LSU

Department of Civil & Environmental Engineering

CEE IN FOCUS

FALL 2021 • VOLUME 21 • NUMBER 1

FROM THE DEPARTMENT CHAIR

Our department is very active in studying and proposing solutions to the calamities bestowed on Louisiana due to the active hurricane season that we have every year. In this edition of our newsletter, two of our faculty, Drs. Sabarethinam Kameshwar and Navid Jafari, will share with you how they have addressed such issues.

The LSU Steel Bridge Team is back and gearing up for what is sure to be an exciting 2021-2022 season! The team has enjoyed consistent success in the last few years, including back-to-back advancement to the national finals.

We are very proud to announce that the Department of Civil and Environmental Engineering inducted into its Hall of Distinction three new members in October of 2021. They are Mr. Robert Slimp, chairman and chief executive officer of the HNTB Corporation; Mr. Steve Boudreaux of Stantec Consulting Services; and Professor Robert L. Thoms.

The previous academic year saw four of our very productive faculty retire/resign from the department and seek other opportunities. Dr. Steve Cai (the Edwin B. and Norma S. McNeil Professor) retired after 20 years here and joined as a distinguished professor at Southeast University in Nanjing, China. Dr. Chester Gordon Wilmot (the Lloyd J. Guillory Jr. Professor) retired after 28 years of service to both LSU and the Louisiana Department of Transportation. Mr. Clifford J. Mugnier retired from our department and the LSU Center for GeoInformatics (C4G) after 21 years of service. Dr. Xiuping Zhu, assistant professor, resigned to join Fudan University in Shanghai, China, as a professor. We are very happy to welcome Dr. Aaron Bivins, who graduated from Georgia Institute of Technology. He comes to us from the University of Notre Dame, where he was a jointly appointed postdoctoral research associate in the Department of Civil and Environmental Engineering and Earth Sciences and the Environmental Change Initiative. We also welcome Dr. Chunli Dai, who received her PhD from the Geodetic Science Program at The Ohio State University in 2015. Previously, she was a research scientist at the Byrd Polar and Climate Research Center at The Ohio State University.

Lastly, we are profoundly sorry about the passing of Dr. Scott Hagen, one of our esteemed faculty members who had a long and successful career in the field of coastal engineering. Our condolences to his family, friends, and colleagues.

Dr. George Z. Voyiadjis, D.Eng.Sc.,
Boyd Professor
Chair and Bingham C. Stewart
Distinguished Professor of Engineering

DEPARTMENT NEWS

HURRICANE IDA RECONNAISSANCE OBSERVATIONS IN LOUISIANA

Hurricane Ida made landfall on August 29, 2021, at 11:55 am near Port Fourchon as a major hurricane with sustained wind speeds greater than 110 mph and three-second gusts exceeding 128 mph. Although Ida had high wind speeds, it had small size and surge. In Plaquemine Parish, the levees were overtopped but were not breached, which caused flooding. Areas not protected by the levee system also experienced significant flooding during Ida. Widespread building and infrastructure damage was reported in the aftermath of the hurricane, along with extensive power outages.

Single-family residences were severely damaged in areas such as Grand Isle, Dulac, Cocodrie, and Chauvin. The damage in these areas included failure of members in roof frames; collapse of walls; and in some cases, complete structural damage leading to collapse. These damages appeared to be wind-induced (e.g., Figure 1); however, building damage in Grand Isle could be attributed to multiple hazards–wind and surge. Further north, damage to single-family residences were limited to loss of shingles and roof cover and wall cladding, with isolated cases of structural damage to roof components.

Several multi-family residences had damage, but most suffered non-structural damage, e.g., severe loss of roof cover. Some, however, had structural damage including gable end collapse.

Manufactured and mobile homes suffered significant damage in areas like Dulac and Montegut. Common damages included complete overturning of mobile homes and dislocation from supports. Additionally, roof damage was prevalent in areas with high wind speed.

Commercial buildings, such as strip malls and retail buildings, suffered more frequent damage compared to similar events in the past. Typical damage included damage to metal roof panels, loss of membrane roof, wall and roof damage, and cladding failure. Gas stations experienced loss of canopy or collapse. In coastal communities, partial collapse of industrial buildings was observed.

Figure 1. *Building collapse near Cocodrie (Photo by Brandon Rittelmeyer).*

Figure 2. *Damage to Little Calliou Volunteer Fire Department Station in Chauvin[1]*

Figure 3. *Cladding damage to South Lafourche High School.[1]*

The damages described above were mainly observed in coastal areas and bayou parishes that were close to the hurricane's track. Building damage was minimal in New Orleans and Baton Rouge since they were farther away from the hurricane and faced lower wind speeds.

Hospitals in the New Orleans-area had low levels of damage, such as broken windows and loss of membrane roof. However, the functionality of the hospitals immediately after the hurricane seemed limited due to loss of power and limited potable water. In contrast, the Lady of the Sea General Hospital in Cut Off suffered severe roof damage.

Fire stations were observed to have mixed performances. Some fire stations performed well while others had significant structural damage. The most common damage included failure of large doors and cladding. However, more severe roof failure was observed in Little Calliou Volunteer Fire Department Station (Figure 2).

Several schools suffered significant damage, the most common being loss of metal roof and damage to wall cladding. Figure 3 shows damage to wall cladding at South Lafourche High School, which also had metal roof damage.

Widespread damage to the power distribution system–mainly damaged wood poles and power lines—was observed. Additionally, a transmission tower near Bridge City collapsed during the hurricane. Figure 4 shows the collapsed tower which had buckled members, brittle failure, and corrosion.

Damage to roadway infrastructure was limited to movable bridges. A bridge in Jean Lafitte was hit by a barge, and several other bridges in the Bayou Parishes had mechanical left them inoperable. Low-lying railway tracks were washed out near Lake Pontchartrain along Interstate 10. Additionally, Houma-Terrebonne Airport suffered significant damage that included a collapsed hanger.

The widespread damage caused by Hurricane Ida has revealed several weaknesses in the building stock and the infrastructure systems. Particularly, the extent of damage observed in essential facilities such as schools, fire stations, and hospitals raises concern and warrants identification of mitigation measures since these facilities are critical for community recovery after such disastrous events. Furthermore, the collapse of the transmission tower and the widespread loss of power in southeast Louisiana further highlights the vulnerability of the energy infrastructure and the necessity for improving its resilience.essential facilities such as schools, fire stations, and hospitals raises concern and warrants identification of mitigation measures since these facilities are critical for community recovery after such disastrous events. Furthermore, the collapse of the transmission tower and the widespread loss of power in southeast Louisiana further highlights the vulnerability of the energy infrastructure and the necessity for improving its resilience.

