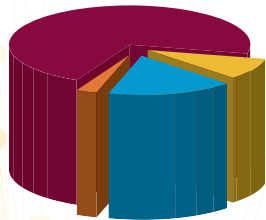
Undergraduate Degrees Conferred

- 5 Environmental
- 182 Civil
- 103 Construction
- 36 Construction Engineering



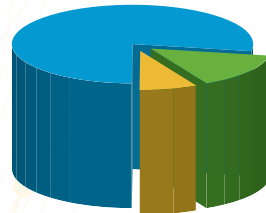
Graduate Degrees Conferred

- 56 Construction Masters
- 7 Construction PhD
- 56 Civil Masters
- 19 Civil PhD



Faculty

- 55 Tenured and Tenure-track Faculty
- 7 Full Time Lecturers
- 13 Research Faculty
- 2 Professor of Practice



Enrollment

- 1,374 Undergraduate
- 254 MS
- 136 PhD

SSEBE Research Expenditures:

\$18,390,954

National Academy of Engineering Members

Edward Kavazanjian, Jr.
Bruce Rittmann

ASCE Distinguished Members

G. Edward Gibson, Jr.
Edward Kavazanjian, Jr.
Bruce Rittmann

Total Scholarships and Fellowships Awarded 2019:

\$303,100

National Academy of Construction Members

Samuel T. Ariaratnam
William Badger (emeritus)
G. Edward Gibson, Jr.

Canadian Academy of Engineering Member

Samuel T. Ariaratnam

ASU Charter

ASU is a comprehensive **public research university**, measured not by whom it excludes, but by **whom it includes** and how they **succeed**; advancing **research and discovery** of public value; and assuming **fundamental responsibility** for the economic, social, cultural and overall health of the **communities** it serves.

Mission

Demonstrate **leadership** in academic excellence and accessibility

Establish **national standing** in academic quality and impact of colleges and schools in every field

Establish **ASU as a global center** for interdisciplinary research, discovery and development by 2020

Enhance our local impact and social **embeddedness**

Director's Letter



The School of Sustainable Engineering and the Built Environment (SSEBE) has always been known for its use-inspired, innovative, and impactful research and educational activities, and 2019 proved that to be the case once again. The school is at the forefront of conducting research and training the next generation workforce in principles of sustainable engineering and construction, urban resilience, the future of mobility, water purification and resource management, learning from nature to design durable infrastructure systems of tomorrow, and environmental stewardship.

Our school's highly rated programs in civil engineering, environmental engineering, construction management and technology, and construction engineering are producing graduates with the Fulton Difference, made possible by many experiential and undergraduate research opportunities provided by the Ira A. Fulton Schools of Engineering – which is the largest engineering college in the United States with more than 24,000 students.

With the concepts of *sustainable engineering and resilience of infrastructure systems* at the heart of all that it does, SSEBE is engaged in cutting-edge research to advance the human condition in communities around the world. With the tremendous support of outstanding staff and many industry and agency partners and donors, faculty and students are engaged in research and discovery to advance automated transportation systems, understand the connection between gut microbiomes and autism, develop sustainable and efficient construction practices, and build robots that are inspired by nature. Using advanced technologies to purify water, new computational models to forecast and manage water resources, novel materials to capture carbon and cool our environment, and sensors and drones to map and assess our infrastructure systems, SSEBE is leading the way in building sustainable and resilient communities of the future.

Faculty in SSEBE are being recognized for their many accomplishments:

Westerhoff received the **2019 Clarke Prize** for contributions to water science and technology; **Conroy-Ben** received the **Technical Excellence Award** from the American Indian Science and Engineering Society; **Muenich** was selected to participate in the **25th Frontiers in Engineering Symposium**; **Garcia** won a **NSF CAREER Award**; **Ariaratnam** was inducted into the **National Academy of Construction**; and the list goes on.

And we added more to the ranks of our faculty, welcoming the following new faculty members: Tianfang Xu and Ruijie Zeng in hydrosystems, Barry Kutz in construction, and Hasan Ozer in pavements and materials.

As we look to the future, we are excited by the opportunities that lie ahead. ASU has just launched the Global Futures Laboratory and is building a new Interdisciplinary Science and Technology Building (ISTB7) that will serve as the nerve center for transdisciplinary work in sustainability, resilience, and future of society. This initiative, among many others, will provide our students and faculty new opportunities to learn, engage, thrive, and make a difference. We hope you will connect with us and join us on this journey to a more sustainable, healthy, prosperous, and resilient future.



Epilogue: We are in the midst of a pandemic as this report goes to print. Our faculty, staff, and students have performed admirably in the wake of the COVID-19 outbreak, transitioning to online learning and virtual delivery of our curriculum, engaging deeply in research efforts to support workers on the frontlines and the fight against COVID-19 and providing thought leadership on how communities and countries can be better prepared to handle the next severely disruptive event. Through it all, the institution remains committed to its mission of access and has made the full complement of its digital learning resources and curricula available to learners of all ages through asuforyou.asu.edu. Please take a look and explore how ASU can help advance your education and career. Together, we will emerge stronger.

Ram M. Pendyala, PhD
Professor and Director
School of Sustainable Engineering
and the Built Environment

Civil, Environmental, and Sustainable Engineering

Keith D. Hjelmstad, Ph.D.

President's Professor

Civil, Environmental, and Sustainable Engineering Program Chair

As one of the largest civil engineering programs in the country, we continue to be a leader in the production of outstanding civil engineers as we educate the people who will be responsible for the future of our built environment. The challenges of operating this large a program are many but the collaborations among our students, faculty, staff, and external partners is a thing of beauty.

Over the past couple of years, we have nearly doubled the number of industry partners committed to *Friends of Civil and Environmental Engineering* (FOCEE). This group provides a vital link between our program and the industry that hires our students. FOCEE has four committees: Education, Partnering, Internship and Employment, and Membership and Resources. Each committee supports the overall mission of FOCEE in important ways to further the aim of being the organization of choice for civil and environmental engineering firms in the region and beyond. We continue to appreciate the commitment of these industry leaders to our program.

Our *Teaching Community of Practice* continues to be a great resource for our faculty as they work to make their courses great learning experiences for our students. This year we have extended an invitation to all interested faculty in the Fulton Schools of Engineering at ASU. We are proud to lead the way in the effort to make our learning environments more student centered.

Each year we find new ways to bring significant impact to the world around us. I am confident that the coming year will be another great one!



Construction Engineering

Samuel T. Ariaratnam, Ph.D., P.E., P.Eng., F.ASCE, FCAE, NAC

Professor - Construction Engineering Program Chair

The Construction Engineering Program continues to attract some of the brightest students who are interested in a degree program that combines both engineering and construction. The ability to experience classes in Civil Engineering and Construction Management provide our students with the foundation to both design and manage construction projects. Our program continues to be successful in sending our graduates out into industry both domestically and internationally. A strong economy in the construction industry sector has resulted in our senior undergraduates and graduate students receiving excellent job offers once again this past year. Furthermore, our graduates possess strong analytical and interpersonal skills that are vital for success in today's workplace.

Our program continues to emphasize planning, design, and management for the construction of infrastructure including bridges, airports, pipelines, and other systems that are vital to our nation's economy. Training and graduating high-quality Construction Engineers is important as we strive to address domestic and global infrastructure needs to keep up with aging systems and rapidly increasing populations.

I have been actively recruiting students, while also promoting ASU, SSEBE and our Construction Engineering Program. Currently, the majority of our SSEBE international graduate students come from India and China. These two countries continue to be a major focus in our recruiting and marketing efforts as we continue to grow our enrollment.

With every graduating class, Construction Engineering at ASU becomes more recognized on a national and international stage. My goal is to continue to maintain a strong educational curriculum, work towards increasing enrollment to meet industry demands, and further cultivate fundraising efforts to support innovative program initiatives. Thank you for all of your support!





Environmental Engineering

Treavor H. Boyer, PhD

Associate Professor • Environmental Engineering Program Chair

The Environmental Engineering (EVE) undergraduate program is in its 3rd year with approximately 150 students enrolled in the program. The EVE program offers a Bachelor of Science in Engineering degree (BSE) in Environmental Engineering and will seek ABET accreditation during the next ABET visit to ASU in Fall 2021.

The educational objectives of the EVE program are to prepare its graduates so that three to five years after graduation they can:

- 1) Comprehend the scope of complex environmental problems and participate in developing solutions;
- 2) Establish a career based on technical competence, integrity, and passion;
- 3) Incorporate industry or educational experiences to advance the field and contribute to the well-being of society and the environment; and
- 4) Work cooperatively and effectively with culturally diverse colleagues.

The main highlight for the current 2019–2020 academic year is recognizing the first graduates from EVE. Five students graduated in December 2019 and 13 students are expected to graduate in May 2020. Moving forward, the EVE program should graduate 25 to 50 students per year, which will make it one of the largest Environmental Engineering programs in the US. Another important highlight is the EVE program is ranked #14 (#10 among public universities) in the 2020 Best Undergraduate Environmental Engineering Programs by US News & World Report, which is a reflection of the excellent Environmental Engineering faculty and students.

Finally, the EVE program is moving forward with a new Master of Science in Environmental Engineering, which is expected to be available as early as August 2020. I look forward to updating you on the progress and accomplishments of the EVE program in the coming years.



Graduate Program

Peter Fox, PhD, PE

Professor • Graduate Program Chair

The School of Sustainable Engineering and the Built Environment graduate degree programs encompass Civil, Environmental and Sustainable Engineering (CESE), Construction Management (CON) and Construction Engineering (Con Eng) - CESE MS, CESE PhD, CON MS, CON PhD and Con Eng MSE.

The high quality of our graduate programs continues as reflected by our US News and World Report rankings. Please spread the word about our graduate programs which are all ranked in the top 20 and some are even top 10 for public universities. This is not only an accomplishment of our current faculty and graduate students, but also the alumni of our graduate programs that have been making an impact on our world.

We continue to have more than 100 PhD students and our PhD student enrollment is growing as a consequence of our success at obtaining research centers and funding. We have continued to increase the number of enrolled under-represented groups and our goal to make our program more diverse and inclusive is being embraced by our faculty and research sponsors.

We will have a new graduate MS degree program in Environmental Engineering starting in the fall of 2020 to complement our growing undergraduate Environmental Engineering (EVE) degree program. Our students are the key reason that we continue to improve and this year's group of graduate student applicants is no exception. Former students should be proud of their accomplishments as they have helped build our graduate degree programs into their current successful state.



Del E. Webb School of Construction

Anthony J. Lamanna, PhD, PE, F.ACI, F.ASCE
Associate Professor • Del E. Webb School of Construction Programs Chair

The Del E. Webb School of Construction programs are growing and evolving to meet the needs of our students and industry employers.

All programs in the Del E. Webb School of Construction are now categorized as STEM. We've seen a significant enrollment increase in our MS program from international students and have seen our veteran undergraduate students receive more GI Bill funding because of the change.

Our students continue to compete in student competitions and attend national industry events. If you have an event and would like construction students or faculty to attend, please let us know!

We continue to place all of our graduates, each semester. Judging from the multiple offers each graduate receives, we could easily place more into the workforce. Consider assisting us in recruiting more K-12 students into the construction industry (and to ASU); we can provide brochures and handouts to your employees doing outreach at middle and high schools. More students entering the field mean more students entering our construction programs, which means more graduates entering the workforce.

New Faculty Join SSEBE



Mackenzie Boyer

Lecturer
PhD, University of Florida
Joined SSEBE in January 2020
Expertise: Water Conservation



Hasan Ozer

Associate Professor
PhD, University of Illinois, Urbana-Champaign
Joined SSEBE in August 2019
Expertise: Pavement materials characterization, pavement design analysis, development of rehabilitation and preservation programs.



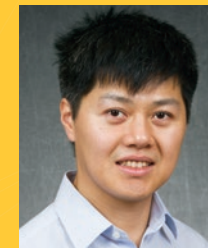
Tianfang Xu

Assistant Professor
PhD, University of Illinois, Urbana-Champaign
Joined SSEBE in August 2019
Expertise: Numerical simulation of groundwater flow and solute transport, uncertainty quantification, and applications of machine learning in hydrology.



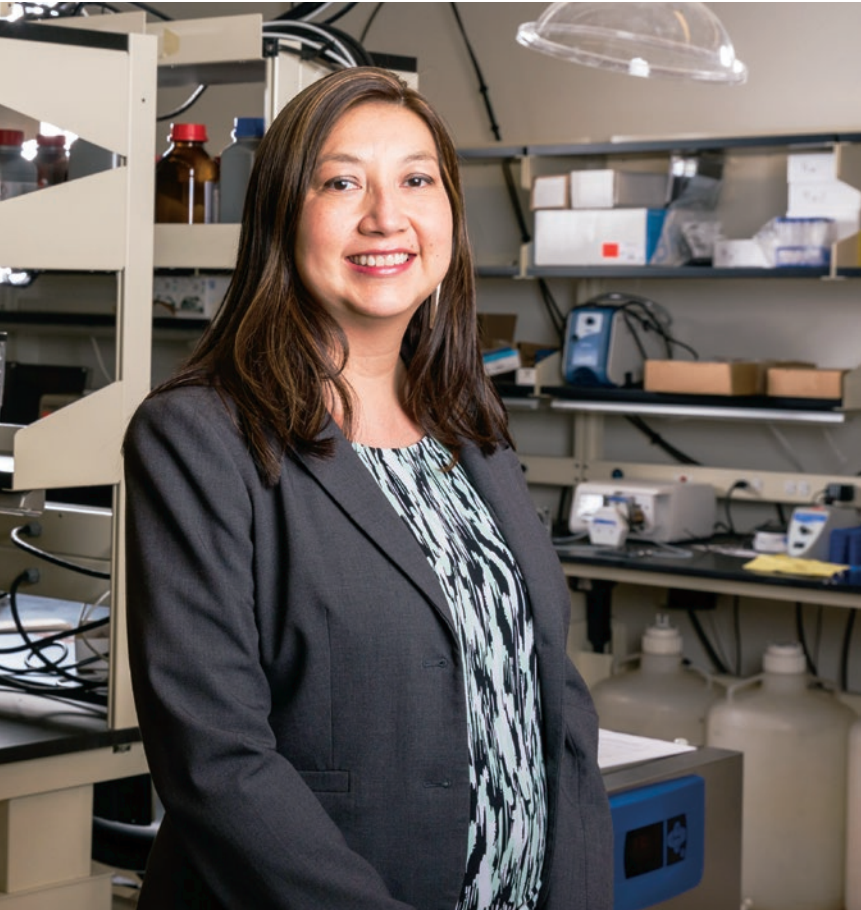
Barry Kutz

Lecturer
MS, Arizona State University
Joined SSEBE in August 2019
Expertise: 35-year career in the construction industry. Sr. Vice President Preconstruction for McCarthy Building Company.



