College of Engineering
Department of Civil & Environmental Engineering

Louisiana State University
3325 Patrick Taylor Hall
Baton Rouge, LA 70803

ADDRESS SERVICE REQUESTED

ALUMNI REGISTRATION & UPDATES

The Department of Civil & Environmental Engineering is always interested in how our alumni are doing. We hope you will take the time to send your updates to **jmueller@lsu.edu** or, if you prefer, you can "snail mail" them to:

Department of Civil and Environmental Engineering
Louisiana State University
Attn: Julie Mueller
3325 Patrick Taylor Hall
Baton Rouge, LA 70803-6405

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-quality photo, if available.

Thanks for staying in touch!

To connect with the LSU College of Engineering, please visit **www.eng.lsu.edu/alumni/update**

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

CEEINFOCUS

FALL 2016 VOLUME 16

FROM THE DEPARTMENT CHAIR

A letter from George Z. Voyiadjis

The Department of Civil and Environmental Engineering (CEE) undergoes a continuous process of reevaluation that leads to development and improvement of our programs. As we develop our undergraduate and graduate curricula, we are cognizant of our mission of producing future leaders who are adequately prepared at their first job and can creatively apply thereafter their basic knowledge. An important aspect of the whole curriculum review effort is to make the use of information technology an integral part of the teaching and learning processes. As the computer provides added capability in the hands of the students, we should effectively exploit it in their learning process. The curriculum review process involves reexamining the discipline groupings that have slowly grown within civil and environmental engineering as *well as within* other engineering branches. We need to carefully and continually assess what we want our graduates to know at the time of graduation and also at the end of each course.

Our department has experienced a sizeable growth during the last decade. Bringing our count to 28, this semester we welcomed three new assistant professors: Samuel Snow, Zimeng Wang and Xiuping Zhu. Research funding in the department has doubled in the last five years with our faculty having secured over 6.0 million dollars in research funding from state, federal and private organizations. The department has the second highest enrollment of graduate students in the University.

The objective of our research-oriented programs is to find effective solutions to the problems currently faced by the profession, and then to predict the issues that may challenge the profession in the future. In the process, we will be educating individuals who are equipped to effectively respond to such challenges. Our programs are faced with the continuous challenge of securing adequate laboratory and space resources, computing facilities, and basic instrumentation to support the faculty's effort to pursue sponsored research funding.

Our faculty are making vigorous efforts to undertake collaborative research within the department cutting across the discipline areas, within the college across different fields of engineering, across the different departments/colleges in the university, and across universities. These efforts reflect the interdisciplinary nature of present day research efforts and help to attract sponsored research proposed by interdisciplinary research teams and industrial partnerships.

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

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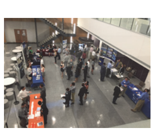
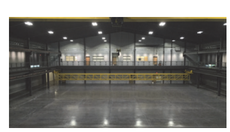






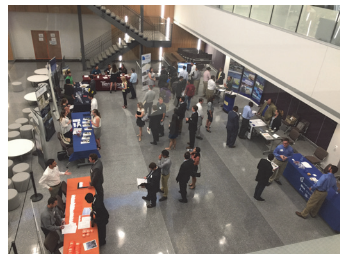
A FOUNDATION OF EXCELLENCE PROGRAM

ASCE AT LSU STUDENT CHAPTER UPDATE

STEM ACTIVITIES

Over the summer, ASCE members Gabrielle Dubroc (President) and Daniel Gutierrez participated in the 2016 Baton Rouge STEM Expo. Also, alongside CEE Assistant Professor Dr. Aly-Mousaad Aly, Gabrielle Dubroc and Mitchell Mayard aided in a local summer math camp. At the most recent outreach events members helped students build gumdrop bridges and structures and tested their strength using pennies and textbooks. Next semester, the chapter plans to increase outreach at local schools. These hands-on activities expose students ranging from pre-K to high school to STEM ideas.

ASCE CAREER FAIR



On September 29, ASCE at LSU held its first chapter organized career fair aimed towards Louisiana State University and Southern University civil and environmental engineering majors who are interested in learning more about local engineering companies and seeking internships and potential job offers. Compared to larger scale events, the Chapter sought to offer students and employers a more personable event. Companies in attendance included: Terracon Consulting Engineers & Scientists, Crest Industries, Gresham Smith and Partners, Forte & Tablada, GeoEngineers, Sigma Engineers & Constructors, Inc., Arcadis, CobbFendley, and Volkert. With over 50 students attending, the event was a success. The Chapter would like to thank all companies and students who participated.