1. Prevatt, D. Kameshwar, S. Roueche, D. Rittelmeyer, B. Duarte, T. Heo, T. Ibrahim, H. Klepac, S. Lafontaine, O. Lin, T. Manuel, L. Pilkington, S. Pinyochotiwong, Y. Santiago-Hernandez, J. Strader, S. Gurley, K. Kijewski-Correa, T. Mosalam, K. Robertson, I. (2021) "StEER: Hurricane Ida Joint Preliminary Virtual Reconnaissance Report-Early Access Reconnaissance Report (PVRR-EARR)", in *StEER - 29 August 2021, Hurricane Ida*. DesignSafe-CI. https://doi.org/10.17603/ds2-w6km-fe51.

Figure 4. *Collapsed transmission tower near Bridge City.*[1]

RECONNAISSANCE EFFORTS AFTER HURRICANE IDA

In response to Hurricane Ida, a week-long deployment funded by the National Science Foundation Nearshore Extreme Events Reconnaissance (NEER) and Geotechnical Extreme Events Reconnaissance (GEER) Associations was conducted in southeast Louisiana from October 10 through October 15 to assess the storm's damage extent and impacts to coastal infrastructure, especially levees, beach, and foundations. The reconnaissance efforts were led by Dr. Adda Zekkos (University of California-Berkeley Department of Civil and Environmental Engineering) and Dr. Navid Jafari (LSU Department of Civil and Environmental Engineering).

The deployment primarily focused on Grand Isle, Louisiana, with data collection also in Port Fourchon, Caminada Headlands, and Golden Meadow. The field team consisted of graduate students Jasmine Bekkaye, Alborz Fathinezhad, Omar Ulloa, and Omar Alawneh; and staff members of the National Science Foundation's RAPID Experimental Facility, Michael Grilliot and Jacqueline Peltier. Various equipment provided by the RAPID facility were utilized to characterize and quantify storm impacts to multiple facets of the nearshore system using a combination of ground and aerial campaigns. Additionally, mobile phone cameras were used by all field team members during the reconnaissance efforts to document damage and the community impacts of the storm.

Throughout the week, three different UAVs were employed to gather aerial imagery over affected areas. The sensefly eBee X, a fixed-wing UAV, was used to collect imagery that can be constructed into a 3D DEM. Surveys with the eBee X were conducted over the entirety of Grand Isle, sections of the levees in Golden Meadow, and some of Caminada to distinguish the extent of the storm's hazard and damage, as well as to evaluate the performance of the levee systems at multiple locations.

Additionally, a survey with the eBee X was conducted over Port Fourchon to observe potential damage to industrial storage tanks. Ground control points were placed by students across the island throughout flights and were measured using a GNSS RTK rover to improve the elevation and positional accuracy of the 3D model. The DJI Matrice 210, a quadcopter UAV equipped with a MicaSense Altum multispectral sensor, was flown over sections of the levee at Grand Isle to collect multispectral imagery to measure Ida's impact to vegetation health. The Matrice was also flown over debris staging sites to potentially characterize debris composition using multispectral imagery. The DJI Mavic 2 Pro, a quadcopter UAV, was used to capture aerial imagery of the debris staging sites to document the debris amounts and composition.

Multiple surveys were conducted by the Z-boat, a hydrographic survey boat that uses radio telemetry to gather shoreline bathymetry data. These surveys were performed primarily along the Highway 1 bridge crossing Caminada Pass to determine changes in bathymetry near and far afield from the bridge piers. The Leica RTC360, a terrestrial lidar scanner, was employed to collect 3D point captures of sections of Grand Isle's levee that sustained significant damage. In addition to sections of damaged levee, 360° scans around the debris staging sites using the RTC360 were collected during the Matrice 210 multispectral flights to use

in conjunction with the multispectral imagery to better characterize debris compositions and volumes.

A Streetview camera system that could be mounted on a car or worn as a backpack system was used to collect 360° images of the levee at Grand Isle and numerous streets throughout Golden Meadow, Caminada, and Grand Isle that had visible damage and debris. To document the levee at Grand Isle, the Streetview camera system was either mounted on a golf cart or worn on a backpack mount by students who took turns hiking across the top of the levee from one side of the island to the other. The Streetview camera system was additionally mounted on a car while a RAPID staff member drove through every road in Grand Isle—on LA-1 from Grand Isle to Raceland, Louisiana, and through various streets in Golden Meadow to document the damages to infrastructure and the resulting debris generated.

The variety of instrumentation utilized during the Hurricane Ida reconnaissance efforts will provide invaluable insights on the performance and response of coastal infrastructure during powerful storm events. The extensive data collected aims to fundamentally improve current knowledge of storm-induced ecological, geomorphological, and geotechnical changes to coastal infrastructure. The lessons learned and knowledge acquired from this perishable data can improve current models to promote resilience and reduce vulnerability in coastal communities.

CEE STEEL BRIDGE TEAM LOOKS TO BUILD ON SUCCESS

The LSU Steel Bridge Team is back and gearing up for what is sure to be an exciting 2021-2022 season! The team has enjoyed consistent success in the last few years, including back-to-back advancement to the national finals.

The National Student Steel Bridge Competition is an annual event where student teams from colleges across the country design, fabricate, and assemble a 1:10 scale steel bridge. This spring, the LSU Steel Bridge Team took first place at the regional level and advanced to nationals for the second year in a row. Unfortunately, just two days before the national competition, the team needed to make an emergency substitution for one of the builders. The builds are extremely physically and mentally demanding, so squeezing in extra practices on the day before the official build was a reflection of the team's commitment to the competition. Even with the last-minute substitution, the team outperformed its score from regionals thanks to the effort during practices and the work done to improve the strategy leading into nationals. Though the team is extremely competitive, being a member is more than awards and trophies. It is an educational, enriching, resume-building experience with a close-knit team that feels like family.