Ruijie Zeng

Assistant Professor
PhD, University of Illinois, Urbana-Champaign
Joined SSEBE in January 2020
Expertise: Improving the mechanistic understanding, predictable capability, and sustainable management of watersheds as coupled nature-human systems.



Otakuye Conroy-Ben researches wastewater pollution and their effects on local Native American communities. Photographer: Deanna Dent

Assessing the quality of water to improve the quality of life

Research that is helping regional communities solve their wastewater pollution problems has earned **Otakuye Conroy-Ben a Technical Excellence Award from the American Indian Science and Engineering Society.**

The award is presented to an indigenous professional who has made contributions to the STEM fields — science, technology, engineering and math — by developing a product or a solution and is actively involved in the Native American community.

Conroy-Ben, an assistant professor of environmental engineering, is one of five 2019 recipients of the AISES Professional of the Year Award presented at the organization's national conference in Milwaukee, Wisconsin, October 10-12.

Conroy-Ben, who is of Oglala Lakota descent, got involved with AISES as an undergraduate student, and has increased her involvement over the years. She was a recipient of an AISES graduate student research award and later joined the organization's board of directors. She is currently involved in the mentorship program.

"This is an organization that's near and dear to my heart and so I was thrilled to be recognized for my hard work and my years of dedication to the organization," Conroy-Ben said.

Since she joined the Fulton Schools in 2016, she has continued to be active in the organization as an advisor to the ASU chapter of AISES.

Now a tenure-track faculty member, Conroy-Ben studies environmental endocrine disruption and antibiotic-resistant genes that arise from wastewater, as well as the transport of microbes in water. Her work on the biological effects of polluted water has direct applications to the challenges facing the tribal communities she works with.

As an engineer, Conroy-Ben has been focusing on improving the lives of people in local tribal communities. Her research lab, the Emerging Contaminants Laboratory, focuses on wastewater contaminants and epidemiology. Beyond laboratory research, she also works directly with members of the tribal communities to better understand their needs and to provide her expertise in water quality.

Frontier of Engineering sparks knowledge

Rebecca Muenich was selected along with approximately 100 of the nation's outstanding early-career engineers to attend the **National Academy of Engineering's 25th Annual U.S. Frontiers of Engineering Symposium**. This year's symposium was hosted by The Boeing Company in North Charleston, South Carolina to discuss the latest developments in engineering.

The focus was on progress in four areas: advanced manufacturing in the age of digital transformation, engineering the genome, the technology and ethics of self-driving cars, and blockchain technology.

"The FOE has different themes each year, but participants are not limited to those themes," says Muenich. "In fact, one purpose for the FOE is for engineers to learn about the latest technologies and ideas in fields other than their own to help facilitate convergent and new knowledge."

Muenich, who is an assistant professor of civil, environmental and sustainable engineering focuses on analyzing and modeling trade-offs in the food-energy-water nexus under varying land use, land management and climate scenarios. Her work does not fit neatly into any of the symposium's four key areas.

"I was surprised at how interesting and informative it was to hear people speaking on engineering topics totally outside of my discipline," says Muenich. "Despite the differences, there were a lot of similarities between my work and some of the work presented."

She also found talks on engineering the genome especially intriguing and saw the potential for productive research collaborations in the future.

Muenich is leading a project funded by the U.S. Department of Agriculture aimed at increasing ASU's capacity to perform agricultural research and education. The effort is focused on identifying opportunities for agriculture in the desert Southwest, where water is scarce and land development pressures are high.



Rebecca Muenich in front of a Boeing 787 Dreamliner at Boeing South Carolina discovered similarities in the work presented at the U.S. Frontiers of Engineering symposium to her own work.

Rebecca Muenich

The PENTA Building Group professorship will boost students' career opportunities through stronger alumni and industry connections

Jim Ernzen found his professional passion more than 23 years ago when he began teaching construction management at Arizona State University.

What he realized even then is how much learning students need beyond classroom instruction to get a complete education and a solid jump-start on their careers.

Especially vital to students' success, Ernzen says, are mentorships, internships to get first-hand job experience, research training and connections to leaders in the industry.

Personal commitment and financial backing by benefactors outside the university are critical to providing students those opportunities. But attracting such support requires focused relationship-building and fostering the strong sense of institutional purpose to sustain the allegiance of those supporters.

"You need to deeply engage your professional community. You need to strengthen generational connections with alumni," Ernzen says. "That's how to open a wider path for our students to get the kind of education we want for them."

So now, in addition to his teaching, Ernzen, an associate professor, will lead the charge to achieve these goals as the first **PENTA Building Group Professor for Construction** in the **Del E. Webb School of Construction**.

With The PENTA Building Group endowed professorship, Ernzen joins a distinguished group of Del E. Webb School faculty members. **Anthony Lamanna** is the Sundt Professor of Alternative Delivery Methods & Sustainable Development and is the Sunstate Chair of Construction and Engineering.

These endowed positions are building the foundations on which the school can achieve increasingly robust educational excellence and further establish a legacy of impact on the construction industry.



Jim Ernzen



Paul Westerhoff

ASU professor Paul Westerhoff selected for 2019 Clarke Prize

Arizona State University Regents Professor **Paul Westerhoff** has been named the **2019 Clarke Prize Laureate** for outstanding achievement in water science and technology by the **National Water Research Institute**. Westerhoff will receive a medal and a \$50,000 prize.

The Athalie Richardson Irvine Clarke Prize is one of the most prestigious awards in the world presented to active researchers and practitioners making significant advances in water technology. Clarke Prize Laureates demonstrate excellence through their continuous contributions to the body of knowledge related to protecting, maintaining, treating and reclaiming water resources.

"It is an incredible honor to be named among such an accomplished group of scientists and engineers," says Westerhoff, who is a professor in the **School of Sustainable Engineering and the Built Environment**, the Fulton Chair of Environmental Engineering in the Ira A. Fulton Schools of Engineering and a senior sustainability scientist at the Julie Ann Wrigley Global Institute of Sustainability. "This would not be possible without great students, awesome collaborators and the support of a great university."

While much of Westerhoff's work has focused on the risks nanomaterials can pose to contaminating rivers,

lakes, streams and water treatment and delivery systems, he and his team are now exploring ways scientists can use nanotechnology to safely solve previously intractable water problems. He will also examine how machine learning and artificial intelligence can be applied to water quality datasets to help resolve global water.

Westerhoff currently directs the EPA Center for the Life Cycle of Nanomaterials and serves as deputy director of the NSF Nanosystems Engineering Research Center for **Nanotechnology-Enabled Water Treatment**. NEWT is developing technologies to provide sustainable water treatment systems for drinking water and industrial wastewaters.

Universities worldwide recognize their brightest and most successful alumni with prestigious academic awards

Rosa Krajmalnik-Brown, a professor in civil and environmental engineering in the **School of Sustainable Engineering and the Built Environment** and a faculty member in Arizona State University's **Biodesign Swette Center for Environmental Biotechnology** and an associate faculty member in the **Biodesign Center for Fundamental and Applied Microbiomics**, received the **Distinguished Alumni award** from her alma mater, the Universidad Autonoma Metropolitana, Iztapalapa (UAM) in Mexico, honoring her work as a researcher.

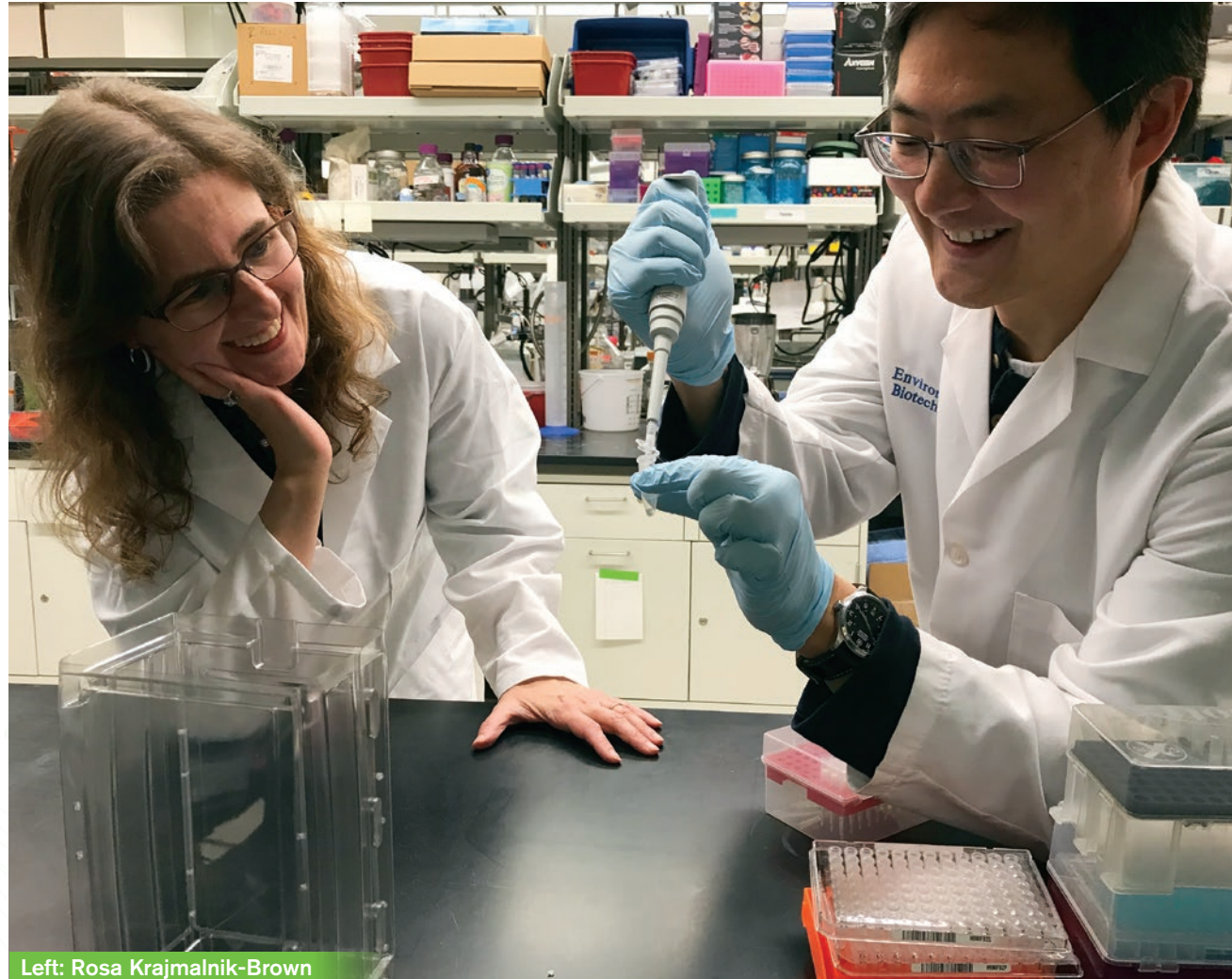
"This award means a lot to me," Krajmalnik-Brown said. "I am happy that professors at my previous institution are aware of my work, and I am really happy to be giving back to society through my teaching and research accomplishments."

"I hope this recognition motivates young women to consider STEM careers, follow their dreams, and contribute to society," Krajmalnik-Brown said.

Each year, the university awards various alumni from its three campuses with the Distinguished Alumni award. Nominators look for candidates who "stand out with their academic, cultural and social accomplishments" or who contribute "to the development and growth of their institution or country."

Although she is widely recognized for her work with microbiology and autism, her research also focuses on microbial ecology in the context of bioremediation and bioenergy production. Bioremediation involves the introduction of microorganisms to an environment to break down or consume polluted or contaminated materials, restoring the health of the environment.

In a similar show of recognition, Krajmalnik-Brown received an NSF CAREER award in 2011, and she was selected as a leader in the "40 under 40" list for Phoenix.



Garcia receives NSF CAREER Award



A canal brings water through the Phoenix metropolitan area. As part of a National Science Foundation Faculty Early Career Development (CAREER) Award project, Margaret Garcia, an assistant professor of civil and environmental engineering, is developing a set of models to help policymakers render informed decisions about water use and infrastructure in regional water supply networks.



Rolf Halden's organization is one of three environment-focused awardees and seven additional social innovation awardees, chosen from a field of 1,354 entries from all 50 states, to receive **The J.M.K. Innovation Prize**. The prize honors "organizations tackling America's most pressing challenges through social innovation; pilot projects, new organizations or nascent initiatives that involve a certain amount of measured risk, but which may ultimately lead to large-scale, transformative results."



