



VOLUME

NUMBER

## FROM THE DEPARTMENT CHAIR



Welcome to the 2024 Spring issue of our newsletter. I would like to take this opportunity to illustrate the research and education activities of our department, the achievements of our faculty, and the successes of our students. This newsletter features these items for the academic year 2023–2024. Our faculty members continue to conduct cutting-edge research on many fronts and receive national recognition.

I have been selected as the 2024 American Society of Civil Engineers Theodore von Karman Medal recipient. The award recognizes distinguished achievement in engineering mechanics, applicable to any branch of civil engineering.

Dr. Navid Jafari has been honored with the Arthur Casagrande Professional Development Award. You will also find information on the latest awards and distinctions of our faculty and students.

There is also an article on Dr. Clint Willson and his students' work on the Global Water Brigades service project and an article on how LSU researchers have designed a tool to explore the effects of solar farming on Louisiana ecosystems.

It is my pleasure to introduce to you our latest Civil and Environmental Engineering Hall of Distinction inductees. First, is Dr. W. Andrew Jackson. He is a President's Excellence in Research Professor and Provost Integrated Scholar in the Department of Civil, Environmental,

and Construction Engineering at Texas Tech University. Dr. Jackson obtained his MS (1992) and PhD (1996) from the Department of Civil and Environmental Engineering at LSU. The second inductee is Dr. Eric Ireland Kalivoda, a native of Baton Rouge. He received a Bachelor of Science in Civil Engineering from LSU, a Master of Science in Civil Engineering from the University of Arizona, and a Doctor of Philosophy from North Carolina State University. He is a registered Professional Engineer in Louisiana, Arizona, and North Carolina. Kalivoda was appointed DOTD secretary and served in that capacity until his retirement in January 2024. They both will be honored with our annual banquet in fall of 2024. These recent inductees have made significant contributions to our profession and to the department through their honorable achievements and support.

The LSU Environmental Engineering students competed in the 34th WERC Environmental Design Competition held April 6-10th, 2024, at New Mexico State University in Las Cruces, New Mexico. Sixteen LSU students competed as part of three teams, addressing tasks in the areas of stormwater treatment, water treatment for the production of H2 as an energy source, and carbon capture. The teams won three awards.

We also held our 12th annual CEE Graduate Student Research Conference and presented awards to our top three students. We continue to be proud of their outstanding achievements.

Sincerely,

Dr. George Z. Voyiadjis  
Boyd Professor, Chair  
Bingham C. Stewart Distinguished Professor of Engineering

# DEPARTMENT NEWS

## VOYIADJIS AWARDED ASCE'S VON KARMAN MEDAL

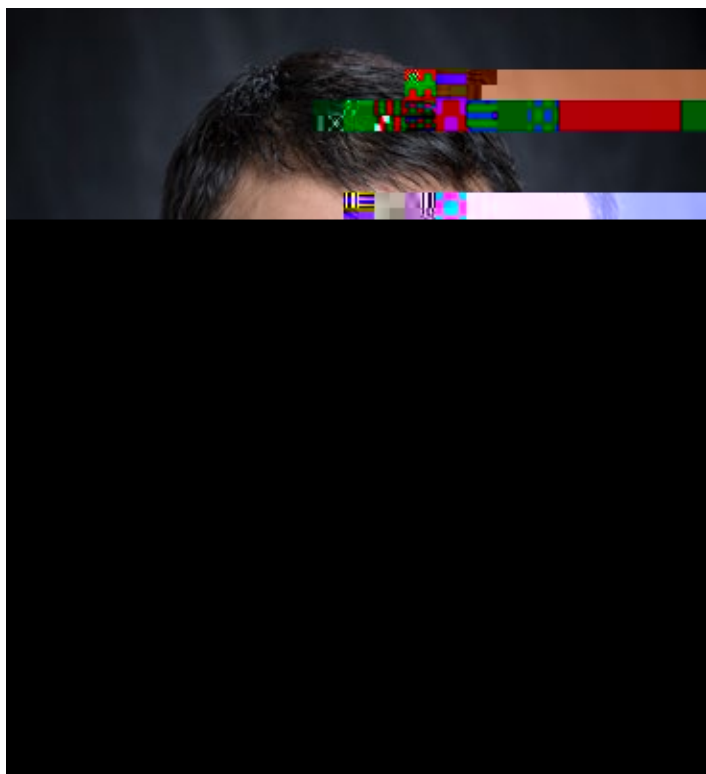
"Do not be afraid of failure as it is the gate to knowledge and eventual success in your endeavors. Always be proactive in starting new areas and concepts, as this may lead to proposing ground-breaking