The Steel Bridge team helps students develop important skills they may not have the opportunity to learn in a typical classroom. In the shop, everyone is taught to safely operate the powerful tools used in the fabrication and modification of the bridge. On the build team, communication is key. Builders need to be loud and assertive, something that doesn't come naturally to all of us. During the design phase, everyone's voice is heard and all are invited to present ideas, including those who don't have deep knowledge of steel design. Students learn to think creatively and develop real-world applications to the formulas in their textbooks.

Another exciting part of the Steel Bridge experience is the travel. Competing in the regional and national competitions is the culmination of the team's dedication and hard work throughout the year. Although the team was not able to physically travel the past two seasons due to COVID-19, it still represented LSU by competing virtually from Patrick F. Taylor Hall. The members look forward to traveling again in spring 2022 as in-person competitions resume. The regional competition will be held at the ASCE Gulf Coast Student Symposium at Auburn University in March and the National Finals will be held at Virginia Tech in May.

CEE HALL OF DISTINCTION

In 2001, the Department of Civil and Environmental Engineering (CEE) established a Hall of Distinction to recognize individuals who have made stalwart contributions to the profession. Candidates are carefully selected based on distinguished professional achievement and service to civil and environmental engineering. Inductees will have made substantial impact in their field and to the Department of Civil and Environmental Engineering. In honoring these individuals, the department intends through them to recognize all those who have contributed to engineering excellence.

Inductees:

Robert Slimp

Dr. Robert Thomas

Steven Boudreaux

For biographies on all inductees visit:
http://www.lsu.edu/eng/cee/alumni/hall-of-distinction.php

Robert J. Slimp, PE

As chairman and CEO of HNTB Corporation, Robert Slimp oversees and directs the employee-owned, infrastructure solutions firm's strategic direction and leads more than 5,000 multidiscipline professionals in more than 70 offices across the United States.

HNTB is a $1-billion, 107-year-old leader in U.S. transportation, serving public- and private-sector clients with a specific focus on these markets—departments of transportation, tolls, tunnels, bridges, intelligent transportation systems, aviation, and transit and rail. Under Slimp's leadership, HNTB professionals solve clients' most complex technical, financial, and operational challenges, delivering a full range of mobility infrastructure-related services, including award-winning planning, design, program management, construction management, and architectural services.

Since joining HNTB in 2005, Slimp has held executive-level positions of increasing responsibility at the local, regional, and national levels. He joined HNTB as the firm's office leader in Austin and San Antonio and was later promoted to president of the firm's Northeast and Southeast divisions, where he led multidisciplinary staff in more than 30 offices.

Since becoming CEO in 2013, the firm's positive growth trajectory accelerated, with gross revenue increasing 73% in that timeframe. HNTB consistently ranks in the top 20 of the top 500 design firms listing by Engineering News-Record, the industry's leading trade publication.

Before joining HNTB, Slimp worked for another national infrastructure firm, designing projects and managing design teams in Louisiana, Texas, and other states across the country.

He knows that a strong transportation infrastructure system creates jobs, promotes economic development, and advances America's competitiveness in the international marketplace. He frequently speaks on these topics and engages in advocacy for equitable transportation with key elected officials across the country and in organizations such as Accelerator for America, United for Infrastructure, and other groups.

Slimp is also passionate about developing people and serves as a mentor to many within HNTB. His inclusive leadership style reflects his view that diversity of thought, experiences, and personal characteristics leads to better outcomes. He is also personally engaged in efforts to attract more students to the engineering profession. In 2018, he and his wife Shelly established a personal foundation within the LSU College of Engineering to award scholarships to qualifying female engineering students.

Slimp graduated from LSU with a bachelor of science in civil engineering. He and his wife have two children, Wesley and Ava.

Robert L. Thoms

Robert Lee Thoms was born at home near Nixon, Texas, on May 10, 1933. He graduated from the local public school in May 1950 and attended Texas Lutheran College in Seguin from 1950-1952. He next attended the University of Texas (UT) from 1952 until January 1955, where he earned a bachelor's in architectural engineering. This entailed taking all courses with civil engineering students, except for the substitution of architectural design courses in place of an extensive land surveying program. During this period, he was inducted into the honorary engineering societies of Chi Epsilon and Tau Beta Pi. Upon graduation, he was offered a position as instructor in the CE department by the chairman, hil M. Ferguson, and began teaching and graduate studies.

Thoms took coursework and did research at UT from 1955-1956. During this time, he also met and courted his future wife, Ann Fraser. He next taught in the math department at Del Mar Junior College in Corpus Christi, Texas, from 1956-1957. He and Ann were married in early 1957. They moved back to Austin in the summer of 1957, where he completed his work for the master's in architectural engineering under the direction of Hudson Matlock in the CE department.

From 1957-1959, he taught in the Department of Engineering Mechanics and took graduate-level courses at UT. He and Ann welcomed the arrival of their first child, Rebecca (Becky) Lynn, in the fall of 1959. Shortly thereafter, Thoms left to teach and pursue his PhD in the Department of Theoretical and Applied Mechanics at the University of Illinois in Champaign-Urbana. Ann and Becky joined him some six weeks later, following a long train trip from Texas.

While at UI from 1959-1962, Thoms was inducted into Sigma Xi and received a Ford Foundation teaching fellowship. He completed requirements for his PhD in September 1962, and he and Ann, along with three little Thoms (Becky, Heather, and Eric), headed south to LSU in Baton Rouge.

From 1962 to 1982, Thoms taught undergraduate and graduate courses at LSU in departments that evolved from engineering mechanics to engineering science and ultimately, civil engineering. He and Ann also welcomed a fourth member (Bryan) to their family in 1964. He attained the rank of full professor in 1969 during sabbatical leave with family at the University of Washington in Seattle. While at LSU, he served as the first president of the newly formed Faculty Senate and on numerous committees, including two chancellor search committees. He was also elected to Phi Kappa Phi and became a Professional (Civil) Engineer (PE) in Louisiana at this time.

Thoms elected for early retirement from LSU in 1982 after 20 years of service and began a consulting career. He and Richard M. Gehle incorporated "applied geomechanics" in Louisiana for consulting in mining and storage in salt formations. By 1988, he and Ann were "empty nesters," and they moved to College Station, Texas. Here, he and Gehle formed AGM Inc., a Texas company specializing in issues related to usage of salt formations. Thoms was also appointed an adjunct professor of geophysics and visiting member of the graduate faculty at Texas A&M.