The National Science Foundation grants the **Faculty Early Career Development Program (CAREER) Award** to early-career faculty members who have the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization.

Margaret Garcia, an assistant professor of civil and environmental engineering, wants to make water use trade-offs more transparent for resource system decision-makers.

A full understanding of the risks and advantages of decisions about local water network infrastructure is possible only when analyzing them at a larger scale. This isn't easy to do, as it requires a highly multidisciplinary set of talents, including expertise in hydrological patterns spanning time and space, and knowledge of water infrastructure operations and government workings at multiple levels.

As part of a five-year National Science Foundation Faculty Early Career Development Program (CAREER) Award project, Garcia is combining methods and theories from multiple fields to develop a set of models to help policymakers make informed decisions about water.



Samuel Ariaratnam, professor of construction engineering and management and program chair in the Del E. Webb School of Construction, is one of 39 new inductees into the **U.S. National Academy of Construction**.

The academy recognized him for "outstanding contributions in research and education in the area of trenchless and underground construction."

Ariaratnam will join 287 current members who have received this high professional honor for engineers and constructors from every segment of the industry. Ariaratnam, was also elected to the **Canadian Academy of Engineering in 2018**.

Ariaratnam also received the **2019 Excellence in Pipelines Award** from the Utility Engineering & Surveying Institute of the American Society of Civil Engineers for his past and continued contributions and leadership to the ASCE and in particular the Pipelines Division.

Faculty Honors and Awards



Enrique R. Vivoni, professor with the School of Earth and Space Exploration and the School of Sustainable Engineering and the Built Environment was named **Associate Dean of Graduate Initiatives in the Graduate College**. As the associate dean, Vivoni will lead international initiatives at the Graduate College to enhance ASU's global presence, further develop the Postdoctoral Affairs Office and broaden knowledge mobilization initiatives.



Tony Lamanna, associate professor in the School of Sustainable Engineering and the Built Environment and Del E. Webb School of Construction Programs Chair, received the **ASCE Editor's Choice Award** for his work: "Studying the abandoned hole effect on ultimate strength of mechanical anchors in tension."



Leon van Paassen, associate professor, was invited to present at **The 6th International LafargeHolcim Forum for Sustainable Construction**, which was hosted by the American University in Cairo, Egypt, from April 4 – 6, 2019. Van Paassen will present and participate in a workshop entitled "Changing paradigms: Materials for a world not yet built", that examine various new models for creating a sustainably built human environment that is both fully recyclable and constructed from materials that are grown or naturally transformed so as not to damage the non-human environments of the world.



Left to right: Elham Fini, Francois Perreault, Ahmed Aljanabi

Leaders in science, engineering and medicine from the United States and the Middle East gather annually for the **Arab-American Frontiers of Science, Engineering, and Medicine symposium** to discuss scientific advances and research advances.

Assistant professor **Francois Perreault** and associate professor **Elham Fini**, and **Ahmed Aljanabi**, a recent doctoral graduate in environmental engineering, were invited to attend the seventh annual symposium in Cairo, Egypt.



Anca Delgado, assistant professor, research paper, titled "Coupling Bioflocculation of *Dehalococcoides mccartyi* to HighRate Reductive Dehalogenation of Chlorinated Ethenes" has been selected for the **AZ Water 2019 Quentin Mees Research award**. This award celebrates academic achievements by recognizing authors of exceptional research papers and brings research in water-related technology to the level of practical use.

2019 Scholarships and Fellowships

Scholarships and Fellowships Recipients

AGC Construction ASU Student Scholarship	Jonathan Herbert, Franklin Lee, Allen Wells, Michael Ballenger, Amber Nguyen, Ryan Young	Del E. Webb Foundation Graduate Scholarship	Bernard Belloff, Mennatallah Hammam, Kumar Rajendra Madan, Patrick Vizard, Yanyu Wang
Amy and Kent Geiser Honorary Scholarship	Julia Zimmerman	Del E. Webb Foundation Finance and Accounting Scholarship	William Hannen, Kenneth Reyes
Andrew Hanneman Scholarship	Jesus Frausto, Julio Galaviz	Del E. Webb Foundation Undergraduate Student Scholarship	Alexander Jablon, Jett Larson, Mario Renteria, Tanner Whitsell, Ashley Colaizzi
Associated Minority Contractors Association NAMU Scholarship	Julian Cervantes, Margo Saucedo	Del E. Webb Foundation Women in Construction Scholarship	Margo Saucedo
Bechtel Construction Scholarship	James Haden, Thomas Holt	Del E. Webb Memorial Scholarship	Austin Burke, Lucas Preston Ellett, Treavor Keene, Brian Mangan
Ben C. Griggs Memorial Scholarship	Derek Salas	Desert Star Construction Excellence in Luxury Home Building Scholarship	Treavor Williams
Betty Hum Graduate Assistantship	Ananya Chada	DeTommaso Endowment (NAMU)	Macy Canete, Robert Heaton
Briston Veteran Advancement Scholarship	Victor Evans	Dr. Matthew W. Witczak Scholarship	Carlos Javier Obando Gamboa, Daniel Oldham, Xiao Zhang, Jolina Karam, Farah Al-Kerwy
Carl L. and Jean Wolcott Meng Memorial Scholarship	Alia Raderstorf	Dr. Sandra L. Weber Memorial Scholarship	Arely Lopez Cortez
CEMEX Scholarship for Advancing Women in Construction	Marisol Magana	Edd and Gail Gibson M&G Leaders Scholarship	Jeffrey Hubler
Central Arizona Society for Healthcare	Derek Hillestad, Paul Mathews	Elyse and Paul Johnson Maroon & Gold Leaders Scholarship (NAMU)	Matthew Bodjanac, Madison Torrey
CFMA Joseph J. Quigley Memorial Scholarship	Ross Yalch	Engineering Graduate Fellowship	Rahul Rai, Kiarash Ranjbari, Harsha Ravi, Brice Belling, Ananya Chada, Panneerselvam Errappa Kanniappan, Mennatallah Hammam, Paul Mathews, Gustavo Muro, Patrick Vizard
Charles and Nancy O'Bannon Scholarship - Civil	Angela Egan	Eric and Kristina Petrie Scholarship	Connor Elmasry, Christian Ordaz
Charles and Nancy O'Bannon Scholarship - Construction	Logan Bashford	Ferdinand A. Stanchi Fellowship	Alysha Helmrich, Brice Belling
Construction in Indian Country Native American Scholarship	Uriel Duncan, Braxton Gries, Darnell Hatathlie, Dzani Little, Shandiin Yessilth	FNF Construction, Inc. Scholarship	Alexander Terberg, Ronalso Zuniga Hernandez
D.L. Withers Construction Scholarship	Nathan Nulliner		
Daniel and Katherine Mardian Scholarship	Macy Canete		
Dave Clifton Memorial and ASPE Chapter 6 Scholarship	Uriel Carranza, Valentino Nunez		

2019 Scholarships and Fellowships

Frank M. Chandler Memorial Scholarship	Jaron Barnes, Conner Ottinger	R. Glen Schoeffler Scholarship	Parker Webber
James Fann Memorial Scholarship	Kristin Pond, Tanner Spohn	Richard E. Mettler Residential Scholarship	Bernard Belloff, Jerry Sorenson
James Grose New American University Scholarship (NAMU)	Spencer Kolesar, Jessica Miranda Molina, Valentino Nunez	Robert H. Johnson Undergraduate Scholarship	Katherine Anderson, Ledg Downs, Robin Lifshitz, Brian Smith, Jack Symmes
Jan Bennett Endowed Scholarship	Jacob Hedeem, Varun Mohan	Robert J. Wheeler Memorial Scholarship	Cannon Carson, Patrick Gallagher, Nathan Hopkins, Caleb Johnson, Miguel Mancinas, Giovanni Orlando, Maxwell Ruhnke
Jan Tuma Memorial Scholarship	Susan Cihelka	Rod J. McMullin SRP Water Resource Scholarship	Charles Cederstrom, Jeremy Guerrero
Jason McElroy Memorial Scholarship	Eric Moser	Ron Pratte Scholarship	Jared Hogie
Jim Bebout Scholarship	Robert Heaton	Samuel F. Kitchell Undergraduate Leadership Award	Jeffrey Hardison, Josh Burley
John G. Colton Construction Study Fund	Spencer Kolesar, Omar Albor Castillo	Stephen and Therese Pisarcik Scholarship	Jeffrey Hubler
Kavazanjian Fellowship	Robin Cheng Ng	Suntec Concrete Scholarship	Ryan Fischer, Abrahan Garibay, Stephen Hite
LaVeda Huitt Carpenter Native American Scholarship Initiative	Shandiin Yessilth	Team DSC Scholarship for Excellence in Craftsmanship	Fernando Escobar
LC Jacobson Graduate Fellowship	Brianne Arviso, Brice Belling, Spencer Hawkins, Hannah Patterson	Terry Bourland Memorial NAMU Scholarship	Jesus Frausto, Jack Symmes, Ariana Fong, Cole Maurer
Martin H. Rosness Memorial Scholarship	Christian Jimmie	The Ames Family Scholarship	Alexsundra Captan
Marvin Sheldon Memorial Scholarship	Ashlyn Schroff	The Beavers Heavy Construction Scholarship	Nathan Eldodt, Jesus Godoy, Brandon Harrison, Joel Ortiz, Aaron Sneed, Ryan Laverdiere
Microsoft Social Innovation Scholarship	Hanisha Chava, Kundana Gaddam	UEB Advancing Women in Construction Scholarship	Carly Mcneill, Alexis Torres Osuna, Brenna Windish
Mike Kolling Memorial Scholarship-Civil Engineering	Nathaniel Davis	Westwood Scholars	Nathaniel David, Crystian Rodriguez
Mike Kolling Memorial Scholarship-Construction	Jon Billings	William A. Pulice Scholarship Endowment	Kevin Perreault
Opus West Construction Corp. Undergraduate Scholarship	Eder Estrada		
Paragon Structural Design, Inc. Scholarship	Nicholas Rounick		
PENTA Building Group Scholarship	Stettler Anderson, Tyler Jacob		
Phoenix/Scottsdale Groundwater Contamination Scholarship for Environmental Science	Richard Kupferer, Juliana Vazquez, LouAnne Wegrzyniak		
Pulte Home Corporation Scholarship	Clay Bornowski		

Doctoral Graduates in 2019

Ramadan Salim

Relationship between Asphalt Binder Parameters and the Linear Viscoelastic and the Failure Properties of Asphalt Mixture
Chairs: Kamil Kaloush and Benjamin Underwood

Ahmed Ahmed

Optimization Models for Iraq's Water Allocation System
Chairs: Larry Mays and Peter Fox

Dean Papajohn

Contract Administration Functions and Tools in Design-Build and Construction Manager/General Contractor Project Delivery in U.S. Highway Construction
Chair: Mounir El Asmar

Hasan Albo-Salih

An Optimization-Simulation Two-Dimensional Model for Optimal Operating of River-Reservoirs Systems under Flooding Conditions in Real-Time
Chair: Larry Mays

Jeffrey Vann

A Soil Suction-Oedometer Method and Design Soil Suction Profile Recommendations for Estimation of Volume Change of Expansive Soils
Chair: Sandra Houston

Puneet Nandkumar Khatavkar

Water Infrastructure Modeling and Control under Extreme Drought and Limited Power Availability Conditions
Chair: Larry Mays

Pengfei Zhang

Life-Cycle-Cost Effective Analysis of using Low Impact Development Compared to the Traditional Drainage System
Chair: Samuel Ariaratnam

Jad Chalhoub

Benefits of Using Augmented Reality in Planning, Construction and Post-Construction Phases in Specialty Contracting
Chair: Steven Ayer

Mohammad Hossein

Khoshchehreh Jamali
Special Interpersonal Relationships in Project-Based Organizations
Chair: Avi Wiesel

Abdulrahman Yussef

Assessing the Maturity and Accuracy of Front End Engineering Design (FEED) for Large Industrial Projects
Chairs: G. Edward Gibson, Jr. and Mounir El Asmar

Michael Beauregard

Maintaining Performance: Evidence-Based Educational Facility Management through a Decision-Support Tool Leveraging Prior Empirical Research
Chair: Steven Ayer

Nguyen Le

Identification of Risk Factors, Success Practices, and Feasibility of the Best Value Approach Application to Improve Construction Performance in Vietnam and other Developing Countries
Chair: Oswald Chong

Richard Standage

Exploratory Study of Distortionary Corrective Modification of Concrete Contraction Joints through Infused Silica-Based Compounds
Chair: James Erzen

Jun Xiao

Congestion Mitigation for Planned Special Events: Parking, Ridesharing and Network Configuration
Chair: Yingyan Lou

Chenghao Wang

Participatory Roles of Urban Trees in Regulating Environmental Quality
Chair: Zhihua Wang

Daehyun Kim

Pore-scale Study of Bio-mineral and Bio-gas Formations in Porous Media
Chair: Leon van Paassen

Douglas Rice

Passive and Active Surfaces to Reduce Fouling of Membranes and Membrane Modules
Chair: Francois Perreault

Yuanzhe Liu

*Understanding Electro-Selective Fermentation of *Scenedesmus Acutus* and its Effect on Lipids Extraction and Biohydrogenation*
Chair: Bruce Rittmann

Lucien El Asmar

Assessing Experiential Learning in Construction Education by Modeling Student Performance
Chair: Anthony Lamanna

SSEBE Outstanding Senior Award

Aidan Bjelland

Cory Kehoe

Jonathan Lyle

Hilary Merline

Suzanne Schadel

Colin Smith

Shandiin Yessilth



Aidan Bjelland



Jonathan Lyle



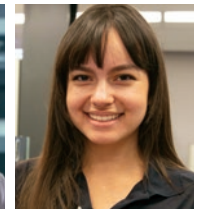
Hilary Merline



Suzanne Schadel



Colin Smith



Emily Alcazar

SSEBE Leadership and Service Award

Emily Alcazar

Jacob Ellis

Connor Fegard

Kade Moore

Mark Natale

Dinesh Palety

Noah Rudko

SSEBE 4.0 Awards

Ibrahim Al Tarouti

Aidan Bjelland

Kade Moore

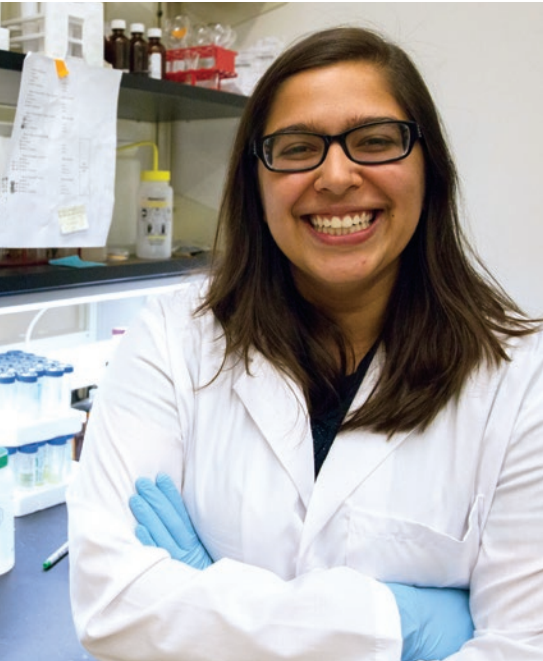
Jack Symmes

Raymundo Torres

Osuna

Noah Rudko

Dean's Dissertation Award, Fall 2019



Arizona State University first caught **Anjali Mulchandani's** attention when she was an undergraduate at UCLA and attended a seminar by ASU Regents Professor Bruce Rittman about his work in the Swette Center for Environmental Biotechnology at ASU's Biodesign Institute.