CURRENT OFFICERS (2016)

President	**Gabrielle Dubroc**
Vice President	**Jeremy Vezina**
Secretary	**Breanna Bell**
Treasurer	**Enrico Targa**
Meeting Coordinator	**Jaden Gillespie**
Community Service Chair	**William Saunders**
Fundraising Chair	**Megan Corzo**
Webmaster	**Mitch Everhardt**

OFFICER-ELECT (2017)

President	**Josh Oliver**
Vice President	**Ronald Smith**
Secretary	**Summer Flowers**
Treasurer	**Jonathan Mays**
Meeting Coordinator	**Jared Blohowiak**
Community Service Chair	**William Saunders**
Fundraising Chair	**Anna Startseva**
Webmaster	**Jack Cadigan**
Event Coordinator*	**Denzel Flores**

new position

WASTE HEAT ENERGY RECOVERY:

Low-grade waste heat (temperatures <130 °C) is a huge energy resource generated at many industrial sites and available from geothermal and solar-based processes. Worldwide, ~1 TW of this low-grade thermal energy could be recaptured for useful work production. Converting waste heat to electrical power is attractive because it is environmentally benign and in many cases sustainable. Dr. Zhu has developed an ammonia-based flow batteries (AFB) to recover waste heat energy based on thermally-regenerative chemicals (ammonia). She plans to continue working on waste heat energy recovery based on salinity gradient created by waste heat.

BIOELECTROCHEMICAL SYSTEMS:

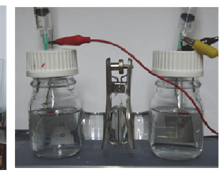
Microbial electrosynthesis of organic products is a novel strategy in which microorganisms use electrons derived from an electrode to reduce carbon dioxide to organic chemicals. By using this technology, the greenhouse gas CO_2 can be converted into fuels (e.g., methane) or other useful organic commodities such as acetate. When renewable energy from wastewater, salinity gradient, waste heat, or the sun is used to drive CO2 conversion, this process is also an attractive method for energy storage and distribution. Dr. Zhu has successfully electrosynthesized acetate from CO_2 by using mixed-culture microorganisms. Now she is trying to synthesize more valuable chemicals (such as methanol and ethanol) from CO_2 based on bioelectrochemical systems.

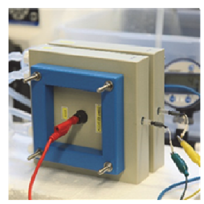
SUSTAINABLE ELECTROCHEMICAL WASTEWATER TREATMENT:

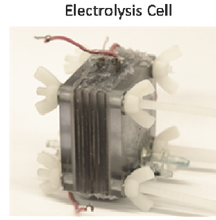
Electrochemical oxidation, reduction, and coagulation are effective for wastewater treatment, but consumption of electrical energy limited their practical application. Through appropriately combining electrochemical energy recovery systems with electrochemical wastewater treatment processes, sustainable wastewater treatment technologies could be developed. Dr. Zhu has integrated microbial fuel cells (MFCs) with electro-Fenton oxidation and electro-coagulation for wastewater treatment with electrical power recovered from wastewaters. She will continue to develop sustainable electrochemical wastewater treatment processes based on renewable energy recovered from wasted sources.

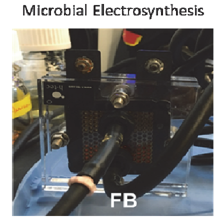

Microbial Fuel Cell


Electrolysis Cell


Microbial Electrosynthesis


Reverse Electrodialysis Cell


Ammonia flow battery



Organic flow battery

FACULTY HIGHLIGHTS (CONTINUED)

Dr. George Z. Voyiadjis, Boyd Professor and CEE Department Chair, received the honorary doctorate of ***Doctor Honoris Causa of Poznan University of Technology*** (Poland), in October 2016. Cited for Constitutive Modeling and Simulation of materials/structures under extreme loadings due to impact loading at high strain rates.