Thoms decided to try semi-retirement in 2001 after a productive stay in College Station. He and Ann moved to Waveland on the coast of Mississippi while Gehle remained in Texas as a research assistant in the CE department of Texas A&M. Their stay in Waveland was generally a happy one with early morning walks on the beach, fishing, and visits by family. Their sojourn in Mississippi was brought to an abrupt end in August 2005, by the arrival of Hurricane Katrina.

He and Ann returned to Baton Rouge after Katrina and have lived there since. Sadly, Gehle died in 2006 of pancreatic cancer. Thoms continued his semi-retired consulting career until almost fully retiring in 2018, i.e., he remains a member of the Environmental Advisory Committee to the Strategic Petroleum Reserve (SPR).

Steve Michael Boudreaux, PE (LA, MS, TX)

Equipped with a bachelor's in civil engineering from LSU in 1978, Boudreaux has been fortunate to serve the transportation industry in Louisiana, Mississippi, Texas, and Alabama. His career now spans more than 43 years and is filled with challenging projects, satisfied clients, and wonderful relationships—all provided by the career opportunities in engineering.

With Pointe Coupee Parish and the New Roads, Louisiana, community as his lifelong home, Boudreaux learned the value of hard work early on. He stated, "As a farmer, my dad instilled in me a love and appreciation for hard work, which eventually became the work ethic that I am so happy to have today." Another quote given to him by his Paw-Paw (grandfather) Lejeune, who also gave him his original love for building things, is, "A man who knows how to work is never without a job."

After graduation from LSU in 1978, Boudreaux began his career with HNTB in Baton Rouge as a bridge engineer. During his seven years with the company, he was privileged to work on career-shaping projects like the Line & Grade Studies for I-49 Shreveport Urban and the Crescent City Connector (Mississippi River Bridge) in New Orleans. He also worked on final bridge design assignments, such as the Spring St.–Market St. Interchange in Shreveport and I-210 Interchange in Lake Charles.

In 1985, ABMB Engineers (Adkins, Boudreaux, McGaugh & Bruce) was formed. Boudreaux and his young partners were passionate about creating something of their own. ABMB was skilled and devoted to the transportation industry—starting out as a bridge and roadway firm and eventually also specializing in traffic and ITS. In more than 27 years of service, Boudreaux and his partners grew ABMB from four people to nearly 150 in Louisiana and Mississippi. Its main clients being the LADOTD and MDOT, ABMB focused on delivering high-quality projects and offering cutting-edge technology and innovation wherever it benefitted the project. As principal-in-charge of structures for ABMB, Boudreaux's past projects in Louisiana and Mississippi include I-49/I-20 and I-20/Lakeshore Drive Interchanges in Shreveport; I-49/US 167 Interchange in Alexandria; I-10 Truck Rail (Ramp II-3) Mississippi River Bridge and I-10 Picardy Interchange in Baton Rouge; I-210 Cove Lane Interchange in Lake Charles; I-20/Tarbutton Interchange in Ruston; US 61-Liberty Road Interchange in Natchez (ACEC–2009 Engineering Excellence Award); and I-10 Canal Road Interchange in Gulfport.

In 2012, Boudreaux and his partners agreed to be acquired by Stantec Consulting Services Inc. Boudreaux said, "It was bittersweet because it closed the door on ABMB but opened the door for our engineers to much larger opportunities throughout the US and Canada as we became part of a 25,000-person professional organization." Since becoming part of Stantec, Boudreaux has served as senior principal and operations leader for the company's BC2018 (business center), which covers Louisiana, Mississippi, and Alabama. Over these last eight-plus years, he has continued to serve the LADOTD, MDOT, and ALDOT. As the transportation industry has evolved, Boudreaux has served his transportation clients in alternative project delivery of Design-Build (DB) and Public Private Partnerships (P3) projects. In Louisiana, he has been privileged to serve as principal-in-charge on four of the 11 Design-Build projects undertaken by the LADOTD and as part of the quality-control team on Stantec's SH 288 Toll Lane P3 project in Houston.

With engineering as his chosen career, Boudreaux's passion is built on his love for the Lord and the love and support of a precious wife. He has served at First Baptist Church and the New Roads community as a deacon and faithful member of FBCNR congregation for more than 30 years. Boudreaux and his wife, Carol, have enjoyed more than 46 years of marriage and have a son and two grandchildren. He said, "Without a doubt, I married up. Carol has taught me the value of love, commitment, and family, which has been a true richness in my life." While neither directly affected his technical ability, Boudreaux acknowledges the impact that these two relationships have had on his career in equipping him as a servant-leader and providing him with wisdom, integrity, and discernment—making him the person and professional engineer he is today.

FACULTY NEWS

CEE FACULTY AWARDS

Voyiadjis Elected to European Academy of Sciences and Arts

Boyd Professor and Chair of the LSU Department of Civil and Environmental Engineering George Voyiadjis has been elected as member of the European Academy of Sciences and Arts, making him a member now of all three European Academies—the other two being the European Academy of Sciences and Academia Europaea of Physics & Engineering Sciences.

"My association with the faculty and researchers in European universities and institutions was one of the reasons for this recognition," Voyiadjis said. "I worked closely with researchers at Poznan University and the Polish Academy of Sciences, from 2004-2009, as the head U.S. researcher on a joint National Science Foundation grant. The project focused on investigating fracture and particularly localized fracture phenomena in thermo-elasto-viscoplastic flow processes under dynamic loadings in materials. I also established, in 2009, an exchange agreement with Ecole Nationale d'Ingénieurs (ENIM), Metz, France, and LSU and the University of Lorraine (UL) in France recently signed a memorandum of understanding to extend our relationship for the next five years."

About the European Academy of Sciences and Arts

The European Academy of Sciences and Arts is an international, non-governmental, and non-profit organization committed to promoting scientific and societal progress. Founded in Salzburg in 1990 by Felix Unger, Franz Kardinal König, and Nikolaus Lobkowicz, its members are leading scientists, artists, and business experts who are dedicated to innovative research, interdisciplinary collaboration, as well as the exchange and dissemination of knowledge. Among its members are 32 Nobel Laureates.