When she visited ASU's Tempe campus, Mulchandani said, she could immediately see how the goals set forth in ASU's charter mirrored her personal values.

"The university's missions of access, excellence, impact and innovation create an environment where students, faculty and key stakeholders all collaborate to solve the grand challenges facing our world today."

Throughout her academic career, Mulchandani explored a variety of fields, beginning undergraduate studies in microbiology, later switching to environmental engineering and eventually combining the fields to conduct research in environmental microbiology. Inspired by Rittman's work, when she arrived in the Fulton Schools, she was looking to do research on sustainable water treatment technologies.

"I spent my first two years at ASU studying sustainable management strategies for sewage sludge to recover valuable

resources like energy, metals like gold and nutrients," she said. "After defending my master's thesis, I was looking to move more into drinking water. I saw how much waste we produce in the drinking and wastewater processes, and was inspired to work on developing technology that produced drinking water with very minimal waste."

Mulchandani decided to pursue a graduate degree in environmental engineering and began conducting research with Regents Professor Paul Westerhoff's lab team.

Her dissertation work focused on using technology that produces water from the air's moisture to develop a decentralized drinking water supply for underserved communities experiencing a water crisis.

"By capturing the water out of the air, we do not produce any waste products and have a very clean, sustainable supply of water," Mulchandani said. "Atmospheric water capture has the potential to really be a game-changer for both decentralized drinking and industrial water supplies."

Mulchandani received funding from the National Science Foundation "to do whatever she wanted," said Westerhoff, her advisor. "She definitely thrived with that kind of independence. Some people take things on just to do them, but she really has the passion to follow through and do an amazing job on everything she takes on."

Following graduation, Mulchandani hopes to become a university professor and continue to make an impact through teaching and environmental research.



Twelve transportation students from eleven countries joined an exclusive orientation and leadership program reserved for **IRF Fellows** in Washington DC where they enhanced their skills and met industry leaders. **Ramadan Salim** and **Seng Hkawn N-Sang**, PhD students in the School of Sustainable Engineering and the Built Environment were among the 12 participants in the **2019 IRF Road Scholar Program**.



Lorraine Miralha Marins da Silva was selected as a recipient of an **AAUW International Doctoral Fellowship** in the amount of \$20,000 for the 2019-20 award year. Founded in 1881, AAUW is one of the

world's largest sources of funding for graduate women, due to the generosity and legacy of generations of AAUW members. These prestigious awards are highly competitive and selective.



Emily Alcazar earns Bachelor's Degree in Civil Engineering at age of 17

Emily Alcazar started taking college courses when she was 12 years old. She graduated magna cum laude from the Ira A. Fulton Schools of Engineering with a bachelor's degree in **civil engineering** at the age of 17. She is the youngest graduate out of more than 2,600 students in the Fulton Schools' spring 2019 graduating class.

"Starting college so young made my academic accomplishments impressive merely because of my age," says Alcazar. "Because of this, I knew I wanted my legacy to be more than earning a degree at a young age. I wanted my work to be inspirational and contribute to society. Civil engineering allowed me to do that through emphasizing topics such as environmental issues, water treatment processes, transportation, structural analysis and more."

The Gilbert, Arizona, native received a Maricopa County Community Colleges All-Arizona Academic Team Scholarship in 2015 while a student at South Mountain Community College.

"The scholarship provided me with a full ride to any public university in Arizona," says Alcazar. "ASU has the strongest engineering program and I'm very glad I chose to join the Ira A. Fulton Schools of Engineering."

Alcazar has been a very active member of the ASU community during her undergraduate years. She participated in the Fulton Undergraduate Research Initiative, better known as FURI, for two semesters in the lab of Professor Narayanan Neithalath studying 3D printing of concrete.

"The various applications of this technology such as providing affordable housing to developing countries, innovative architecture and implementing sustainable materials, gave me immense motivation to join [Dr. Neithalath's] research group," says Alcazar.

Alcazar worked with Professor Narayanan Neithalath to advance the current state of 3D printed concrete for its industrial use in the future as a means of faster, cheaper and cleaner construction.



Left to right: Matthew Aguayo and Aashay Arora

Annual Pitchfork Awards

Arizona State University has recognized hundreds of students, advisors and organizations who demonstrate personal and organizational leadership, collaboration and commitment to better the ASU community. The university celebrates the people who strive to make a difference on ASU's campus through the annual Pitchfork Awards. **Aashay Arora** was named the **Outstanding Graduate Student Leader** in the annual **ASU Pitchfork Award Ceremony**.

Aashay and **Matthew Aguayo**, another recent PhD graduate, have started a start-up company based on a new energy-efficient coating system developed at ASU (based on an NSF grant). They were featured in several innovation challenge competitions including the Rice Business Plan competition and have been selected to the I-Corps program. They were the winners at **ASU Venture Devils Demo Day**. ASU is interested in employing the coating system on its buildings and will start with two identical buildings on the Poly campus and monitor their energy consumption during the summer. This was possible through an ASU SIRF grant.



Mariana Lanzarini-Lopes

Competition encourages Arizona researchers to bring down walls

Students present ideas for solutions in tech, education and the arts at Falling Walls Lab; winner heads to Berlin finale

Mariana Lanzarini-Lopes who is working on her PhD in environmental engineering, was one of 12 research competitors at the pitch event and won a trip to Berlin for the Falling Walls Lab finale in November 2019.

The competition, sponsored by the Global Futures Laboratory at ASU, showcased research in technology, education and the arts. Falling Walls Labs have been held around the world every year since 2011, and this was

the first one in Arizona, with jurors from all three public universities and Maricopa Community Colleges. The research showcases are part of the Falling Walls Foundation, an international platform for science, business, politics, the arts and society that was created in 2009 to mark the 20th anniversary of the fall of the Berlin Wall.

In her pitch, Lanzarini-Lopes told the judges that 2 billion people around the world drink contaminated water and 500,000 people die from it every year. LED light has been known to be a disinfectant, but the problem has been deploying it efficiently, because the lights must be close to the microbes to kill them.

"If you look at current water treatment systems, they use bulky lamps that are not energy-efficient and contain mercury and are not available in developing countries," she said.

She's working on a way to use flexible optical fibers woven into a fabric to disinfect water at treatment plants and in pipes.

Lanzarini-Lopes works in the NEWT lab, the Nanosystems Engineering Research Center for Nanotechnology-Enabled Water Treatment, run by Paul Westerhoff, and has received funding from NASA to investigate how the system could work in space.

PhD student **Daniella Saetta** is one of 20 chosen to participate in **MIT CEE Rising Stars Workshop**.

PhD student **Sooraj Kumar Nair** wins **\$5,000 Student Innovation Fellowship** from Thornton Tomasetti Foundation to Advance 3D Printing of Concrete.

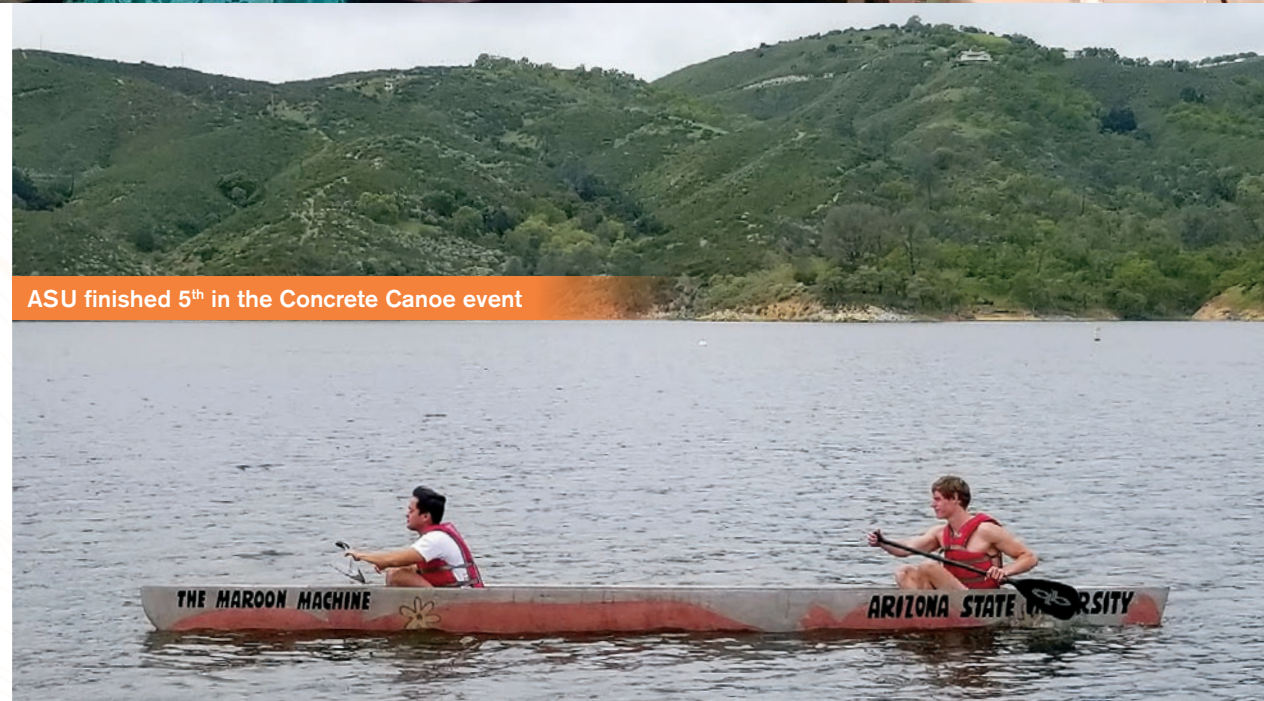
The **2019 Construction Management Association of America (CMAA) Arizona Chapter Scholarship** recipients are **Jeffrey Feghaly, Jeremy D. Revels, Kevin R. Perreault** and **MennatAllah Hammam**. Each received \$1,000.



Pacific Southwest Conference

The annual **Pacific Southwest Conference (PSWC)** is a three-day event hosted by ASCE student chapters that encourages industry learning and friendly competition between universities. Schools compete against each other in technical projects, intermural sports, and other miscellaneous events.

The 2019 conference held April 3-6, 2019 was hosted by California Polytechnic State University. ASU teams placed **1st in the Mystery Competition (bowling)**, **2nd in Sand Volleyball** and **5th in the Concrete Canoe event**. Congratulations to all students who participated in the conference!



ASU finished 5th in the Concrete Canoe event



Artist Conceptualization

Powerful ‘mechanical trees’ can remove CO₂ from air to combat global warming at scale

Arizona State University and Silicon Kingdom Holdings (SKH) have announced an agreement to deploy carbon-capture technology developed by Professor **Klaus Lackner**, director of ASU’s Center for Negative Carbon Emissions.

The proprietary technology acts like a tree that is thousands of times more efficient at removing CO₂ from the air. The “mechanical trees” allow the captured gas to be sequestered or sold for re-use in a variety of applications, such as synthetic fuels, enhanced oil recovery or in food, beverage and agriculture industries.

Unlike other carbon-capture technologies, this technology can remove CO₂ from the atmosphere without the need to draw air through the system mechanically using energy-intensive devices. Instead, the technology uses the wind to blow air through the system. This makes it a passive, relatively low-cost and scalable solution that is commercially viable. If deployed at scale, the technology could lead to significant reductions in the levels of CO₂ in Earth’s atmosphere, helping to combat global warming.

Carbon dioxide is an odorless, colorless gas that is a byproduct of burning fossil fuels and other natural processes. Humans release more than 36 billion metric tons of CO₂ into the atmosphere annually, significantly changing Earth’s natural carbon cycle. The excess carbon traps heat and causes global warming.

