



FROM THE DEPARTMENT CHAIR



We had quite a few challenges and activities since January of this year. A lot of uncertainty was involved during this period of time, addressing both safety and instructional protocols/needs that were new to us. We have been offering nearly half of our teaching load online, as well as advising our students virtually. We have adjusted to the new mode of operation with planning and addressing our educational needs

for the Fall and Spring. This was an evolution period of our mode of operations for our students, faculty, and staff.

In response to the Covid-19 pandemic, a number of our faculty were involved in research projects to help our local community and address global issues in both water treatment and transportation safety. For instance, Dr. John Pardue, professor of civil and environmental engineering at LSU (CEE), has been involved in testing wastewater in the community and on campus for the coronavirus. He, along with a number of our faculty, have worked over the last several months with researchers from the LSU School of Veterinary Medicine to test samples of wastewater from around the LSU campus in Baton Rouge to determine where and if cases are to be found.

This semester, a senior faculty, Dr. Christopher Kees, joined our department. Before joining CEE, he worked at the U.S. Army Engineer Research and Development Center. Dr. Kees is in the coastal engineering area and is well-known in computational hydrology and porous media, as well as the coastal hydrodynamics community. He holds a joint appointment with the LSU Center for Computation and Technology.

Congratulations to CEE Professor Zhiqiang Deng on receiving a \$750,000 award from NASA and a \$750,000 matched grant from the Louisiana Board of Regents for his project that will allow oyster harvesters to detect oyster beds that are infected with norovirus and vibrio vulnificus, also known as flesh-eating bacteria. The Gulf of Mexico produces more oysters than anywhere else in the United States, with Louisiana accounting for more than a third of the nation's annual harvest.

I am proud to add my own accomplishment to this list, as I was honored to be elected as a foreign member of the Academia Europaea-Physics & Engineering Sciences, a prestigious international organization of scholars.

One of our junior faculty who joined us last year, Dr. Hai Thomas Lin, was awarded the Michael R. Mangham Tiger Athletic Foundation Undergraduate Teaching Award in May. The award recognizes professors who demonstrate excellence in instruction. The memorial scholarship honors the life of Michael Ray "Mickey" Mangham, the former chairman of the Tiger Athletic Foundation and LSU football player.

We are close to the end of the fall semester. I appreciate all of you embracing the new normal and diligently doing your best to succeed in our mission in the current mode of operation.

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

DEPARTMENT NEWS

CEE CHAIR NAMED MEMBER OF ACADEMIA EUROPAEA



For the fourth time in seven years, Boyd Professor and Chair of the Department of Civil and Environmental Engineering George Voyiadjis has been elected as a foreign member of a prestigious international organization of scholars, most recently, the Academia Europaea-Physics & Engineering Sciences.

In 2013, Voyiadjis was elected to the Polish Academy of Sciences (Technical Sciences Division); in 2016, the National Academy of Engineering of Korea; and in 2019, the European Academy of Sciences.

“This is a great honor for me and I am extremely proud to be recognized by my peers in such a way,” Voyiadjis said. “I’m also looking forward to representing LSU and the College of Engineering among my European counterparts, whom I first collaborated with in 2004. This award represents a recognition way beyond anything I ever imagined as a student at Columbia University nearly 47 years ago. 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 of this work. Working with my students has been the catalyst of my success in my academic career. The importance of this interaction is to challenge them, but also allow them to interact with you through the evolution of the research work.”

Voyiadjis began his career at LSU in 1980 as an assistant professor after working at the California Institute of Technology, where he earned his master’s in civil engineering, and Columbia University, where he earned his PhD in engineering mechanics. His primary research interests are in plasticity and the damage mechanics of metals, metal matrix composites, polymers, and ceramics with an emphasis on the theoretical modeling, numerical simulation of material behavior, and experimental correlation.

The object of the Academia Europaea is the advancement and propagation of excellence in scholarship in the humanities; law, the economic, social, and political sciences; mathematics; medicine; and all branches of natural and technological sciences anywhere in the world for the public benefit and for the advancement of the education of the public of all ages in the aforesaid subjects in Europe. Its members are scientists and scholars who collectively aim to promote learning, education and research. Current membership stands at around 4,000 and includes 72 Nobel Laureates. Invitations are made only after peer group nomination, scrutiny and confirmation as to the scholarship and eminence of the individual in his or her chosen field. Election is confirmed by the Council of the Academia.