Boyd Professor and Chair of the LSU Department of Civil and Environmental Engineering George Z. Voyiadjis has been selected as the 2024 American Society of Civil Engineers Theodore von Karman Medal recipient. The award recognizes distinguished achievement in engineering mechanics, applicable to any branch of civil engineering.

Voyadjis was chosen for his "outstanding achievements in macro/micro-material characterization of damage and plasticity in solid mechanics, pioneering contributions in multi-scale modeling and localization problems, and national and international leadership and service to solid mechanics."

"This distinguished award represents a recognition way beyond anything I ever imagined as a student at Columbia University many years ago," Voyadjis said. "My experience in industry and my academic appointment overseas has allowed me to think in a more global sense and at the same time, stay relevant to engineering applications in my research endeavors. That's what keeps me grounded and gives me the ability to continue to do all this work. Working with my students has been the catalyst of my success in my academic career.

## JAFARI HONORED WITH ARTHUR CASAGRANDE PROFESSIONAL DEVELOPMENT AWARD



The ASCE has honored Navid H. Jafari, PhD, AMASCE, with the 2024 Arthur Casagrande Professional Development Award for his pioneering work on coastal geotechnics and coastal protection using hard and natural infrastructure.

Jafari has made invaluable contributions and established himself as a leader and pioneer in the area of coastal geotechnical engineering in a nation where safeguarding coastal communities, economic hubs, and critical infrastructure networks is paramount to national security and enduring prosperity.

His ability as an interdisciplinary bridge-builder is exemplified by his collaborations across coastal engineering, systems ecology, and geomorphology. His work probes the responses

of natural and nature-based infrastructure to storm surges, waves, and rising sea levels, weaving a narrative of resilience and adaptation.

The originality of his research and teaching initiatives is that he has brought geotechnical engineering principles into the coastal engineering community. This cross-discipline transfer of knowledge is assisting in restoring and protecting natural ecosystems that provide flood protection and environmental benefits to US citizens; and this interdisciplinary work has resulted in Jafari receiving numerous grants to highlight his academic research addressing real-world and pressing coastal protection issues.

Beyond academia, Jafari has carved a distinctive path, seamlessly weaving research, teaching, and practice. His tenacity is evident in securing federal funding from diverse agencies, a testament to his commitment to fostering emerging researchers and steering coastal initiatives. His influence extends to multi-million-dollar transdisciplinary grants, including the National Academy of Sciences grant probing the geomorphic future of the Mississippi River Birdsfoot Delta.

Jafari has produced outstanding accomplishments as a young researcher in the field of geotechnical engineering and is poised to become a leader in the profession.

The Arthur Casagrande Professional Development Award is presented in recognition of outstanding accomplishments as evidenced by completed works, reports, or papers in the field of geotechnical engineering. The award was established to provide professional development opportunities for outstanding young practitioners, researchers, and teachers of geotechnical engineering.

## LSU RESEARCHERS DESIGN TOOL TO EXPLORE EFFECTS OF SOLAR FARMING ON LOUISIANA ECOSYSTEMS

Though solar farming is not a novel concept in renewable energy, it is fairly new to the state of Louisiana. With the advancement of renewable resources come questions about how they will affect humans and the environment. LSU Civil and Environmental Engineering Professor Chris Kees understands this curiosity and is working alongside LSU School of Landscape Architecture Professor Fabiana Trindade da Silva and LSU School of Renewable Natural Resources Professor Brett Wolfe to study the effects of solar farming in the state.

Thanks to a nearly \$500,000 experimental grant from LSU's Institute for Energy Innovation (IEI), Kees and his co-investigators are developing physics-based models of solar farms that will include their interactions with the surrounding environment and ecosystem using resources provided by LSU's IEI, Center for Computation & Technology, Coastal Ecosystem Design Studio, and Office of Research & Economic Development.