The situation has gotten to the point where we need to stop talking about it and start doing something about it,” said Lackner, an engineering professor in the **School of Sustainable Engineering and the Built Environment**. “Carbon dioxide is a waste product we produce every time we drive our cars or turn on the lights in our homes. Our device can recycle it, bringing it out of the atmosphere (to) either bury it or use it as an industrial gas,” added Lackner, who will serve as the chief scientific adviser to SKH.

The “mechanical tree” is a novel geometry that is agnostic to wind direction. Each one contains a stack of sorbent-filled disks. When the tree-like column is fully extended and the disks spread apart, air flow makes contact with the disk surfaces and the CO₂ gets bound up. During regeneration, the disks are lowered inside the bottom container. Inside the chamber, the CO₂ is released from the sorbent. The released gas is then collected, purified, processed and put to other uses, while the disks are redeployed to capture more CO₂.



Klaus Lackner, director of ASU's Center for Negative Carbon Emissions



Adding fiber to cement eliminates need for rebar, improves construction strength and durability.





Barzin Mobasher (above), professor in the School of Sustainable Engineering and the Built Environment

Fiber-reinforced Concrete Speeds Construction, Reduces Costs

Barzin Mobasher, professor in the **School of Sustainable Engineering and the Built Environment**, is trying to promote a method of speeding up the Valley's endless construction projects that can reduce years to months and months to weeks. His magic bullet is made of fiber-reinforced concrete. Mobasher and his team have come up with a certain set of calculations engineers can use to simplify working with the material.

Transportation experts say the economic, safety, and transit benefits could be huge.

Construction takes time. The bigger the project, the longer the timeline. The Big Dig in Boston—burying a freeway through the heart of the city—took 15 years. Traffic, the flow of goods and services, business conducted adjacent to worksites—it all gets disrupted.

Annually, worldwide, 10 billion tons of concrete are used. It's the cheapest material that can be used in construction of roads, buildings, and other things.

Designs have revolved around the fact that although concrete can withstand a lot of compression, it can't withstand a lot of tension. Put weight on it and it's fine. Pull it apart and it breaks. Traditionally, overcoming this flaw has meant putting steel rebar in the concrete. Engineers assume the steel will carry the load the concrete is supposed to take. They completely ignore the issue of tension.

Composites have been around for 60 or 70 years. You mix fibers of steel or composites into a carrier (like concrete or epoxy)—typically 40 pounds of fibers in 2,000 pounds of concrete. These are very strong fibers, but also very small. When you decrease the size of something, you decrease the size of flaws that can occur in the structure.

If the concrete tries to crack, the fibers intercept the crack and act like internal Band-Aids. They hold it together and allow it to carry more of a load. It's an interlocking mechanism.

"The work that my team has done is to come up with procedures and calculations and equations that will tell you that if you put this amount of fiber in your mix, now you can count that your whole concrete tension that you used to ignore—now it can carry X amount of load. Alternatively, you can put enough fiber in there so that you don't have to put the rebar in there...this changes the whole game," Mobasher says.

"This way you eliminate a lot of the side costs," Mobasher says. "You're paying more for the material on a pound-by-pound basis to be using fibers, but you're saving so much on all the extra costs."



Summer in the City

The unseasonably temperate weather in the Phoenix metropolitan area this spring may have everyone scratching their heads, but rest assured, heat will always be a concern in the Valley whose name pays homage to the most omnipresent force there – the sun.

“I think it’s a blip,” said associate professor **Mikhail Chester**. “I think when you look at the end of the year, in January of 2020, the overall trend for 2019 will fit with what we’ve been seeing everywhere, which is that the average temperature has gone up.”


Chester is one of many researchers at ASU whose work focuses on heat. From mitigating its effects through the built environment to understanding how socioeconomic status factors into heat-related vulnerabilities, their lines of inquiry run the investigative gamut.

Chester serves as a co-leader of **ASU’s Urban Resilience to Extremes Sustainability Research Network**, also known as UREx SRN. The research network includes 17 partner institutions in nine cities across North and South America. Supported by a \$12 million grant from the National Science Foundation, UREx SRN aims to devise, analyze and support urban infrastructure in the face of climatic uncertainty and put cities on paths to sustainable futures.

One of the projects to come out of the network is the ICARUS project, which uses simulation modeling to look at how infrastructure, behavior, travel and going back and forth between indoor and outdoor environments throughout the day contribute to heat exposure. The goal is to provide a framework for the city to test and employ mitigation strategies, such as planting trees for shade or changing materials like asphalt out for cooling reflective coatings.

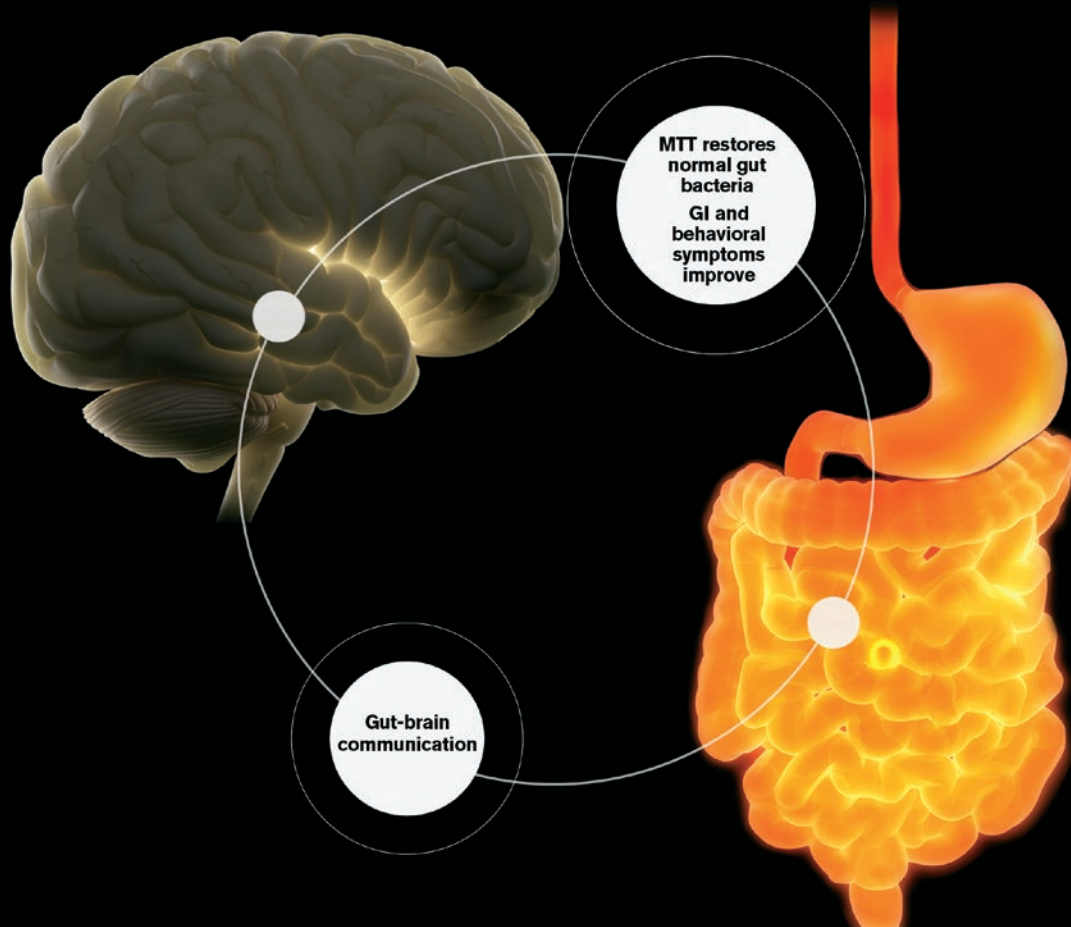
Several other projects in the works are exploring the reliability of infrastructure — water pumps, power lines, transformers, etc. — under extreme heat. With support from the Arizona Department of Transportation, Chester and his team of researchers have developed the capacity to estimate how frequently infrastructure failure can be expected based on rising temperatures and are working to find strategies for proactive maintenance to prevent its failure and how best to respond when it does. For example, if infrastructure is expected to fail 10% of the time during extreme heat, one solution may be to have 10% more emergency resources on hand then.





ASU experts in a variety of disciplines are working on creating solutions and mitigation strategies for extreme heat dangers.

Autism and the microbiome



Autism symptoms reduced nearly 50% 2 years after fecal transplant

Recent research suggests our gut microbiomes affect brain communication and neurological health. Worldwide, interest is growing in the idea that changes in normal gut microbiota may be responsible for triggering various conditions. At ASU, a research team is exploring using the microbiome to treat autism symptoms.

According to the Centers for Disease Control and Prevention, about 1 in every 59 children in the U.S. is diagnosed with autism, up from 1 in every 150 in 2000. They report that “about half a million people on the autism spectrum will become adults over the next decade, a swelling tide for which the country is unprepared.”

The apparent rise in autism spectrum disorder (ASD) and its stubborn resistance to treatment has spurred a legion of researchers to enter the field and explore the disability in innovative ways.

Currently, effective treatments for ASD include behavioral therapy, speech and social therapy, psychiatric medications and dietary and nutritional approaches. However, no medical treatments have been approved to treat core symptoms of ASD such as social communication difficulties and repetitive behaviors.

One promising avenue of autism research involves the gut microbiome, which is the collection of microbes that lives in our intestines and helps us in many ways, including aiding digestion of our food, training our immune system and preventing overgrowth of harmful bacteria.

Recent research suggests our gut microbiomes also affect brain communication and neurological health. Worldwide, interest is growing in the idea that changes in normal gut microbiota may be responsible for triggering a vast range of diseases.

In a new study, “Long-Term Benefit of Microbiota Transfer Therapy in Autism Symptoms and Gut Microbiota,” published in *Scientific Reports*, Arizona State University researchers **Rosa Krajmalnik-Brown**, James Adams and lead author Dae-Wook Kang demonstrate long-term beneficial effects for children diagnosed with ASD through a revolutionary technique known as Microbiota Transfer Therapy (MTT), a special type of fecal transplant originally pioneered by Australian gastroenterologist Thomas Borody. Remarkably, improvements in gut health and autism symptoms appear to persist long after treatment.

Two years after treatment, most of the initial improvements in gut symptoms remained. In addition, parents reported a slow, steady reduction of ASD symptoms during treatment and over the next two years. A professional evaluator found a 45% reduction in core ASD symptoms (language, social interaction and behavior) at two years post-treatment compared with before treatment began.

“We are finding a very strong connection between the microbes that live in our intestines and signals that travel to the brain,” said **Krajmalnik-Brown**. “Two years later, the children are doing even better, which is amazing.”

“Many kids with autism have gastrointestinal problems, and some studies, including ours, have found that those children also have worse autism-related symptoms,” Krajmalnik-Brown said. “In many cases, when you are able to treat those gastrointestinal problems, their behavior improves.”

So, the questions at hand are: What’s going on in the gut, how does it affect both physical and behavioral symptoms of autism, and how can we develop a long-lasting treatment?

Krajmalnik-Brown, Kang and Adams have shown that by transferring healthy microbiota to individuals lacking certain gut bacteria, it is possible to “donate” a more diverse set of bacteria into the patient and improve gut health.



Rosa Krajmalnik-Brown, a professor in the School of Sustainable Engineering and a professor at the Bidesign Swette Center for Environmental Biotechnology at the Bidesign Institute



Colorado River at Horseshoe Bend near Page, Arizona.

ASU awarded NASA grant for study on Colorado River water management

An interdisciplinary team of researchers at Arizona State University has received a \$1 million grant from **NASA's Earth Science Division** to provide long-range scenarios for water management for the Colorado River Basin.

"Water management is a pressing issue for Arizona," said **Enrique Vivoni**, principal investigator of the project and professor in the **School of Sustainable Engineering and the Built Environment** and the School of Earth and Space Exploration. "This grant will assist in helping local, state and federal entities with their drought contingency planning."

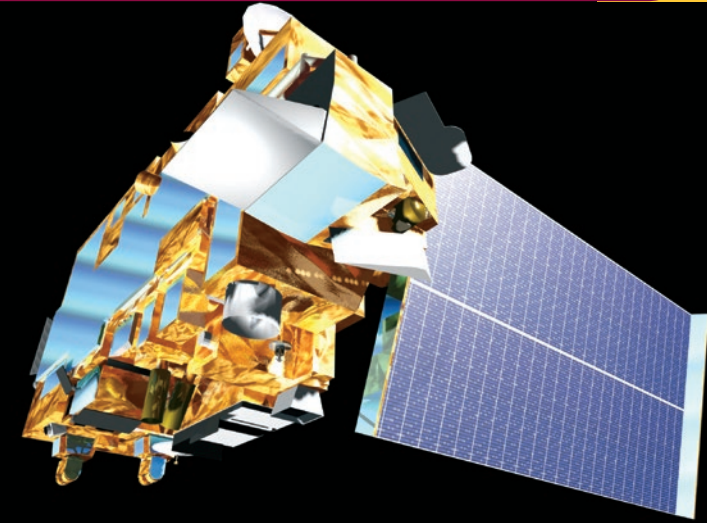
Arizona depends heavily on the Colorado River Basin, the drainage area of the Colorado River that includes parts of seven states in the U.S. and the country of Mexico and supplies the majority of the state's current renewable water.

With this grant, the team will provide a comprehensive evaluation of climate and land-use changes and how these impact the Colorado River Basin. Data collection for the study will involve Earth-observing satellites as well as ground data from the U.S. Geological Survey, the National Oceanic and Atmospheric Administration and other entities.