NEW FACULTY MEMBERS

Dr. Chunli Dai Joins CEE Faculty

Dr. Chunli Dai is new to the LSU Department of Civil and Environmental Engineering faculty this fall. Previously, she was a research scientist at the Byrd Polar and Climate Research Center at The Ohio State University, where she also received her PhD from the geodetic science program in 2015.

Dai's research interests include the use of various satellite remote-sensing techniques to understand Earth's dynamics and its processes under climate change and to address interdisciplinary engineering and scientific problems. She is particularly interested in developing novel computational algorithms using Big Data sets from contemporary geo-sensing systems to study coastal subsidence; natural hazards, such as landslides, volcano eruptions, and earthquakes; as well as coastal vulnerability to sea-level rise.

Mass wasting processes and their linkage to climate change.

Dai's past research has focused on establishing an Arctic mass wasting inventory using machine-learning algorithms from the Big Data set of time-dependent digital elevation models (ArcticDEM) generated from satellite photogrammetry. Her work was featured in Earth & Space Science News (EOS) in an article titled "Using Satellites and Supercomputers to Track Arctic Volcanoes." Dai used digital elevation models to reveal the aftermath of the 2008 Mount Okmok eruption in Alaska and the 2012-2013 Tolbachik eruption in Kamchatka (Figure 1).

For Dai, landslides provide an even more exciting application of ArcticDEM technology. Mass redistribution maps can be generated for both landslides on steep slopes and movement due to ground ice melt, which disturbs the surface and results in thermokarst landslides. There is evidence that such movements are increasing in area and frequency with atmospheric warming. As more data are collected over time with machine learning, patterns may emerge that could help inform future permafrost loss.

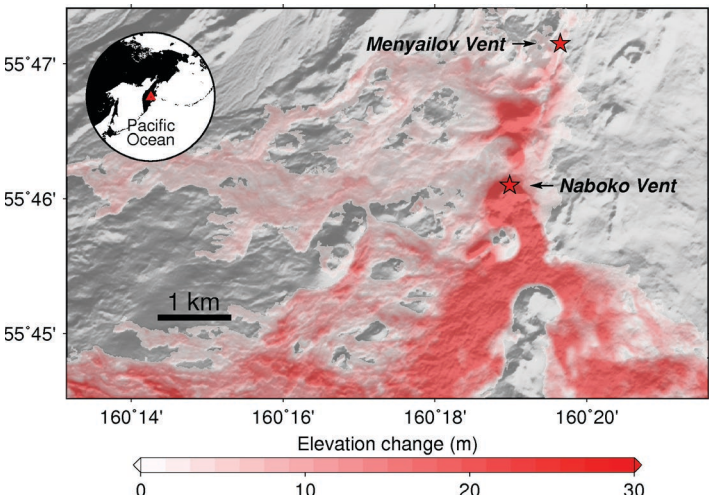

Figure 1. *Lava flow thickness variations mapped from ArcticDEM data.*

Precursory motions of slow-moving landslides.

The focus of Dai's ongoing and future research is to detect precursory motions of coastal landslides utilizing optical and radar satellite imagery and state-of-the-art data processing tools. Her recent discovery of a potentially tsunamigenic landslide in Barry Arm, Alaska (Fig. 2, published in GRL in 2020) was widely reported in news media. It played a role in allowing the National Landslide Preparedness Act bill to pass the US Senate. As a pioneering step toward automated detection of landslide precursory signals on a large scale, this work will pave the way for the early warning of large landslides and tsunamis and provide critical information for the preparedness and mitigation of coastal hazards.

Coastline mapping.

Dai is also a member of the NASA Sea Level Science Team. She is specifically working on the coastal migration zone analysis, including the global mapping of coastlines, the analysis of high-risk coastal zones, and the production of high-quality coastal DEMs.

Coastal subsidence and time-dependent geoid modeling.

Dai's future research is aimed at establishing a regional time-dependent geoid model for Louisiana by integrating various data sets, such as field gravimetric measurements, in situ deflections of the vertical measurements, high-resolution digital elevation models, airborne gravimetric measurements, satellite gravity data, GPS, and Interferometric Synthetic Aperture Radar (InSAR) data. Collaborating with researchers from multiple institutions, she aims to decode the driving mechanisms of land subsidence. The integration of gravity data and surface deformation data can help refine the subsurface and surface processes modeling, which will further improve the geoid modeling.

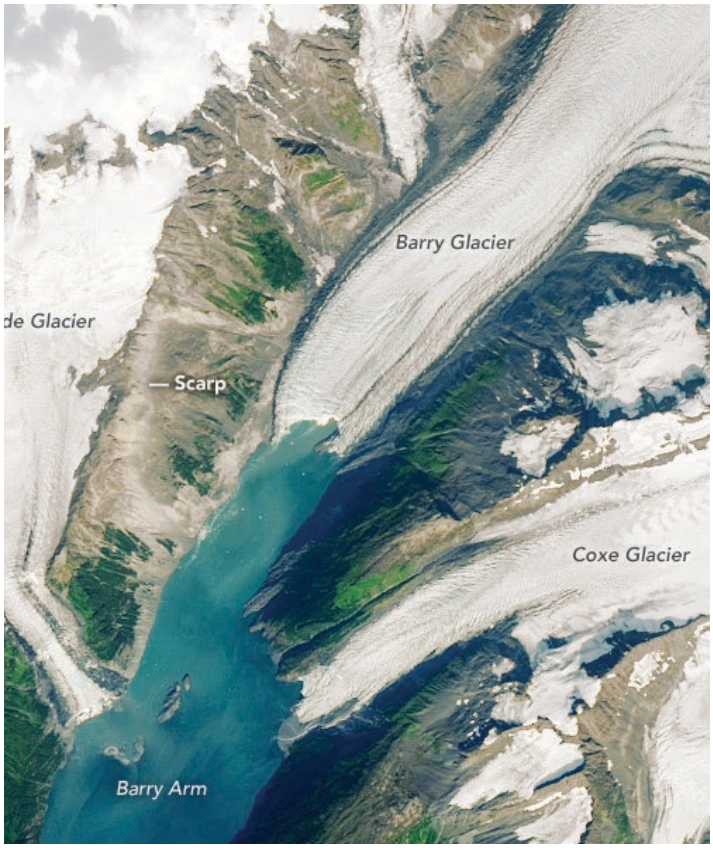

Figure 2. *The unstable terrain that poses a landslide and tsunami threat lies between the Cascade Glacier and Barry Arm Glacier. Image courtesy of Lauren Dauphin.*

Dr. Aaron Bivins Joins CEE Faculty

This Spring 2022 semester, Dr. Aaron Bivins will officially be a part of the LSU Department of Civil and Environmental Engineering faculty. He arrives at LSU from the University of Notre Dame, where he was a jointly appointed postdoctoral research associate in the Department of Civil and Environmental Engineering and Earth Sciences and the Environmental Change Initiative.