"We will include wind, water, soil, and vegetation interactions, so we're not only maximizing energy production but also optimizing resilience to flooding and wind; improving the health and biodiversity of native flora, fauna, and soils; and improving—on their own terms—the local communities that host large-scale solar deployments," Kees said.

Kees' team is developing models that are based on computational fluid and solid mechanics and ecological processes, which have a basis in the models used for understanding fluid-structure interaction in aerospace engineering, flooding in coastal engineering, and landscape evolution in ecology and agriculture. The models encompass a range of scales from water or air flow around a single panel or structural component to periodic arrays of panels over hundreds of acres of land or water.

## CIVIL ENGINEERING GRADUATE PRESENTS AT AMERICAN CONCRETE INSTITUTE CONVENTION

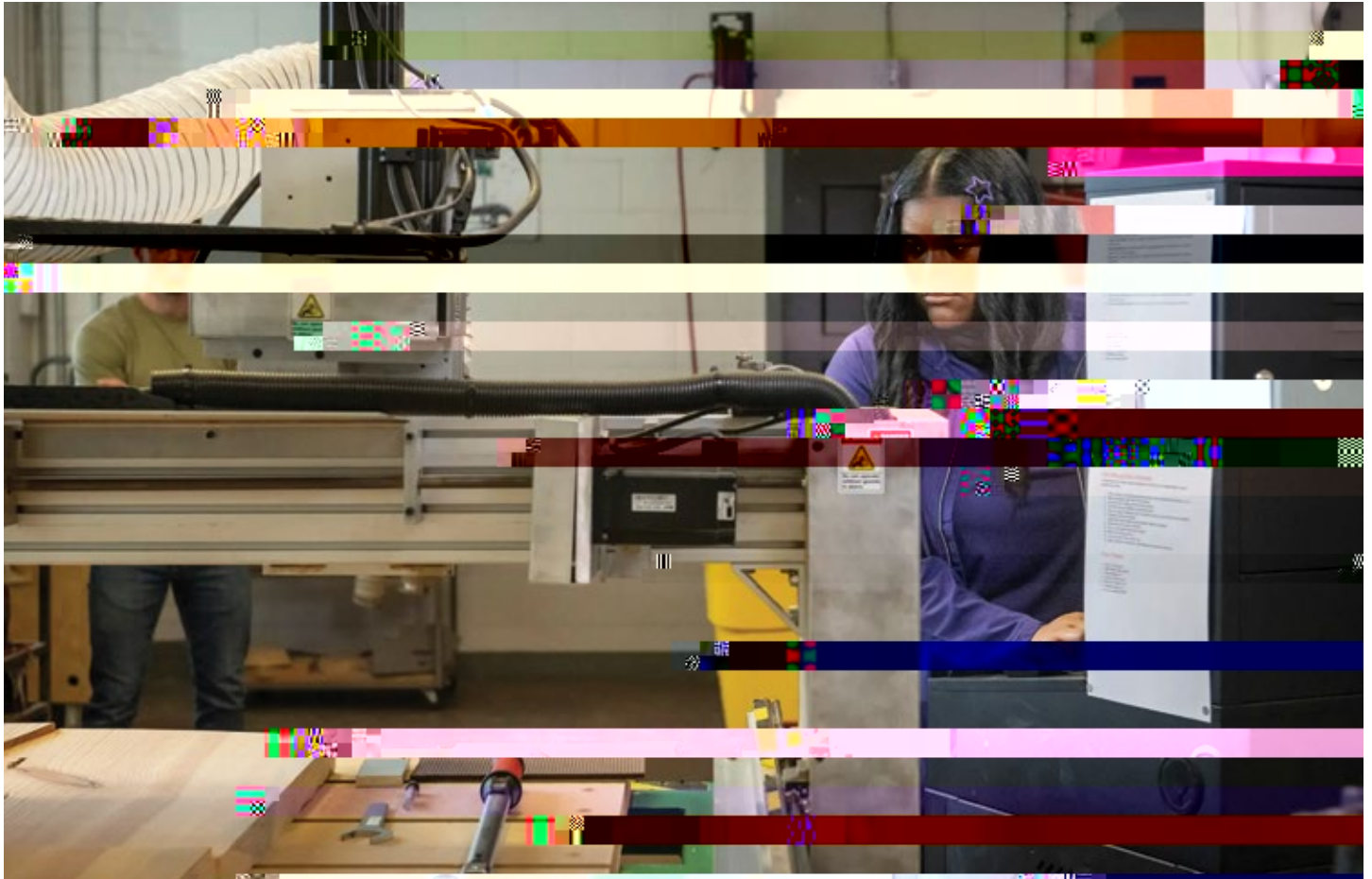
Andrew Callender, a recent May graduate in civil engineering from Baton Rouge, presented his research group's work at LSU Discover Day on producing low-carbon concrete using Louisiana-sourced materials to support the future underwater concrete additive manufacturing technology funded by NSF. Callender, who worked as an undergraduate research assistant in Assistant Professor Yen-Fang Su's laboratory, secured first place in the STEM oral presentation. Callender was also one of 10 chosen to present at the American Concrete Institute's (ACI) 2024 Spring Convention in New Orleans. (Thirty undergraduate students from across the world applied to present at the conference)