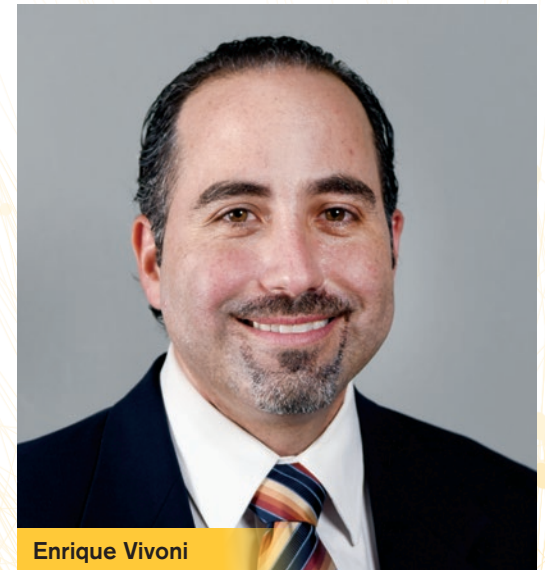
The Colorado River is one of the most engineered watersheds in the world with three major tributaries and 10 major regulating reservoirs. In the U.S. and Mexico, the river supplies more than 40 million people with renewable water in nine states, 22 Native American nations and 22 national parks and refuges. It is also used to irrigate 5.5 million acres of agricultural land and to produce 4,180 MWh of hydroelectric power.

This crucial water resource is currently under threat from rising demands linked to population growth and economic activities, as well as declining amounts of available streamflow and reservoir storage.

For this grant, ASU has partnered with Central Arizona Project (CAP), Arizona's largest resource for renewable water supplies. CAP brings water from the Colorado River to central and southern Arizona via aqueducts, tunnels, pumping plants and pipelines.



The ASU/CAP team will use data collected from "MODIS" onboard NASA's Aqua Earth-observing satellite mission. Image courtesy NASA/GSFC



Enrique Vivoni



The microbial world of viruses is poised to attack. Viral, nonliving entities have the ability to infect you and spread to others, jumping from host to host to host. Unchecked, viral infections can spread through families and communities like wildfire.

Biodesign receives \$1.5 million to develop early warning system for flu outbreaks

With \$1.53 million in support from the National Library of Medicine, three research teams from Arizona State University's Biodesign Institute are bringing their distinct areas of expertise to answer the question, "How can we improve our ability to predict viral outbreaks?"

Experts in environmental health, bioinformatics and virology are teaming up to create a map to track viruses and forecast outbreaks nationwide.

Their plan is essentially twofold: first, to create an accessible online database that catalogues and characterizes viruses nationwide; and second, to develop a map of the United States that tracks where and how viruses exist and travel across the nation.

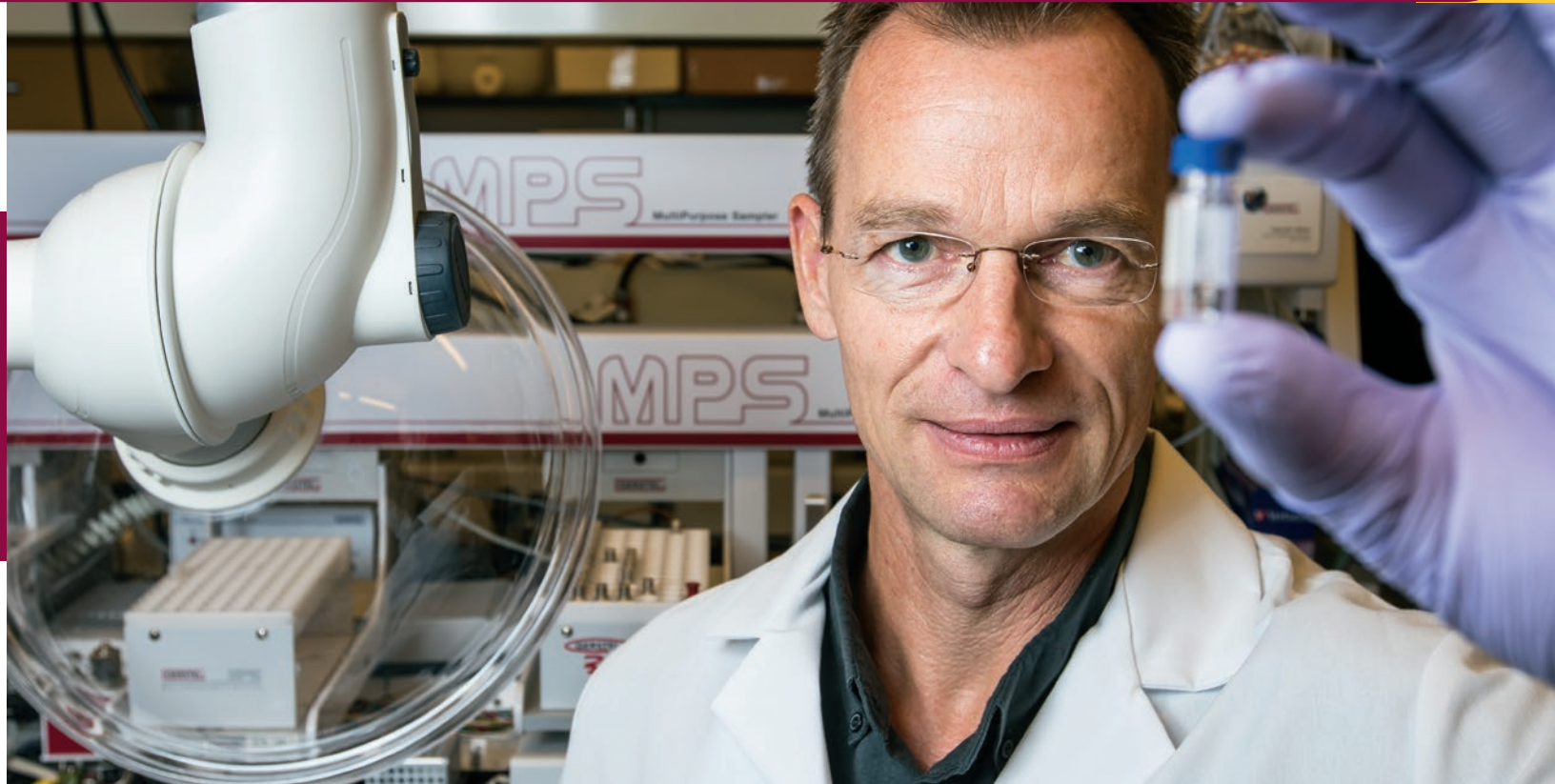
According to the Centers for Disease Control and Prevention, approximately

79,000 people died last year from influenza in the United States, 960,000 were hospitalized and 49 million individuals were infected. Ultimately, the goal is to provide data that will help communities and public health officials develop an early warning system that will forecast outbreaks and pandemics. First on their viral hit list is influenza, more commonly known as the flu.

The teams will track the presence of viruses at wastewater plants and medical clinics. In doing so, they will be developing much more than a map. The database will characterize the viruses they find, identify new viruses and provide information that shows infectious trends for humans, animals, plants and bacteria.

Molecular virologist Arvind Varsani, environmental health engineer **Rolf Halden** and biomedical informaticist and epidemiologist Matthew Scotch — all researchers

Rolf Halden, director of the Biodesign Center for Environmental Health Engineering, and a professor in the School of Sustainable Engineering and the Built Environment



at the Biodesign Institute — will combine their scientific skills for the greater good. This open-access viral databank will provide a multidimensional view of viruses and their infectious trends, allowing researchers to look at viruses through a whole new lens.

“This is an excellent example of the spirit of discovery at Biodesign,” said Joshua LaBaer, executive director of the Biodesign Institute. “Bringing multiple scientific disciplines together is key to advancing knowledge and developing solutions to some of life’s most intractable problems.”

“Previously, we didn’t have the technology or computer power to accomplish a study of this size and ambition,” said **Halden, director of the Biodesign Center for Environmental Health Engineering, and a professor in the School of Sustainable Engineering and the Built Environment.** “However, it is a new era. We now have advanced technology in big data and metagenomic sequencing.

Today, bioinformatics experts are able to manage tidal waves of data.”

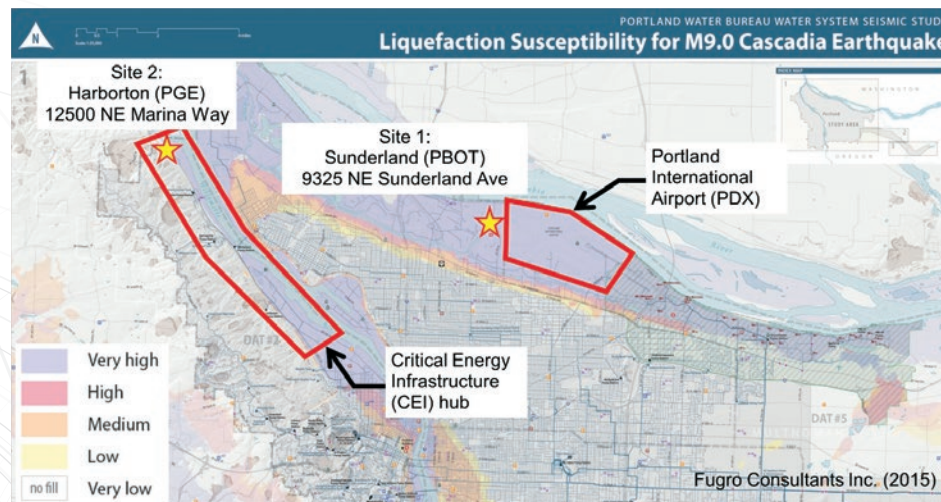
The new study will rely on samples from about 30 municipal wastewater facilities — facilities that are already participating in Halden’s Human Health Observatory project. Halden launched the Human Health Observatory at ASU to take on public health challenges, from toxic pollutants to human pathogens. As part of this project, Halden’s team pulls samples from more than 250 wastewater sites across the nation. With this new grant, Halden and his team will extend the sample collection, and in the process, identify and track viruses, both known and yet to be discovered.

Locally, the city of Tempe will participate in the project, with ASU Health Services recruiting patients to provide nasal samples during their clinic visits. The samples will be compared to the composite samples that Halden collects from the local wastewater treatment facility.

Academia-Industry-Government Agency Collaboration Seeks to Enhance Seismic Resilience

Researchers at the **Center for Bio-mediated and Bio-Inspired Geotechnics (CBBG)** in the **School of Sustainable Engineering and the Built Environment (SSEBE)** collaborated with researchers from Portland State University and the University of Texas at Austin in the first field trials mitigation of earthquake-induced soil liquefaction via Microbial Induced Desaturation (MID). Field testing was conducted using funding from the National Science Foundation at two sites in the Port of Portland, one in the Port's Critical Energy Infrastructure (CEI) hub alongside the Willamette River and one adjacent to Portland International Airport alongside the Columbia River.

The Oregon Governor's Office Seismic Resilience Plan identifies enhancing seismic resilience in these areas, and in particular mitigation of the impact of earthquake induced soil liquefaction when subject to a Magnitude 9 Cascadia Subduction Zone earthquake, as a critical issue due to the importance of the facilities in these areas to respond and recovery efforts.



After hearing a presentation on this work by SSEBE investigators at the US National Conference on Earthquake Engineering in the summer of 2018, the Oregon Department of Geology and Mineral Industries (DOGAMI) representative on the Governor's Resilience Task Force approached CBBG about collaborating with local (Portland) engineers on field trials of the MID technology in the Port area.

CBBG personnel then worked with the Portland State and University of Texas researchers and DOGAMI on a proposal to NSF for the field testing program. Other collaborators who were engaged in the field testing program included the CBBG Industry Partners GeoSyntec Consultants and Conetec, Inc. and local ground improvement contractor Condon-Johnson.

Monitoring systems installed at both sites under CBBG guidance indicated that the liquefiable strata at both sites was successfully desaturated via MID. Portland State researchers are continuing to monitor both sites to establish the persistence of the desaturation (i.e., the longevity of the ground treatment).

A proposal has been submitted by the Portland State-CBBG-U. Texas team to NSF for additional testing, including simulating earthquake motions using large shakers operated by the University of Texas under the NSF Natural Hazard Engineering Research Infrastructure program. The work on MID in Portland is just one example of how CBBG is mobilizing support in academia, industry, and government agencies to address critical problems associated with geotechnical aspects of civil infrastructure systems.



Ed Kavazanjan

Bruce Rittman

Leon van Paassen

SSEBE professors **Ed Kavazanjan**, **Bruce Rittman**, and **Leon van Paassen** have been developing MID technology in the laboratory and in centrifuge model testing since the inception of CBBG in 2016, starting with former graduate student **Sean O'Donnell** and continuing with current SSEBE graduate students **Caitlyn Hall** and **Elizabeth Young**.

NANOPARTICLE IMPACT



Paul Westerhoff

Nanomaterials changing from risky to beneficial

ASU Regents' Professor **Paul Westerhoff**, holder of the Fulton Chair of Environmental Engineering, has been given some of the most prestigious awards for environment and ecology studies and research that includes extensive work on understanding the impacts of nanomaterials.

Westerhoff, who teaches in the **School of Sustainable Engineering and the Built Environment**, began getting heavily involved in nanomaterials research in 2005.

His work has earned support from the U.S. Environmental Protection Agency, the Department of Energy and the National Science Foundation and from industry groups such as the Semiconductor Research Corporation, individual companies, the Water Research Foundation and other nongovernmental organizations.

National Science Foundation and from industry groups such as the Semiconductor Research Corporation, individual companies, the Water Research Foundation and other nongovernmental organizations.

Westerhoff directed a 10-university EPA network that studied the life cycles of nanomaterials and their impacts on humans and the environment. He currently is deputy director of the NSF Engineering Research Center on **Nanotechnology Enabled Water Treatment (NEWT)**, which is developing technologies to provide sustainable clean water systems to many areas in the U.S. that lack sustainable clean water supplies.