LSU RESEARCHERS TO TEST CAMPUS WASTEWATER FOR COVID-19 CASES

For the last several months, researchers from the LSU College of Engineering and School of Veterinary Medicine have tested wastewater in various areas around East Baton Rouge Parish to track cases of coronavirus. What they have found, thus far, is that cases increased soon after Louisiana moved into Phase 2 and dropped after the city-parish instituted a mask-wearing mandate. Now they will implement that research on the LSU campus to help determine numbers and location of cases.

“This innovative project is yet another example of how we’re putting the cutting-edge research of LSU faculty into action to help monitor and contain COVID-19, and it will be a great supplement to the many other preventative measures we’re taking to ensure our campus is as safe as it possibly can be for our students, faculty, and staff,” said LSU Interim President Thomas C. Galligan Jr.

The first step in the process is taking the flow-composited wastewater sample and pasteurizing it, followed by performing an RNA extraction. A reverse transcription is then conducted to obtain cDNA, followed by the qPCR detection of SARS-CoV-2, the official name for coronavirus. The testing is conducted at the GeneLab, a multi-faceted core laboratory directed by the Division of BioMMED at the LSU School of Veterinary Medicine that engages in specific research and training projects. For the LSU campus project, the researchers have designed a new sampling network that will target 350-500 students with each sample. The locations differ depending on the on-campus residence but will be scattered throughout campus. Samplers at the two large off-campus pumping stations are running and will continue to be analyzed to determine the total of amount of virus circulating on the campus.

“We will be testing every on-campus residence [dormitories and on-campus apartments],” said LSU Environmental Engineering Professor John Pardue. “Initially, we will monitor every location once per week. It takes two days to process each sample, so we will have the data the same week the samples are taken. We will continue indefinitely until the campus has the information



needed. We will transmit the results to the campus team managing the pandemic response with recommendations based on the amount of virus detected.

“If there are elevated levels measured in the sewage, we can intervene with a more extensive individual testing program so students can be isolated to prevent the spread in any one location. We have months of experience measuring SARS-CoV-2 in Baton Rouge wastewater, so we understand the significance of the numbers that we measure using this technique. Since we are measuring everywhere, we will be able to determine the relative amount of infected students at each location. While we can estimate the number of infected students as one or five or 10 based on literature values, we really are doing the testing to support LSU’s individual medical testing plan.”

Pardue is joined on the project by LSU Veterinary Medicine Professors Konstantin “Gus” Kousoulas, Ramesh Subramanian, and Vladimir Chouljenko; and LSU Civil and Environmental Engineering Professors William Moe and Samuel Snow. LSU Facility Services also helped plan the on-campus network locations.

PROFESSOR RECEIVES \$1.5 MILLION AWARD FOR OYSTER RESEARCH



Each year, nearly 2 billion oysters are consumed around the globe. The Gulf of Mexico produces more oysters than anywhere else in the United States, with Louisiana accounting for more than a third of the nation's annual harvest. This means plenty of people along the Gulf Coast are eating raw oysters; unfortunately, some of these oysters carry diseases without the consumer knowing. Thanks to a \$750,000 award from NASA and a \$750,000 matched grant from the Louisiana Board of Regents, LSU Civil and Environmental Engineering Professor Zhiqiang Deng is working on a project that will allow oyster harvesters to detect oyster beds that are infected with norovirus and vibrio vulnificus, also known as flesh-eating bacteria. Deng's project, called Satellite-Assisted Forecasting Environment for Improving Oyster Safety (SAFE Oyster) was selected for the federal award by the NASA Established Program to Stimulate Competitive Research (EPSCoR) Program

Office. Deng proposes using innovative NASA satellite-based information products to enhance the forecasting of norovirus and vibrio risks of oysters harvested along Louisiana and other Gulf Coast areas.

"This project is meant to decrease the number of people getting sick and also decrease oyster recalls," Deng said. "The project will aid in the economic development of Louisiana by reducing costly oyster ground closures and recalls, thereby increasing oyster production."