"Currently, about 8% of man-made carbon emissions come from the cement industry," Callender said. "A new cement blend called Limestone Calcined Clay (LC3) is shown to lower emisw cemen

# STUDENT NEWS

## LSU FRESHMAN DISCOVERS NEW PYTHAGOREAN THEOREM PROOF WHILE IN HIGH SCHOOL

*HER STORY WAS FEATURED ON 60 MINUTES*



An LSU freshman is on her way to having her name and work part of mathematics history. Meet Calcea Johnson. While in high school in New Orleans, Johnson discovered a new proof for the Pythagorean Theorem. Since then, she and a high school classmate have shared the experience with *60 Minutes* (*60 Minutes* in ital throughout the story).

“At first, I thought it was a prank. I thought it was some joke because I was like, ‘*60 Minutes* emailed me? That’s craziness.’ And then I looked up the correspondent who emailed me, and I was like, ‘This is real.’ And I just really was in disbelief, and I had to go to my mom, and I was like, ‘You won’t believe it! They just reached out to me and they want an interview.’ And the whole process was really nice, actually. It was less intimidating than I thought it would be. They really tried to make me feel welcome,” Johnson said.

The episode aired May 5. Johnson and her classmate sat down with CBS News correspondent Bill Whitaker and shared the discovery they made in high school.

“It really started with a math contest by our high school. This was its second year, and it had a bonus question: to create a new proof of the Pythagorean Theorem,” Johnson said. “There was also a monetary incentive, \$500, and that was really great for a senior in high school. But \$500 is not that much when you start doing all this work. We were the only two in the whole school to come up with a solution to the bonus question.”

The work done by Johnson and her classmate, Ne’Kiya Jackson, proved Pythagorean’s Theorem using trigonometry. The 2,000-year-old theorem states that in a right-angled triangle, the square of the hypotenuse side equals the sum of



squares of the other two sides.

"It was a lot of trial and error," Johnson said.

They presented their work at the American Mathematical Society semi-annual conference. Johnson said they are waiting for it to be published in a leading mathematical journal.

"If it is accepted into a journal, which we hope it is, then it would mean that our work has been accepted by the math community, which means it's solid and valid. We've had a lot of mathematicians look over our paper beforehand, and they've all said, 'The math is good. It's valid. This is a good proof,'" Johnson said.

While the proof is on its way to becoming part of the annals of mathematics, her story has received national and international attention.

"I would have never expected that this would go so far, so quickly, because it just really took off," Johnson said. "I feel really blessed to have this recognition and for people to see that young people, people of color, and women can do these things. So even though I am getting the attention, I feel like it's important to remember the other people who are also doing these things who I represent."

When she's not being interviewed about her mathematics discovery, Johnson is an LSU Ogden Honors College student studying environmental engineering.

"LSU just felt so welcoming, and all of the professors seemed like they cared about the students," Johnson said. "I really, really felt that love, and I felt that there were a lot of resources for students."