Dr. Voyiadjis was honored with a dedicated special issue on the *Multi-Physical Solutions for Harsh Environments: Computations and Experiments*, in the Journal of Engineering Materials and Technology, ASME, with Editors Taehyo Park and Xi Chen in January 2017, 205 pages (in press). He was also honored with a dedicated special issue in The International Journal of Damage Mechanics, with Editor Lizhi Sun in January 2017, 158 pages (in press), on the occasion of receiving the International Conference on Damage Mechanics (ICDM) trophy.

Clifford Mugnier, Chief of Geodesy at the LSU Center for GeoInformatics (C4G), was a keynote speaker at the annual fall meeting of the Association of Petroleum Surveying & Geomatics in Houston, Texas.

NEW FACULTY SPOTLIGHT

DR. XIUPING ZHU
ASSISTANT PROFESSOR

Dr. Xiuping Zhu joined the Department of Civil and Environmental Engineering at Louisiana State University as an assistant professor in August 2016.
Prior to joining the CEE faculty, she worked as a post-doctoral researcher at Pennsylvania State University for almost five years. Dr. Zhu received her Ph.D. degree in Environmental Engineering at *Peking University*, Beijing, China, in July 2011, and her B.S. degree from Environmental Engineering Department at *Beihang University*, Beijing, China, in July 2005. Her research focuses on the development of electrochemical systems for sustainable environmental remediation with energy recovery from wasted sources, such as wastewater, waste heat, and salinity gradient between seawater and river water. She has investigated bioelectrochemical systems for simultaneous wastewater treatment and electricity generation, reverse electrodialysis cells for salinity gradient and waste heat energy recovery, and electrochemical oxidation for wastewater water treatment. She has published 40 peer-reviewed international journal papers in the area of environmental/electrochemical engineering.

SALINITY GRADIENT ENERGY RECOVERY:

Salinity gradients naturally existing between river water and seawater could provide a large and renewable resource for clean energy production.
The potential power production from estuarine salinity gradient energy (SGE) is estimated to be 1.4–2.6 TW, which is similar to the current worldwide demand for electrical power (~2 TW). Several SGE technologies have been proposed to capture this energy, including pressure-retarded osmosis (PRO), reverse electrodialysis (RED), capacitive mixing (CapMix), and hydrogel expansion (HEx). Dr. Zhu has optimized the flow rate and solution concentration in RED to improve the energy recovery efficiency. Moreover, she proposed a new approach to recover salinity gradient energy based expansion and shrinking of hydrogels. Recently, she plans to develop Na-ion and Cl-ion based battery systems to more efficiently recover salinity gradient energy.

ITE AT LSU STUDENT CHAPTER UPDATE

The LSU student chapter of the Institute of Transportation Engineers (ITE-LSU) is committed to ignite interest in the traffic/transportation engineering profession, and build bridges between students and the professional community in this field. The chapter holds regular meetings throughout the academic ear. Meeting topics vary from technical discussions to experiences of speakers. ITE-LSU also organizes tours and panel discussions to ensure that our members have a unique opportunity to learn from multiple guests and network with multiple companies/institutions.

Meetings this semester have included several guest speakers. The student chapter co-advisor, Dr. Julius Codjoe, spoke about the purpose and applications of Intelligent Transportation Systems (ITS) and gave his perspective about the future of ITS. Mr. Steve Strength from Louisiana Local Technical Assistance Program (LTAP) gave a presentation about traffic safety. Mr. Ingolf Partenheimer, Chief Traffic Engineer for the City of Baton Rouge, spoke about red light running cameras (the functionality of the cameras and the criteria for selecting intersections to install them). These are just a few examples of topics covered a meetings.

In the fall semester, the chapter also organized a tour of the traffic sign and signal shop of the City of Baton Rouge. The tour was guided by Mr. Ingolf Partenheimer, Chief Traffic Engineer for the City of Baton Rouge – Parish of East Baton Rouge, as well as Mrs. Sarah Edel, DPW Traffic Engineer. Students experienced the design and production of traffic signs and learned more about traffic operations and control.

For more information about the chapter, visit **http://itelsutigers.wixsite.com/itelsu**.