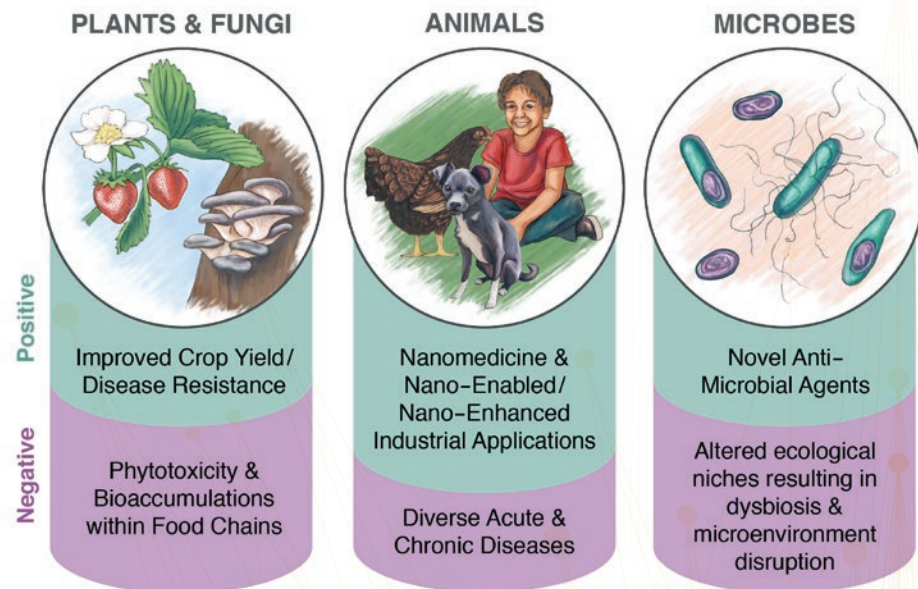
Until recent years, Westerhoff's research focused on the risks nanomaterials — both natural nanomaterials and those created purposely (engineered) or unintentionally (incidental) by humans — could pose by contaminating rivers, lakes, streams and water treatment and delivery systems.

However, Westerhoff's research at the nanoscale has shifted to align with some new research directions specifically those that examine how engineered nanomaterials could be made to function to the advantage of the environment and humans' physical well-being, and to spark formulation of cleaner, safer and more effective industrial systems and practices.

Westerhoff is also expanding his research focus to explore how nanomaterials may impact integrated human biological systems. He says he views the human body in much the same way as he looks at environments such as rivers, soils or interconnected ecosystems.

For instance, he is conducting other research to find out what nanomaterials could do to help remedy human gut ailments or problems rooted in the brain.

"With the human and environmental health advances it looks like nanomaterials might make possible," Westerhoff says, "we may be seeing big returns on all of the investments federal agencies have made in this area of research for the past couple of decades."



Anthropogenic and natural nanomaterials enter biological systems across the tree of life through multiple routes, where they have broad positive and negative impacts. These impacts are driven by multiple factors, including the dose, duration, number of exposures and the characteristics of the nanomaterial. Many nanomaterials have beneficial effects or are harmless. In cases of detrimental properties, however, studies can produce useful risk assessments and development of preventive measures to ensure biological safety.

Illustration: Rose Perry/Pacific Northwest National Laboratory Creative Services

OPERATION SAFE ROADS: Pendyala gives details about what research is revealing in a radio interview with KTAR News in Phoenix



Ram Pendyala

Do stiffer traffic citation fines lead to safer streets?

In some countries, fines for traffic violations that are many times higher than fines in Arizona and throughout the United States seem to have a deterrent effect on inattentive driving that leads to serious vehicle crashes. But transportation engineer **Ram Pendyala**, professor and director in the School of Sustainable Engineering and the Built Environment, says raising fines probably would not by itself result in making driving safer on Phoenix streets and highways. Pendyala recommends that public awareness and education efforts need to be part of a solution to the rising numbers of auto collisions.

What are the causes of a rise in fatal roadway accidents involving pedestrians — particularly in cities such as Phoenix?

Pendyala says multiple factors are involved. Urban growth, driving speeds, multilane streets, larger automobiles and road designs all appear to be contributing factors. Studies are indicating that better street illumination at nighttime and more signs cautioning drivers to watch for pedestrians might be among effective remedies to the problem.



DO NOT
ENTER

WRONG
WAY

Phoenix area freeway system not to blame for wrong-way drivers, says expert

The topic of wrong-way drivers is not new here in Arizona. With five wrong-way driving incidents in five days, some people may be looking at our roadways.

Yingyan Lou, associate professor, said the design of our freeways is not to blame for the Valley's recent wrong-way driver epidemic.

"I would say the design is very standard compared to other places. The operation and maintenance of the Phoenix freeway is, I think, one of the better places in the entire country," said Lou.

She said freeway systems must adhere to certain codes of design and that the highway system we drive on every day is one of the newest designs since Interstate 10 is the last piece of the entire interstate system to be connected.

She said wrong-way drivers have been a nationwide issue since the 1960s. While it's nothing new, the issues come back to cases of impairment by drugs or alcohol, not the roadways themselves.

Lou said, making road signage as obvious as possible, in terms of infrastructure, is one way to help curb the wrong-way driving incidents.

Wrong-way drivers are generally in the HOV lane because they believe that's the far right lane, something drivers should be aware of, experts say.



Yingyan Lou

Predicting the flood before the waters rise



Margaret Garcia

Researchers at Arizona State University are leading the way with new technology that will hopefully be able to detect when downpour from a storm has the potential to turn a street into a river.

They want to tap into technology plenty of Phoenix intersections already have: traffic cameras. Until they can prove their idea will work, they have installed five cameras of their own at intersections throughout the Valley, waiting for the next storm to strike.

“The motivation is definitely safety,” said assistant professor, **Margaret Garcia**, a co-leader on this project called Flood Aware. We have a team of water resource engineers, hydrologists, computer scientists and a transportation engineer,” Garcia explained.

She said, the goal is to be able to use the cameras in Flagstaff and Phoenix in areas that are prone to flooding.

“Police want to corner off areas that are unsafe to drive in,” Garcia described. “They have a heads-up about what areas are likely to be safe to drive in in the next half hour-hour based on forecasts and what we’re observing already.”

They hope this project can become a predictive and preventative tool that can support city and state officials during a downpour.

“We can help emergency responders get a little bit ahead of the game and provide safety warnings or respond where hazards and safety issues might already be occurring,” Garcia said. “But also keep the general public out of harm’s way.” Garcia said the study will be around for three full seasons before deciding if it can be fully implemented.



Distinguished service and excellence in Civil Engineering and Construction earn honors

The School of Sustainable Engineering and the Built Environment celebrated the achievements and service of a select group of alumni and community members during its annual **Academy of Distinguished Alumni and Hall of Fame awards** ceremony and dinner on March 1, 2019.

The **Academy of Distinguished Alumni** honors high-achieving graduates of the school. This year's honorees are leaders in their fields and have given back to programs in the School of Sustainable Engineering and the Built Environment.

The **Hall of Fame**, established in 1990, recognizes people who are not alumni but whose work has contributed to the advancement of the school, its educational and research missions and its ability to prepare the next-generation workforce.

The 2019 ceremony inducted two of the school's outstanding contributors into the Hall of Fame and five alumni exemplars into the Academy of Distinguished Alumni.

Mark Minter served as the executive director of the Arizona Builder's Alliance, a trade association of commercial and industrial builders including general contractors, subcontractors, suppliers and service companies. He is now retired after 40 years of service in the commercial and industrial construction business. Minter has been a consistent supporter of educational efforts by the Del E. Webb School of Construction, which is part of the School of Sustainable Engineering and the Built Environment.



Hall of Fame Inductee Thomas G. Schmitt served as a resident engineer for the Arizona Department of Transportation. In this role, he worked on the construction of the Interstate 10 coming into Phoenix as well as ADOT projects in Tucson and Flagstaff. He served as the ADOT State Engineer before retiring in 1999. He now serves as president of T & S Diversified, Inc., a construction management company, working on a variety of management consultant services.

Schmitt worked with Professor Sandra Houston, who served as the Chair of Civil and Environmental Engineering between 1996 and 2006, to form Friends of Civil Engineering in the early 2000s. He served as the Chair of FOCE for more than 10 years and helped increase interaction between the professional world and the civil engineering program at ASU.

The Academy of Distinguished Alumni inducted five new members into its ranks at the 2019 ceremony. These alumni exemplify the spirit of ASU as a New American University and show excellence in their professional work as well as compassion and support for their communities.

Hall of Fame



Mark Minter



Thomas G. Schmitt

Academy of Distinguished Alumni



Stephen C. DeTommaso, who earned a bachelor's degree in construction in 1975m is the former owner, CEO and president of Torrent Resources, Inc., formerly known as McGuckin Drilling, Inc.



Paul D. Henry has more than 36 years of international engineering. Henry, currently based in Ireland, serves as Europe, Middle East and Africa regional director for data center construction and delivery at Google.



Douglas J. Nicholls, a civil engineering alumnus who graduated in 1994 is currently serving his second term as the 27th mayor of Yuma, Arizona.



John W. Nicklow, a Professional Engineer, has pursued a career in academia since graduating in 1998 with a doctorate in civil engineering. He was appointed president of the University of New Orleans in March 2016.



Janaka Ruwanpura, a Professional Engineer, has been highly recognized with national and international awards currently serves as the vice provost international at the University of Calgary.

Construction engineering achievements earn Fulton Schools alum a top award in her field



Amanda Kerr is presented an award at an International Tunneling Association event. Photo courtesy of the International Tunneling Association

Alumnus **Amanda Kerr** recently received a prestigious international honor for her engineering and construction achievements.

Kerr was named the **2019 Young Tunneler of the Year** by **International Tunneling Association** as part of the organization's annual awards program for "ground-breaking innovation and outstanding projects in tunneling and underground space use."

As a student in ASU's Barrett, the Honors College, Kerr earned an undergraduate degree in civil engineering in 2015 and a master's degree in construction engineering in 2016 through the Fulton School's 4+1 accelerated graduate degree program.

Kerr held leadership positions in the ASU chapters of the Chi Epsilon civil engineering honors society, the American Society of Civil Engineers and the North American Society for Trenchless Technology.

She also participated in STEM outreach activities, particularly focused on underground infrastructure, for local elementary schools and youth programs.

Kerr began her construction career doing heavy civil work with the Southwest branch of Granite Construction on the Tucson International Airport project.

She has worked for five years for Michels Tunneling Operations, a division of the Michels Corporation, a leading infrastructure and utility contractor with facilities throughout the United States and in Canada.

Among her more recent projects is the 4.5-mile-long tunnel for the Blacklick Creek Interceptor Sanitary Sewer in Ohio, during which a boring machine finished excavation of the tunnel three months earlier than planned, enabling the entire project to be completed more than 14 months ahead of schedule.

Currently a lead project engineer for the Michels large diameter tunneling division, Kerr says she values how the projects she works on "provide many opportunities for quick thinking and creativity in a technical environment," and she "looks forward to the challenges to come" throughout her career in tunneling.



Julie Garcia says her college education prepared her well for her chosen career in construction. But her range of experiences at ASU did more than qualify her for a job. They amounted to “the journey of figuring out who I am and what I am passionate about.”

Along with what she learned in earning a construction management degree in the Del E. Webb School of Construction in 2004, Garcia also took training in public speaking and studied social psychology.

She spent a summer studying in Italy, interned for a semester in the Arizona State Legislature and for four years sang in the ASU women’s a cappella group, the Pitchforks. The latter taught her how to “seek harmony, in music and in relationships.”

At work with one of Arizona’s leading construction companies, Garcia is director of preconstruction with Kitchell Contractors, leading teams on major building projects such as a \$500-million-plus campus for the Maricopa Integrated Health System Care Reimagined program.

She has also been involved in construction work for St. Joseph’s Medical Center Barrow Neurological Institute, Phoenix Children’s Hospital, Banner Health and the recently completed University of Arizona Health Sciences Innovation Building project.

Garcia is giving back to ASU as an adjunct faculty associate with the Del E. Webb School of Construction. She has taught Construction Management 101 for the past two semesters.

“I love it,” she says. “I hope to inspire my students to fall in love with the industry as much as I did.”



Yung Koprowski came to ASU with a scholarship requiring she perform community service, so she volunteered to work with the ASU chapter of Habitat for Humanity, the nonprofit that helps communities develop affordable housing.

That work became the catalyst for Koprowski’s career aspirations. She switched to a civil engineering major with a concentration in construction and went on to focus on transportation engineering, earning her degree in 2008.

Today, Koprowski is the founder and principal of Y2K Engineering, based in Mesa, Arizona. The company, started in early 2017, has worked on transportation engineering projects with the city of Phoenix and almost a dozen other municipalities in the metropolitan area, as well as state and county transportation agencies.

Her expertise ranges from traffic engineering and transportation planning, specializing in safety, intelligent transportation systems, traffic operations optimization and “complete streets” designed for multiple means of transport.

Koprowski previously served as president of the Intelligent Transportation Society of Arizona and the Phoenix Sonoran section of the American Society of Highway Engineers. She was also recognized in 2016 as one of the “New Faces of Civil Engineering” by the American Society of Civil Engineers.



Friends of Civil & Environmental Engineering

Friends of Civil and Environmental Engineering

The mission of Friends of Civil and Environmental Engineering (FOCEE) is to support educational programs of the Civil, Environmental and Sustainable Engineering program and facilitate partnerships to improve the quality of life and the built environment. FOCEE has four sub-committees that help to further this mission.