Bivins' research focuses on the use of environmental microbiology to detect and quantify public health-relevant microorganisms in engineered and environmental systems. He leverages techniques such as dead-end ultrafiltration, droplet digital PCR (ddPCR), and quantitative microbial risk assessment (QMRA) to estimate the public health risks associated with exposure to pathogens. His aim is to inform public health decision making and engineering interventions, especially in contexts which may not be amenable to traditional epidemiological designs. His research and teaching interests are informed by his professional practice as a civil engineer in Savannah, Georgia, where he designed and permitted various hydraulic infrastructure, including stormwater, drinking water, and wastewater systems. Bivins' teaching interests include environmental microbiology, applied statistics, project-based learning, engineering communication, and professional engineering practice. He earned his PhD and MS in environmental engineering and BS in civil engineering from the Georgia Institute of Technology in his home state of Georgia. Two specific areas of research interest for Bivins include the health impacts of deficient drinking water supplies and the rapidly growing field of wastewater-based epidemiology.

Deficient drinking water supplies.

While considered the gold standard for drinking water delivery, piped-on-premise drinking water access is not a panacea for waterborne disease. In some instances, deficient piped-water supplies become efficient distributors of waterborne disease. One prevalent deficiency is intermittent water supply (IWS), which is a piped-water supply that delivers drinking water to end-users on a discontinuous basis with hours-to-days of consistent supply interruption due to operational constraints. Bivins has estimated that nearly 1 billion people throughout the world receive their drinking water from an IWS. Using QMRA, he estimated that such supplies could account for 17.2 million waterborne infections per year among those exposed. During a study in Nagpur, India, Bivins found that both culturable E. coli and genetic material from a variety of waterborne pathogens were more frequently detected in water samples from household taps served by IWS than those served by continuous water supply (Figure 1). His findings emphasize the importance of water service continuity to maximize the health benefits frequently assumed for piped-on-premise drinking water infrastructure.

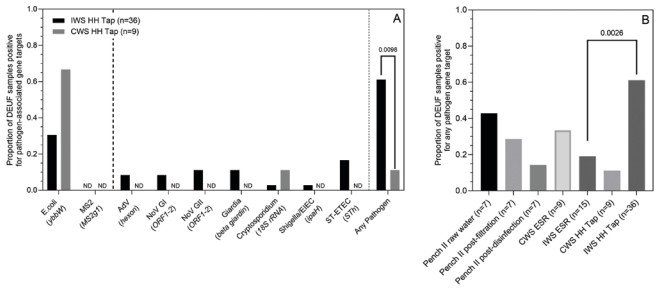

Figure 1. *The prevalence of waterborne pathogen detection by ddPCR in drinking water samples from household taps served by intermittent water supply (IWS) and continuous water supply (CWS).*

Wastewater-based epidemiology.

Wastewater-based epidemiology (WBE) is the surveillance of wastewater for chemical and genetic signals of disease to assess public health and inform interventions. In response to the COVID-19 pandemic, Bivins established the COVID-19 Wastewater-Based Epidemiology Collaborative, which now boasts more than 1,200 members worldwide. He has led the development of methods for the detection and quantification of SARS-CoV-2 RNA in wastewater. He has contributed to wastewater surveillance efforts on university campuses, in municipalities, and from aircraft and cruise ships. He has also contributed to the establishment of quality assurance and quality control protocols and the conceptual framing of SARS-CoV-2 wastewater surveillance paradigms. The data resulting from these efforts has been used to manage COVID-19 in a variety of settings, including the University of Notre Dame, the state of Indiana, and Australia. Figure 2 illustrates the usefulness of WBE as the positivity of wastewater solids for SARS-CoV-2

RNA decreased following mass vaccination of students on a university campus.

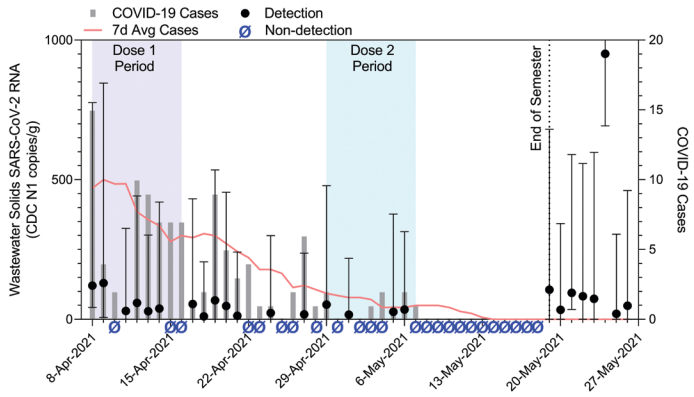

Figure 2. *SARS-CoV-2 RNA concentration in campus wastewater solids during a mass vaccination campaign of students, faculty, and staff.*

As the current COVID-19 pandemic illustrates, pathogenic microorganisms can have profound impacts on human health. While the realities of epidemic disease are currently self-evident, endemic diseases, such as diarrhea from fecal-oral pathogens or respiratory diseases from opportunistic pathogens, also have tremendous impacts on communities. Historically, societies have relied on large-scale engineered interventions, such as wastewater treatment, drinking water treatment, and vaccinations, to protect us from infectious diseases. But the efficiency of these interventions, especially in resource-limited settings, is constrained by the limited understanding of how microbes move through the environment. The goal of Bivins' future research is to characterize the movement of pathogens through engineered and environmental systems to improve the efficiency of engineered interventions and protect human health.