Chapter Officers:
Nelida Herrera, President
Elena Farhadi, Vice President
Kelley Keegan, Treasurer
Divya Kolasani, Secretary
Pranjal Phaltane, Webmaster/Photographer
Grace Ashley, Fundraising Chair
Dr. Sherif Ishak, Advisor
Dr. Julius Codjoe, Co-advisor

GEAUX ENGINEERING

COPRI STUDENT CHAPTER FIELD TRIP TO ERDC

The LSU student chapter of Coasts, Oceans, Ports, and Rivers Institute (COPRI - LSU) recently organized a field trip to the United States Army Engineer Research and Development Center (ERDC) in Vicksburg, MS. Nine LSU students, mostly graduate students of various technical water-related backgrounds, were led by Mr. Keith Flowers and Mr. David May of the USACE. The day consisted of visiting the Mississippi River Museum in downtown Vicksburg, lunch at 10 South overlooking the Mississippi River and a tour of the ERDC facilities. This tour included presentations by Dr. Ahmad Tavakoly and Dr. Chris Massey on AutoRAPID and CSTORM, respectively, a demonstration of the Ship Tow Simulator by Mr. Dennis Webb, a thorough tour of the Sediment Laboratory by Mr. Thad Pratt, a demonstration of the Dune Overtopping Physical Model by Dr. Duncan Bryant and a tour of the world's largest centrifuge in the Centrifuge Research Facility by Ms. Wipawi Vanadit – Ellis.

ERDC addresses problems in "civil and military engineering, geospatial sciences, water resources, and environmental sciences for the Army, Department of Defense, civilian agencies, and our Nation's public good" with the goal of becoming "the world's premier public engineering and environmental sciences research and development organization."

The COPRI – LSU Student Chapter will continue to provide interesting opportunities like this to the students of LSU in the years to follow.

Congratulations to CEE doctoral student **Yasser Bigdeli** (pictured above, bottom left), one of three awardees at the recent Coastal Connections competition. Yasser, working with Dr. Michele Barbato, received a $500 travel award.

The competition is modified from the Three Minute Thesis (3MT™) approach to research communication competition developed by The University of Queensland. The exercise develops academic, presentation and research communication skills while supporting the development of students' capacities to effectively explain their research. Graduate students have three minutes to present a compelling oration on their research topic and its significance using up to two slides. Coastal Connections focuses on the ability of students to consolidate their ideas and crystalize their research discoveries.

The other two winners of the competition were Devika Bhalerao and Kate Abbott. Judges were Becky Carmichael, LSU Communication Across the Curriculum science coordinator; Amy Clipp, who helped write both of the state's Coastal Master Plans; and Jay Grymes, chief meteorologist for WAFB-TV.

Congratulations to graduate student **Moinul Mahdi** on being awarded the B.F. McCullough Award for Outstanding Student Presentation at the 11th International Conference on Concrete Pavements. He also received the Best Student Poster for his research titled "Construction and Performance Evaluation of Roller Compacted Concrete under Accelerated Testing." Moinul is a doctoral student under the supervision of co-advisors Drs. Zhong Wu and Louay Mohammad.

FALL 2016 CEE UNDERGRADUATE SCHOLARSHIP RECIPIENTS

A. W. Noland, Jr. Endowed Scholarship ($900)
David Capooci

Dr. Yalcin B. Acard Memorial Scholarship ($1,000)
Jasmine Bekkaye

Erin Krielow Lahr Memorial Scholarship ($850 each)
Lisa Weaver
Rachel David
Elizabeth Hutchinson
Caitlin Bullen

Frank J. Germano Memorial Scholarship ($1,000 each)
Noah Taylor
Mitchell Everhardt
Logan Betzer

James A. Nugent, Jr. Scholarship ($1,000 each)
Jarrett Logan
Joseph Bresowar

L. Ralph ('49) and Jacqueline L. Dartez Scholarship ($1,750)
Evan Lewis

Robert E. Watson, Jr. Memorial Scholarship ($850)
Cody Estopinal

Stanley M. and Hilma R. Cothren Scholarship ($900 each)
Hannah Pittman
Robert Davis

Uniroyal Chemical Environmental Engineering Scholarship ($1,500)
Kristen Alevizon

William F. Crawford Memorial Scholarship ($500)
Mallory Bartow

have extraordinarily high surface area that can facilitate a wide spectrum of reactions. He found that Mn can catalyze U reoxidation and remobilization through complicated geochemical mechanisms, which may also exert a major influence on other metallic and metalloid contaminants such as chromium, neptunium and selenium.