The SAFE Oyster team includes experts in remote-sensing, water quality modeling, norovirus modeling and forecasting, environmental health, epidemiology, vibrio microbiology, machine learning, and cyber engineering.

The project's objectives include converting NASA satellite remote-sensing images to parameters indicating the environmental health of oyster harvesting waters; creating models that incorporate the remote sensing parameters to forecast the oyster safety risk level; and developing tools for automating the conversion, transfer, and sustained use of the NASA satellite remote-sensing data.

"Like weather forecasts, our models will show which oyster beds need to be looked at and have samples taken," Deng said. "If the samples show a high amount of bacteria, we will notify the government and they will shut it down."

The SAFE Oyster project will not only help the Gulf Coast oyster industry, which boasts an annual economic impact of \$220 million from Texas to Florida, it will also decrease the number of hospitalizations due to acute gastroenteritis and the high cost of treating it. Since 2018, nearly 1,000 people along the Gulf Coast have become infected with vibrio vulnificus, with half losing their lives and some survivors losing limbs. While the norovirus causes diarrhea and vomiting, vibrio eats away at skin and muscle tissue and is more fatal. Vibrio vulnificus infection is the leading cause of death related to seafood consumption in the U.S. For the past 20 years, California has banned the sale of raw, untreated Gulf oysters from April to October, the months when vibrio vulnificus bacteria is more likely to be present. Hence, the old adage to only eat oysters in months containing the letter "r." Deng's project hopes to keep "the canary of the ocean" viable for safe human consumption in an industry that has taken some hits over the years.

The oyster industry has been a staple on the Gulf Coast for generations, though it has seen its fair share of hard times. Most recently, the Bonnet Carré Spillway openings in 2018 and 2019 allowed an unprecedented amount of freshwater intrusion into the saltwater oyster beds, destroying millions of oysters. According to Louisiana Wildlife & Fisheries Oyster Program Manager Carolina Borque, Louisiana can normally harvest up to 12.3 million pounds of oyster meat in one season, which makes up 40% of the country's supply. However, with the spillway opening in 2018 and 2019, the oyster supply decreased to 11 million pounds in 2018 and dwindled to just 7.8 million

pounds in 2019. This has led to oyster shortages and soaring prices. Oysters that normally went for 25 cents each went up to more than 60 cents each.

Even before this, the Deepwater Horizon oil spill in 2010 killed an estimated 4-8.3 billion oysters along the Gulf Coast. Other factors besides the norovirus and vibrio vulnificus ailing the oyster industry are changes to freshwater flow along the Gulf, sedimentation from more frequent storms, inconsistent replacement of oyster bedding material (called clutch), and heavy fishing. A decrease in oysters could not only affect oyster harvesters and restaurants, but also industries that use the shells for such things as chicken feed supplement.

There are also scenarios, such as the one involving Sabine Lake on the Louisiana-Texas border. The lake supports one of the largest unharvested oyster reefs in the Gulf that stretches approximately four square miles. There has been a ban on oyster harvesting in the lake for more than 70 years since it was completely harvested in 1904. While Louisiana would like to harvest their side of the lake, Texas balked because harvesting would destroy the 10-foot-high oyster reef and, in turn, deplete the fish population in the lake. Oysters keep the fish population healthy by filtering the water (just one oyster can filter 50 gallons of water a day).

The 2020 season has not seen much public harvesting for a couple of reasons. "There's not much to harvest due to the flooding in 2019," Borque said. "Plus, the pandemic has really hit the restaurant industry hard."

New Orleans, a hot spot for oysters and tourists, has been almost completely shut down since March, leaving oyster farmers without a place to sell their product. The only saving grace has been oyster leases and caged oyster farming, a more modern way of gathering the slimy gems.

"Ninety percent of restaurants supply these 'boutique' oysters now that come from caged farming," Borque said. "They are a more perfect shape with amazing meat and can be salty or not. They haven't been too big in Louisiana yet because so many harvesters are gathering oysters in a more traditional way."