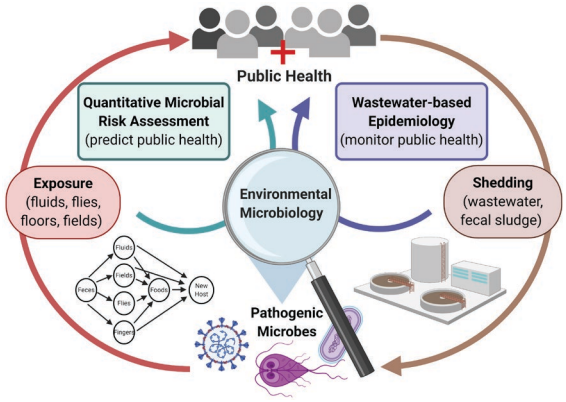

Figure 3. *Leveraging environmental microbiology to manage public health prospectively (upstream of exposure) and retrospectively (downstream of exposure).*

RETIRED FACULTY MEMBERS

Dr. Steve Cai

After enjoying his time at LSU for 20 years, Dr. Steve C.S. Cai is now a professor emeritus and forever a Tiger. Before leaving, Cai said it was his pleasure to work with all of his colleagues, including CEE leaders, faculty, and staff. He credits the people around him and across campus for being supportive and friendly over his career and will be proud to be continually associated with LSU, especially the CEE department in different capacities.

Cai also expressed his appreciation for the various support from LSU and CEE, including EDA assistantships, which helped him recruit more than 20 high-quality PhD students and develop competitive proposals. His research sponsors included NSF, FHWA, NCHRP, LA BOR, and LA LTRC, among others. As a principal investigator for more than 50 university- and federal and state government-funded projects, Cai was able to develop his research interests in bridge performance evaluation/instrumentation/testing, traditional and new material applications in infrastructures, performance and hazard mitigation of coastal structures under wave/wind actions, and long-span bridge aerodynamics. Through these research activities, he published more than 400 technical papers in more than 250 journals and conference proceedings in these areas mainly related to bridges. His students are well placed, including a few on the faculty of universities in the US and abroad, such as the University of Connecticut, Colorado State University, Hunan University, and Nanyang Institute of Technology, to name a few.

Cai began his employment in the LSU Department of Civil and Environmental Engineering as a tenure-track assistant professor in August 2001, was appointed as a tenured associate professor in August 2006, and was promoted to full professor in August 2010. Prior to his arrival at LSU, he had one year of

experience as a tenure-track assistant professor at Kansas State University (2000-2001), four years of experience as a structural researcher and development senior engineer at the Florida Department of Transportation (1996-2000), and three years of experience as a consulting engineer at Michael Baker Jr. Inc. (1993-1996).

At LSU, Cai served as coordinator of the Structures Group for more than 10 years and the Graduate Council from 2016 to 2021. He was awarded the Edwin B. and Norma S. McNeil Distinguished Professorship in 2010. He received several recognitions and awards, including the LSU Rainmakers Award in 2008 and 2009, LSU Distinguished Faculty Award in 2014, and the Best Paper Award from the American Society of Civil Engineers (ASCE) and the Earth and Space Conference in 2008. He also co-authored a paper with his former PhD student, winning the prestigious Collingwood Prize from ASCE in 2009, the Outstanding Young Researcher Award from the Louisiana Transportation Research Center Foundation in 2011, and the Michael Gaus Distinguished Service Award from the American Association for Wind Engineering. Cai was elected a Fellow of ASCE in 2010.

He earned his PhD in 1993 from the University of Maryland Department of Civil Engineering; his MS from Tsignhua University's Department of Civil Engineering in Beijing, China, in 1987; and his BS from Zhejiang University's Department of Civil Engineering in Hangzhou, China, in 1983. He also obtained a graduate fellowship from the University of Maryland and a graduate research fellowship from the Federal Highway Administration (1990-1993).

Cai has served on national and international committees, including as former chair of the ASCE Experimental Analysis and Instrumentation Committee. He also served and continues to serve on many editorial boards, including as associate editor for the Journal of Bridge Engineering, associate editor for the Journal of Engineering Mechanics, editor for Advances in Structural Engineering, and associate editor-in-chief for Advances in Bridge Engineering. He has been an advisor for ASCE and other student organizations. Other major professional services include serving as secretary and treasurer of the American Association for Wind Engineering and serving on the East Baton Rouge Parish Engineering Project Selection Committee as a representative of LSU.

Dr. Chester Wilmot

Chester Wilmot was born in South Africa in 1941 and graduated with a technicians diploma in drafting and surveying from Pretoria Technical College in 1963 and a BS in civil engineering from Pretoria University in 1967. He earned an MEng in transportation engineering from the University of California-Berkeley in 1972 and a PhD in transportation engineering at Northwestern University in Evanston, Illinois, in 1983. During his early career, he worked as a consulting engineer in bridge design and as a researcher in transportation planning for the Council for Scientific and Industrial Research. On his final return to South Africa from studies in the United States, he was appointed as a professor of civil engineering at the Rand Afrikaans University in Johannesburg in 1984. The purpose of the appointment was to establish a graduate program in transportation engineering. He established and ran a program of full-time study leading to a master's degree in transportation engineering with the assistance of four part-time instructors with PhDs from MIT, UC-Berkeley, and other prestigious universities. In 1988, he founded the consulting firm Transportation Research and Consultancy with two other partners to provide services in the field of transportation planning and travel surveys.

In 1993, Wilmot and his family emigrated to the United States. At that time, he was appointed as a research associate professor at the Louisiana Transportation Research Center to promote transportation planning. He conducted multiple projects and provided technical assistance to the Louisiana Department of Transportation and Development on a variety of topics. In 2000, he was appointed as a tenure-track associate professor in the Department of Civil and Environmental Engineering at LSU and has taught the transportation planning courses at LSU since. He also served as project manager of special studies at LTRC between 2000 and 2012. In 2004, Wilmot was granted tenure and promoted to full professor in 2009. In 2017, he was granted the Lloyd J. Guillory Professorship in Civil Engineering. His wife, Brenda, was appointed as a teaching associate at the LSU Lab School in 1997 and although officially retired, still serves as a substitute teacher and Cub Care employee at the school on a regular basis. Their two sons graduated from LSU, and thanks to the opportunities provided to them, are successfully practicing physicians in the United States at this time.