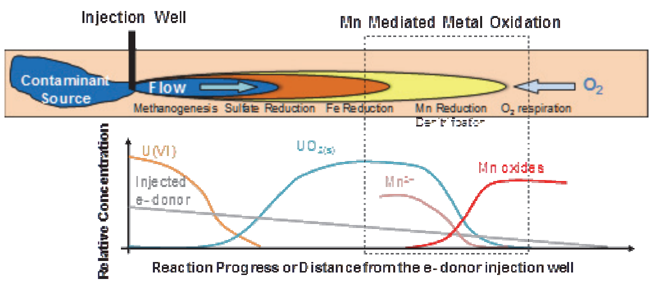


Figure 1. Generic profiles of key redox species in a groundwater plume contaminated with U (Wang and Giammar 2015).

AQUEOUS AND INTERFACIAL PROCESSES RELATED TO AGRICULTURE SUSTAINABILITY

The acquisition of iron by plants is limited by unfavorable kinetics and thermodynamics of soil iron mobilization. As a result, iron deficiency in crop plants is one of the most prominent plant nutritional disorders world-wide. These issues seriously challenge the sustainability of iron fertilization measures. The magnitude of the problem of agricultural iron deficiency, the lack of sustainability, and the high costs of plant iron fertilization call for novel approaches to correct iron deficiency. Dr. Wang made significant contributions to the knowledge of molecular mechanisms of natural plant iron uptake strategies by proposing and experimentally verifying the synergism between reduction and complexation in promoting iron bioavailability (see Figure 2).

Understanding how the plants cope with iron deficiency naturally offers us a guide to more sustainable methods to correct iron limitation and secure our food production and ecosystem sustainability.

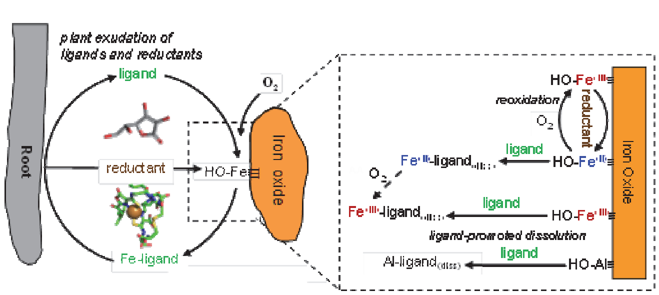


Figure 2. Microscopic schematics of iron acquisition mechanisms of plant roots (Wang et al. Environ. Sci. Technol. 2015.

LSU SERVICE AWARDS

LSU values the importance of commitment to its community. The faculty and staff service award program recognizes LSU employees who have reached 10, 15, and 20 years of service.

The following CEE faculty and staff were recognized this past spring:

FOR 20 YEARS OF SERVICE

Ellen Stevens
CE Undergraduate Program Secretary

FOR 15 YEARS OF SERVICE

Dr. Steve C.S. Cai
Edwin B. and Norma S. McNeil Professor

Dr. Sherif Ishak
Lloyd J. Guillory Professor of Civil Engineering

Dr. Suresh Moorthy
Professional in Residence
and CE Undergraduate Program Advisor

FOR 10 YEARS OF SERVICE

Dr. Q. Jim Chen
CSRS Distinguished Professor in Coastal Engineering

Grace Mason
Business Manager

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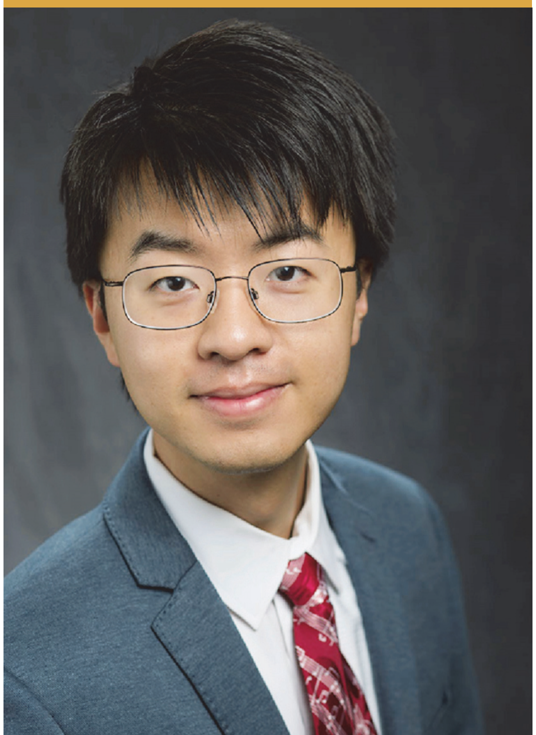
Click “like” and add us to your interest list to receive news and updates from the department!