WATER SUSTAINABILITY PROJECT TAKES STUDENTS TO FRANCE



Perrier isn't the only water important to France. LSU Civil and Environmental Engineering Assistant Professor Samuel Snow recently received a National Science Foundation grant in the amount of \$156,654 for a project that will take his students to France to research water treatment and reuse technologies. The project is a collaborative effort between LSU and Michigan State University, with each university sending three students to France for nine weeks each summer between 2021 and 2023. While there, the students will engage in water science and engineering research with colleagues from the European Membrane Institute and University of Montpellier in Montpellier, France, one of the oldest universities in the world established in 1292.

“What we're trying to do is give students an opportunity to engage with the faculty and research facilities in France who put a big emphasis on water reuse—treating water to the level where we can directly use it after it's treated,” Snow said. “The students will use both membrane and photo-driven technologies, photo chemistry and membrane separation in order to produce cost-effective water treatment technologies.”

The two French universities focus heavily on water treatment and membrane technologies and have high-quality instrumentation and large-scale labs that will enable the students to learn more than they could from their schools in the United States.

The students' research will have multiple focal points, such as photo-catalyzed degradation of pharmaceuticals in hospital wastewater; novel UV-LED technology for photocatalytic wastewater treatment; photocatalytic membranes for inactivation of viruses; natural coagulants for water treatment; and human capacity building through global exchange activities. “The projects are designed to accentuate questions regarding humanity's relationship with water, adding a unique interdisciplinary quality to the program,” Snow said. “The ultimate goal is to foster global, technical and professional competencies in a diverse group of students. This experience will equip them with essential skills for success in the increasingly globalized world as they engage their knowledge and passions to address critical environmental challenges.”

Snow and his MSU counterpart will travel with the students to France and spend the first 10 days teaching and training them before they start on their projects. One experienced graduate student will accompany two undergrad students from both LSU and MSU. Funding for Snow's project begins in September 2020, which gives him nine months to prepare for the first trip. “The timing worked out in that COVID-19 probably won't affect our first trip next year,” he said. “This is my first federal grant, so I'm pretty excited about that. It's an excellent opportunity for the students, and even myself, to grow from the projects we've been working on.”

FACULTY AWARDS

LIN RECEIVES TWO AWARDS



Geotechnical Engineering Professor Hai Thomas Lin was awarded the Michael R. Mangham Tiger Athletic Foundation Undergraduate Teaching Award in May. The award recognizes professors who demonstrate excellence in instruction. The Memorial Scholarship honors the life of Michael Ray “Mickey” Mangham, the former chairman of the Tiger Athletic

Foundation and LSU football player who graduated from LSU in 1962 with a petroleum engineering degree and a law degree from the LSU Paul M. Hebert Law Center in 1966.

Lin was also awarded the Ralph E. Powe Junior Faculty Enhancement Award from Oak Ridge Associated Universities (ORAU) in September. This competitive research award provides seed money for junior faculty members that often result in additional funding from other sources.

MOHAMMAD APPOINTED CHAPTER PRESIDENT



Transportation Engineering Professor Louay Mohammad has been appointed president of the LSU Chapter of Phi Kappa Phi. The Honor Society of Phi Kappa Phi is the nation’s oldest and most selective all-discipline honor society. Membership is by invitation only to the LSU’s top 7.5% of second-semester juniors and the top 10% of seniors and graduate students.

provides seed money for junior faculty members that often result in additional funding from other sources.

STUDENT AWARDS



UPSHAW RECEIVES FELLOWSHIP

Matthew Upshaw, a PhD student under the direction of Professor Steve C.S. Cai, has received The Darrell F. Elliot Louisiana Fellowship, which is awarded annually to a student in construction, design, education, or materials programs during the year of the award by the ACI Foundation and is sponsored by the Louisiana Chapter of ACI. It provides a \$10,000 stipend, in addition to paid attendance fees and travel expenses to two ACI conventions during the award year and assistance in finding an industry mentor. Awardees must compete in a rigorous application process that includes the submission of two letters of recommendation and an essay addressing personal goals in the concrete industry before finalist interviews are conducted.

Upshaw would like to thank Professors Cai and Ayman Okeil for providing letters of recommendation for his application, as well as the Louisiana Chapter Board of Directors for sponsoring the award and the ACI Foundation Scholarship Council for its work in reviewing the applications and conducting all finalist interviews.

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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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