Mr. Clifford Mugnier, CP, CMS, FASPRS

Clifford J. Mugnier's cartographic/geodetic career life began in 1968, when he was commissioned as an officer in the Corps of Engineers and where he reached the rank of captain at the Army Map Service during the Vietnam War. During that time, he was engaged in research for mapping from the CORONA spy satellite system and worldwide topographic mapping. In 1979, Mugnier presented a one-day symposium to the Louisiana Society of Professional Surveyors in which he proposed a research program for Louisiana that would establish a baseline study of existing relative gravity at elevation benchmarks. The next year, Mugnier joined the University of New Orleans (UNO) as an adjunct member of the civil engineering faculty and worked there for 20 years. During his first few years at at UNO, Mugnier, with the assistance of three of his graduate students, observed the majority of benchmarks in metro New Orleans for geodetic-quality relative gravity, the data of which was accepted by the National Geodetic Survey (NGS). In 1989, the NGS observed absolute gravity at UNO.

However, continued subsidence due to faulting, compaction, de-watering, etc., at varying rates led to frustration among foundation engineers, flood prevention planners, and residential communities. A need for resurveying was necessary. To resurvey the benchmarks, however, the NGS would need to survey and walk from Pensacola, Florida, to New Orleans at the rate of $1,500/mile. This expense was too much for the State of Louisiana. The NGS realized that the only way to update benchmarks was to use GPS and gravity. At this point, geodetic research achieved practical real-time significance, as it became the only way to obtain reliable elevations.

In the early 2000s, Dr. Roy K. Dokka, a professor of geology and geophysics at LSU, realized that his field applied to Louisiana subsidence and moved to the Department of Civil and Environment Engineering to establish the LSU Center for GeoInformatics (C4G). Mugnier; who had been a full-time member of the LSU Civil Engineering faculty since 2000 and teaching Surveying, Geodesy, and Photogrammetry; was later approached by Dokka, who offered him the position of chief of geodesy. C4G began installing GPS Continuously Operating Reference Station (CORS) sites throughout Louisiana. At Mugnier's urging, in 2002, the commander of the New Orleans District Corps of Engineers requested the support of the National Geospatial/Intelligence Agency (NGA) by observing absolute gravity at all existing C4G CORS sites in Louisiana. In 2018, the C4G acquired its own FG5-X absolute gravity meter. After Dokka's passing, Mugnier continued his support for the center by helping write federal grant proposals and speaking at state and federal meetings to raise funds for the project. In June 2018, he travelled to Riga, Latvia, to inspect a newly developed instrument for observing the tilt of the gravity field (deflection of the vertical) and recommended that C4G purchase a Latvian-made Digital Zenith Camera the following year. By mid-2019, NGA had completed its second absolute gravity campaign at all of the original CORS sites observed in 2002, and the results provided evidence of noticeable variations of absolute gravity which indicated that most (but not all) changes were presumably due to subsidence. The C4G research staff now continues its densification of observations of absolute gravity, as well as observations of deflections of the vertical throughout the Gulf South for subsidence research at LSU CORS sites. This research also provides support to NGS for geoid enhancement (math model of the Earth's gravity field). Land surveyors and engineers no longer depend on benchmarks for reliable elevation references in Louisiana. The only way to obtain reliable elevations in Louisiana is to observe heights with GPS and compute elevations with the geoid. Louisiana law dictates that LSU C4G is the statutory elevation reference source (LA. R.S. §178.1).

Mugnier has authored more than 300 peer-reviewed papers, reports, and column articles; some of his work has been translated by others into Arabic, Bulgarian, Chinese, French, Japanese, and Spanish. He is cited in more than 200 books, papers, and dissertations in 11 various languages. Mugnier is classified as an expert in NRA Conventional Bullseye (Precision) Pistol competition. He and his wife Miranda are the parents of seven sons and three daughters and grandparents to 18 grandchildren. In his retirement from teaching, Mugnier continues to come in to the C4G weekly. He also continues to publish and offer answers and support when needed. He will continue his private practice in forensic photogrammetry.

IN MEMORIAM: DR. SCOTT HAGEN

The Department of Civil and Environmental Engineering is profoundly sorry to learn of the passing of Dr. Scott Hagen, one of our own esteemed faculty members who had a long and successful career in the field of coastal engineering. Dr. Hagen embodied what it takes to have a distinguished academic career. He always carried himself with a zeal and zest for his work. We send our sympathy and condolences to his wife Dr. Denise Elizabeth DeLorme and the rest of the family.

On January 8, 2015, Dr. Hagen joined our faculty and was named the John P. Laborde Endowed Chair for Sea Grant Research and Technology Transfer. He also had an appointment with the LSU Center for Computation and Technology and was a fellow of the LSU Coastal Studies Institute. He spent the previous 17 years at the University of Central Florida, where he established the internationally- recognized Coastal Hydroscience Analysis, Modeling, and Predictive Simulations (CHAMPS) Lab.

Dr. Hagen and his team developed numerous forecast tide and storm surge models that span the deep ocean to coastal land margins in the northern Gulf of Mexico and are inclusive of the coastal floodplains of Mississippi, Alabama, and the Florida Panhandle. His more recent efforts expanded into transport and biogeophysical modeling, with an emphasis on the coastal dynamics of global climate change and sea level rise, in particular.

Dr. Hagen trained and mentored students to conduct scientific research and benefit society through environmental communication and outreach. He led teams that included graduate students working in conjunction with industry and government counterparts to develop coastal inundation models in direct support of FEMA flood plain mapping. These flood insurance studies have been implemented for the Florida Panhandle, the Alabama coastal areas, and the east Florida/Georgia coastal flood plains.

Dr. Hagen was a Professional Engineer with the State of Florida and was certified as a diplomate of both coastal and water resources engineering. He was a past member of the board of governors for the ASCE Coasts, Oceans, Ports, and Rivers Institute and served on the predictive modeling technical advisory group for the 2017 Louisiana Coastal Master Plan. In 2012, he hosted the 10th International Conference on Hydroscience & Engineering and was honored with an Outstanding Achievement Award for Advancement of the State of the Art in Hydroscience & Engineering. In 2014, he was elected a Fellow of the American Society of Civil Engineers.

Rest in peace, Dr. Scott Hagen.

Drs. John Pardue, Christopher Kees, and George Voyiadjis presented their respective research work to LSU President William Tate IV during his visit to the College of Engineering and Department of Civil and Environmental Engineering.

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ALUMNI REGISTRATION & UPDATES

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Please include basic information, such as your full name, year of graduation, degree, mailing address, email address, telephone number, company, and your title/position. For your update, please include information on your recent professional and personal developments, along with a high-resolution photo, if available.

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