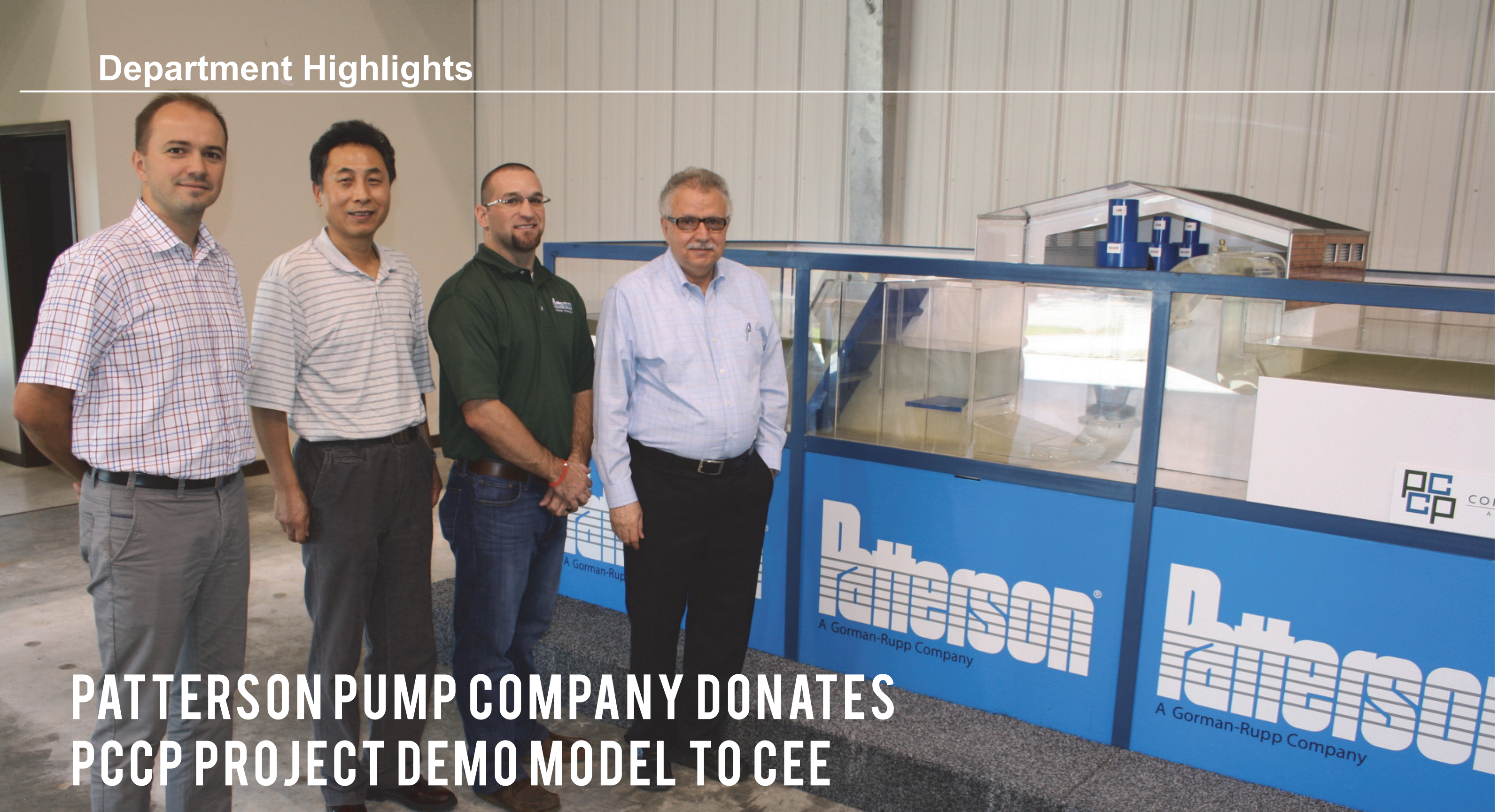
DR. ZIMENG WANG
ASSISTANT PROFESSOR

NEW FACULTY SPOTLIGHT

Dr. Zimeng Wang joined the LSU Department of Civil and Environmental Engineering as an assistant professor in August 2016. He holds a B.S. degree (2009) with honors in Environmental Science from Fudan University and a M.S. (2012) and a Ph.D. (2013) in Energy, Environmental and Chemical Engineering at Washington University in St. Louis. Prior to LSU, He worked as a postdoctoral research fellow at Stanford University. In his early career, his teaching and research were recognized by the Graduate Teaching Award from Washington University and the Graduate Student Award from American Chemical Society. Dr. Wang and his group will conduct laboratory, field and modeling research to better understand the chemical processes at critical environmental interfaces in both natural and engineered aquatic systems. His interested topics include, but are not limited to, subsurface contaminant migration and remediation, water quality and supply, nitrogenous contaminant formation and control, and development of models for environmental engineering applications.

DECIPHERING BIOGEOCHEMICAL PROCESSES OF CONTAMINANTS FOR BETTER REMEDIATION

Fundamental understanding of the biogeochemical processes of environmental contaminants provides the basis for designing treatment processes and remediation strategies. Uranium contamination of soil and groundwater is a legacy of nuclear weapons development and is a continuing concern associated with the nuclear power industry. As a promising in-situ bioremediation strategy, reduction of soluble U (VI) to insoluble U(IV) under anaerobic conditions has been achieved using dissimilatory metal-reducing bacteria and organic electron donors. The stability of the biologically reduced U(IV) products can determine the success of remediation strategies. In his previous research, Dr. Wang unraveled several critical biogeochemical mechanisms that impact uranium stability in the subsurface, particularly how uranium mobility is mediated by the redox cycling of manganese, a ubiquitously present element in soil and groundwater. Mn redox cycles involved a variety of highly reactive intermediates and the oxidized forms of Mn, M oxides,