The **FOCEE Partnering Committee** works to develop relationships among students, faculty, alumni and industry practitioners and to help fill the gap between classroom and workplace. We aim to establish FOCEE as a focal point to enhance the quality of the professional environment by bringing ASU and the industry together to address relevant issues in civil engineering, improve the public understanding of contributions of the civil and environmental engineering professions to society and to develop and promote opportunities for academia to interact with industry professionals.

The **Education Committee** actively seeks opportunities for its members to support and participate in the educational experience at ASU. This includes working with administrators and faculty to identify ways and means whereby professionals may enhance the learning environment. This may include providing industry professional guest lectures, coordinating field trip opportunities, providing Fundamentals of Engineering Exam support and other helpful assistance. Ultimately the FOCEE Education Committee strives to provide heightened student preparedness for the professional environment.

The FOCEE **Internship and Employment committee** focuses on bringing students opportunities for professional development and employment through career related discussions and internships. Some of the activities include student/industry professional interaction at mixers and resume review and interview preparation. Connecting students and our professional industry is vital for the growth of ASU and the civil and environmental engineering industry.



Annual industry/student mixer



The FOCEE **Membership Committee's** goals are to increase the membership value for its members through engagement with students, faculty, clients and peers. Another goal for this committee is to expand the membership of FOCEE firms to increase industry support, involvement, and funding for the Civil, Environmental and Sustainable Engineering program. Finally, the membership committee desires to bring in FOCEE firms to support the ongoing FOCEE programs.

Faculty



Morteza Abbaszadegan

Professor

Director, NSF WET Center
PhD, University of Arizona

Expertise: Health-Related Water Microbiology



Braden Allenby

President's Professor

PhD, Rutgers University

Expertise: Sustainable Engineering



Absar Alum

Assistant Research Professor

PhD, University of Arizona

Expertise: Pollution Science, Biotechnology



Samuel Ariaratnam

Professor and Construction Engineering Program Chair

PhD, University of Illinois at Urbana-Champaign

Expertise: Underground Construction



Steven Ayer

Assistant Professor

PhD, The Pennsylvania State University

Expertise: Visualization Technologies



Wylie Bearup

Professor of Practice & Beavers-Ames Heavy Civil Engineering Chair

PhD, University of Illinois

Expertise: Public Works



Yuqiang Bi

Assistant Research Professor

PhD, University of Michigan, Ann Arbor

Expertise: Water Quality



Mackenzie Boyer

Lecturer

PhD, University of Florida

Expertise: Water Conservation

❖ **New faculty**



Treavor Boyer

Associate Professor and Environmental Engineering Program Chair

PhD, University of North Carolina at Chapel Hill

Expertise: Water Treatment

❖ **SSEBE Service Award**



Efthalia (Thalia) Chatziefstratiou

Lecturer

PhD, The Ohio State University

Expertise: Engineering Education



Mikhail Chester

Associate Professor & Director, Metis Center for Infrastructure and Sustainable Engineering

PhD, University of California, Berkeley

Expertise: Sustainable Infrastructure



Oswald Chong

Associate Professor

PhD, University of Texas at Austin

Expertise: Energy and Resource Management

Faculty



**Otakuye
Conroy-Ben**

Assistant Professor

PhD, University of Arizona

Expertise: Endocrine Disruption



**Paul
Dahlen**

Assistant Research Professor

PhD, Arizona State University

Expertise: Hydrocarbon Remediation



**Wanda
Dalla Costa**

Associate Professor

MA, University of Calgary; MDR, Southern California Institute of Architecture

Expertise: Indigenous Architecture



**Anca
Delgado**

Assistant Professor

PhD, Arizona State University

Expertise: Soil Microbial Processes

❖ **Outstanding Faculty Mentor Award**



**Mounir
El Asmar**

Associate Professor

PhD, University of Wisconsin-Madison

Expertise: Construction, Infrastructure



**James
Erzen**

**Associate Professor and PENTA
Building Group Chair**

PhD, University of Texas at Austin

Expertise: Concrete Materials



**Elham (Ellie)
Fini**

Associate Professor

PhD, University of Illinois at Urbana-Champaign

Expertise: Sustainable Materials



**Peter
Fox**

Professor and Graduate Chair

PhD, University of Illinois at Urbana-Champaign

Expertise: Groundwater Recharge



**Matthew
Fraser**

Professor

PhD, Caltech

Expertise: Air Quality



**Margaret
Garcia**

Assistant Professor

PhD, Tufts University

Expertise: Water Resources



**Sergio
Garcia-Segura**

Assistant Research Professor

PhD, University of Barcelona, Spain

Expertise: Electrochemical Water Treatment



**G. Edward
Gibson, Jr.**

Professor and Sunstate Chair

PhD, Auburn University

Expertise: Front-End Planning

Faculty

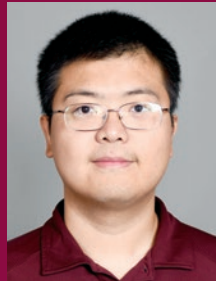


**David
Grau**

Associate Professor

PhD, The University of Texas at Austin

Expertise: Systems Engineering



**Yuanming
Guo**

Assistant Research Professor

PhD, Arizona State University

Expertise: Environmental Engineering



**Rolf
Halden**

**Professor and Director, Biodesign
Center for Environ. Health Eng.**

PhD, University of Minnesota

Expertise: Water and Health



**Nasser
Hamdan**

**Assistant Research Professor and
Industrial Collaboration Director, CBBG**

PhD, Arizona State University

Expertise: Biogeotechnics, Biogeochemistry



**Kerry
Hamilton**

Assistant Professor

PhD, Drexel University

Expertise: Microbiology and Risk



**Keith
Hjelmstad**

**President's Professor and CESE
Program Chair**

PhD, University of California, Berkeley

Expertise: Structural Engineering



**Christian
Hoover**

Assistant Professor

PhD, Northwestern University

Expertise: Fracture Mechanics



**Sandra
Houston**

Professor

PhD, University of California, Berkeley

Expertise: Geotechnical Engineering



**Kristen
Hurtado**

Assistant Research Professor

PhD, Arizona State University

Expertise: Project Management



**Kamil
Kaloush**

**Professor and Director, National
Center of Excellence on SMART
Innovations**

PhD, Arizona State University

Expertise: Pavements and Materials



**Edward
Kavazanjian, Jr.**

**Regents Professor and Director,
Center for Bio-mediated and
Bio-inspired Geotechnics**

PhD, University of California, Berkeley

Expertise: Geotechnical Engineering



**Hamed
Khodadadi
Tirkolaei**

Assistant Research Professor

PhD, Eastern Mediterranean University,
Cyprus

Expertise: Sustainable Geotechnics

Faculty



**Sara
Khoeini**

Assistant Research Professor
PhD, Georgia Institute of Technology
Expertise: Transport Modeling



**Kraig
Knutson**

Senior Lecturer
PhD, Arizona State University
Expertise: Construction Methods



**Rosa
Krajmalnik-
Brown**

Professor
PhD, Georgia Institute of Technology
Expertise: Microbial Ecology
Management



**Barry
Kutz**

Lecturer
MS, Arizona State University
Expertise: Preconstruction delivery
❖ **New faculty**



**Klaus
Lackner**

**Professor and Director, Center for
Negative Carbon Emissions**
PhD, Heidelberg University, Germany
Expertise: Carbon Sequestration



**Anthony
Lamanna**

**Associate Professor and Sundt Professor
of Alternative Delivery Methods and
Sustainable Development, DEWSC
Programs Chair**
PhD, University of Wisconsin
Expertise: Sustainable Construction



**Peter
Lammers**

Research Professor
PhD, Portland State University
Expertise: Biotechnology & Bioenergy



**Jean
Larson**

**Assistant Research Professor and
Education Director, CBBG**
PhD, Arizona State University
Expertise: Engineering Education



**Christopher
Lawrence**

Senior Lecturer
PhD, Arizona State University
Expertise: Geotechnical Engineering



**Yingyan
Lou**

Associate Professor
PhD, University of Florida
Expertise: Transportation Modeling



**Michael
Mamlouk**

Professor
PhD, Purdue University
Expertise: Pavement Materials



**Samuel
Markolf**

Assistant Research Professor
PhD, Carnegie Mellon University
Expertise: Urban Resilience
❖ **New faculty**

Faculty



Giuseppe Mascaro

Assistant Professor
PhD, University of Cagliari, Italy
Expertise: Stochastic Hydrology
❖ **SSEBE Teaching Award**



Larry Mays

Professor
PhD, University of Illinois
Expertise: Hydrosystems, Hydrology



Barzin Mobasher

Professor
PhD, Northwestern University
Expertise: Composite Materials



Rebecca Muenich

Assistant Professor
PhD, Purdue University
Expertise: Watershed Modeling



Narayanan Neithalath

Professor
PhD, Purdue University
Expertise: Materials Science



Hasan Ozer

Associate Professor
PhD, University of Illinois, Urbana-Champaign
Expertise: Pavements and Sustainability
❖ **New faculty**



Kristen Parrish

Associate Professor
PhD, University of California, Berkeley
Expertise: Construction Management



Ram Pendyala

Professor and Director of SSEBE, Director, TOMNET University Transportation Center
PhD, University of California, Davis
Expertise: Transportation Systems



Francois Perreault

Assistant Professor
PhD, University of Quebec, Canada
Expertise: Environmental Nanotechnology



Subramaniam (Subby) Rajan

Professor
PhD, University of Iowa
Expertise: Finite Element Analysis



T. Agami Reddy

Professor
PhD, University of Perpignan, France
Expertise: Sustainable Energy



Bruce Rittmann

Regents' Professor and Director, Biodesign Swette Center for Environmental Biotechnology
PhD, Stanford University
Expertise: Environmental Biotechnology

Faculty



**Thomas
Seager**

Associate Professor

PhD, Clarkson University

Expertise: Infrastructure Systems



**Shahnawaz
Sinha**

Assistant Research Professor

PhD, University of Colorado-Boulder

Expertise: Drinking Water Treatment



**Richard
Standage**

Lecturer

PhD, Arizona State University

Expertise: Concrete Specialist



**Kenneth
Sullivan**

Professor

PhD, University of Wisconsin-Madison

Expertise: Procurement and OCM



**Pingbo
Tang**

Associate Professor

PhD, Carnegie Mellon University

Expertise: Civil Infrastructure Systems



**Junliang
(Julian) Tao**

Associate Professor

PhD, Case Western Reserve University

Expertise: Bioinspired Geotechnics



**Leon
van Paassen**

Associate Professor

PhD, Delft University of Technology

Expertise: Geotechnical Engineering



**Enrique
Vivoni**

**Professor and Associate Dean
Graduate College**

PhD, Massachusetts Institute of Technology

Expertise: Hydrologic Science



**Kristen
Ward**

Lecturer

PhD, University of Arizona

Expertise: Structural Engineering



**Zhihua
Wang**

Associate Professor

PhD, Princeton University

Expertise: Urban Environment



**Paul
Westerhoff**

Regents' Professor

PhD, University of Colorado

Expertise: Water Treatment



**Avi
Wiezel**

**Associate Professor and Assistant
Dean for Facilities**

PhD, Technion-Israel Institute of Technology

Expertise: Human Aspects of
Management

Faculty



Tianfang Xu

Assistant Professor

PhD, University of Illinois, Urbana-Champaign

Expertise: Groundwater Sustainability

❖ **New faculty**



Claudia Zapata

Associate Professor

PhD, Arizona State University

Expertise: Unsaturated Soils

❖ **Top 5% Teaching Award**



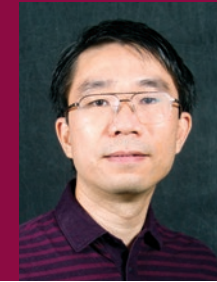
Ruijie Zeng

Assistant Professor

PhD, University of Illinois, Urbana-Champaign

Expertise: Hydrologic Modeling

❖ **New faculty**



Xuesong Zhou

Associate Professor

PhD, University of Maryland

Expertise: Multimodal Network Planning



Faculty Emeritus

William W. Badger, PhD

Howard H. Bashford, PhD

Allan Chasey, PhD

Apostolos Fafitis, PhD

William Houston, PhD

Paul Johnson, PhD

Larry Mays, PhD

Matthew Witczak, PhD

Farewell

We thank the following faculty for their service and wish them well.

Thomas Dempster, *Associate Research Professor*, retired June 30, 2019 after 9 years of service to ASU.

Celina Dozier, *Lecturer*, relocated to Florida after a year at ASU.

Nariman Mahabadi, *Assistant Research Professor*, left for the University of Akron in August 2019.

Larry Mays, *Professor*, retired on August 11, 2019 after 30 years of service to ASU.

Pingbo Tang, *Associate Professor*, left for Carnegie Mellon University on January 1, 2020 after 7 years of service to ASU.

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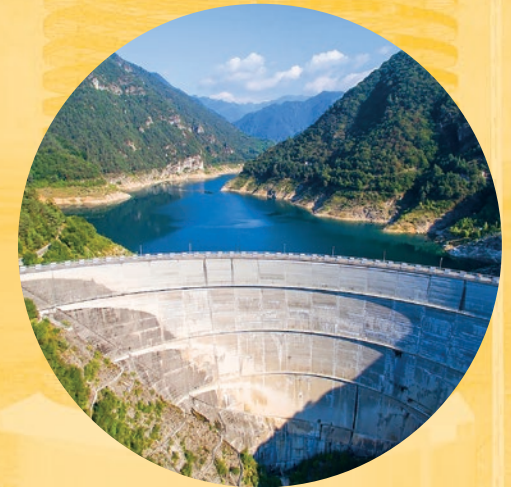
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