## WERC STUDENT AWARDS

LSU Environmental Engineering students competed in the 34th WERC Environmental Design Competition held from April 6-10, 2024, at New Mexico State University in Las Cruces, New Mexico. Sixteen LSU students competed as part of three teams, addressing tasks in the areas of storm-water treatment; water treatment for the production of H<sub>2</sub> as an energy source; and carbon capture. The teams won three awards, competing against schools including Michigan



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## **DR. WILLSON, STUDENTS WORK ON SERVICE PROJECT DURING SPRING BREAK**

During spring break 2024, six LSU students and Dr. Clint Willson went to Panama to work on a Global Water Brigades service project. During their week in a remote village along the Marraganti River, the students worked on several projects to increase the availability of potable drinking water for the residents. The studen

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## **12TH ANNUAL GRADUATE STUDENT RESEARCH CONFERENCE**

# HALL OF DISTINCTION

## W. ANDREW JACKSON, PE, PHD, BCEE, F AAAS



Dr. Andrew Jackson is a President's Excellence in Research Professor and Provost Integrated Scholar in the Department of Civil, Environmental, and Construction Engineering at Texas Tech University. Dr. Jackson obtained his BS in Biology from Rhodes College in 1990. He received his MS (1992) and PhD (1996) from the

Department of Civil and Environmental Engineering at LSU. In 1998, he joined the faculty of the Department of Civil, Environmental, and Construction Engineering at Texas Tech University, where he has worked for the last 26 years. He currently serves as chair of the department. He has been a licensed professional engineer in the state of Louisiana since 2002 and is a board-certified environmental engineer and a Fellow of the American Association for the Advancement of Science (AAAS), the world's largest general scientific society.

Jackson's research has had two main foci: (1) evaluating the fate and transport of a variety of contaminants in natural environments, and (2) development of closed loop water recycling systems in support of space exploration. In 2016, Texas Tech University recognized his research achievements with the *Barnie E. Rushing Faculty Distinguished Research Award*, the highest university research award. Jackson is considered one of the world's experts on perchlorate and chlorate, which are key pieces of the Cl biogeochemical cycle and can cause adverse health effects. His work has focused on natural production mechanisms, plant uptake, and biotic and abiotic transformation of perchlorate, as well as the ability to differentiate sources based on stable isotope analysis. His research even includes grants and publications focused on its occurrence and

fate on Mars, which enabled him to do field work in Antarctica. This work has been funded by EPA, DoD, NASA, and USDA. Jackson's work has led to several awards, including best paper (2005) by the journal *Environmental Science & Technology* and the Project of the Year Award by the Strategic Environmental Research and Development Program. He is also engaged in the development of high-resolution passive samplers to study fate and transport of various contaminants (e.g., explosives, chlorinated solvents, heavy metals, and PFAS). This work, funded by DoD, has led to the development of a field deployable device that is actively used at contaminated sites across the country. Jackson's other research area in sustainable life support has been continuously funded by NASA for the last 20 years. He has work focused on developing sustainable water recycling systems in support of long term extra-terrestrial habitation, particularly novel biological reactors which can operate in micro or partial gravity. This research on both contaminant removal, as well as nutrient recycling and recovery, led to Jackson's chairmanship of the primary NASA life support conference (ICES) in 2013 and the International Conference on Environmental Systems Technical Award in 2018.

Since 2022, he has served as chair of the Department of Civil Environmental and Construction Engineering. A gifted teacher and mentor, he continues to teach Environmental Engineering Capstone Design, Advanced Biological Wastewater Treatment Design, and Bioremediation courses and has received the Lockheed Martin and President's Excellence in Teaching Awards. Jackson is a member of the Association of Environmental Engineering and Science Professors, for which he currently serves on the board of directors, and previously served as chair of the Environmental Engineering Program Leaders Committee, for which he received a Distinguished Service Award. He has served as an editorial board member of various journals and was senior associate editor of the journal *Water, Air, and Soil Pollution*.

Jackson and his wife, Tali, have two children, Elise and William. The family loves to travel, and whenever possible, Jackson attempts to golf.

## ERIC IRELAND KALIVODA, PHD, PE

A native of Baton Rouge, Eric Kalivoda received a Bachelor of Science in Civil Engineering from LSU, a Master of Science in

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