PATTERSON PUMP COMPANY DONATES PCCP PROJECT DEMO MODEL TO CEE

Patterson Pump Company's demonstration model of the permanent canal closures and pumps (PCCP) drainage pump stations in New Orleans was generously donated to LSU's Civil and Environmental Engineering Department with the help of Ronnie Hebert of Environmental Technical Sales (ETEC), Inc. to be used in the ETEC Hydraulics and Water Distribution Laboratory. The model will be temporarily housed in the Vincent A. Forte River and Costal Engineering Research Laboratory until the ETEC Lab in Patrick F. Taylor Hall is completed in 2017.

The Corps of Engineers awarded the approximately $615 million contract to construct the PCCP at the mouths of the 17th Street, Orleans Avenue and London Avenue outfall canals on April 17, 2013, to *PCCP Constructors JV*. The PCCP will provide a permanent and more sustainable measure for reducing the risk of a 100-year level storm surge entering the outfall canals. The PCCP will replace the interim closure structures, which were constructed in 2006. The notice to proceed was issued on May 6, 2013, and construction will be complete in 44 months (2017). The existing interim closure structures will continue to provide 100-year level of storm surge risk detection. The PCCP will be composed of permanently gated storm surge barriers and brick facade pump stations at or near the lakefront. The pumps will move rainwater out of the canals, around the gates and into Lake Pontchartrain during a tropical weather event, and be equipped with a stand-alone emergency power supply capacity so that it can operate independently of any publicly provided utility.

When complete, the PCCP at 17th Street will consist of six 1,800 cubic feet per second (cfs) pumps and two 900 cfs pumps and have a total pumping capacity of 12,600 cfs; the PCCP at Orleans Avenue will consist of three 900 cfs pumps and have a total pumping capacity of 2,700 cfs; the PCCP at London Avenue will consist of four 1,800 cfs pumps and two 900 cfs pumps and have a total pumping capacity of 9,000 cfs.

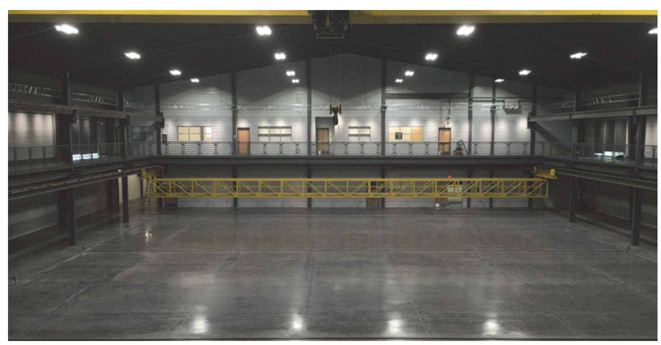
The demonstration model donated to LSU has one working model pump and flows water. Up to three pump bays are represented in the model. The bay geometry is represented, including the trash rack, vortex breaker bars, and stop log slot. Only the outside pump bay and pump are visible and operational. The model is one thirtieth of the scale of the London Avenue outfall canal. The model weighs more than 1,500 pounds dry and its water load is approximately 400 gallons.

LSU's Civil and Environmental Engineering Department is grateful to the Patterson Pump Company for this generous equipment donation that will enhance the classroom and lab experience for generations of students studying hydraulics and water distribution. This gift would not have been possible without the aid of Ronnie Hebert of ETEC, Inc., whom the department also thanks.

CONSTRUCTION OF THE NEW CENTER FOR RIVER STUDIES NEARLY COMPLETE

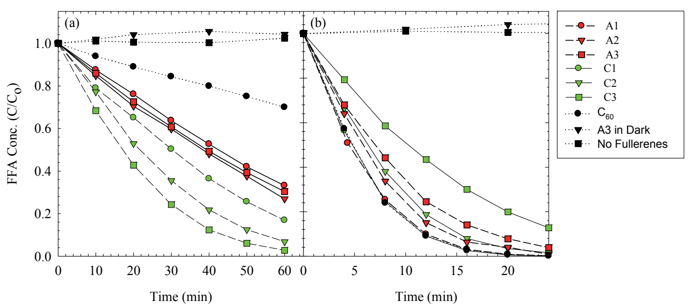
Construction of the new Coastal Protection and Restoration Authority's (CPRA)-funded LSU Center for River Studies (CRS) building is nearly complete, and work is beginning on installation of the exhibit space and construction of the physical model. The new facility is located on the Baton Rouge Water Campus, just south of the I-10 bridge between Nicholson Road and River Road and is next door to the new CPRA building. A third building that will house The Water Institute of the Gulf is currently under construction near the old city dock.

The exhibit space (*pictured left*) will house renderings and information that describe the Mississippi River basin, the importance of the river for navigation and the economy as well as the consequences of the engineering infrastructure necessary for flood control maintaining navigation on "America's Waterway". In addition, the space will be used to showcase and describe CPRA's restoration and protection project planning, design, and implementation as well as the science and engineering that goes into these projects.

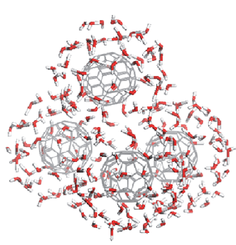


The new movable-bed physical model *(pictured above)* will cover approximately 170 miles of the lower Mississippi River, from Donaldsonville to the Gulf of Mexico, and will be used to study the impact of natural processes and various management strategies on river hydraulics and sediment transport. The physical model will be constructed of 216 5 ft X 10 ft, high-density foam panels, each routed to precisely capture the bathymetry and topography of the region, and will have an

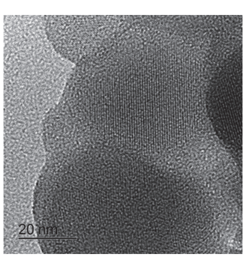
To make an impactful gift, please contact Dr. George Z. Voyiadjis (voyiadjis@eng.lsu.edu) practically useless as photosensitizers. During his time at Georgia Tech, Dr. Snow worked with several sequentially functionalized fullerene derivatives to develop a quantitative understanding of how the number and type of functional groups on a fullerene affects the photochemical and photo-disinfection properties.



During this project it became apparent that within the group of derivatives studied, only those with a positive charge were capable of photosensitization of $^1O_2$ and inactivation of viruses and bacteria (under a reasonable timeframe). This result was unexpected and unexplained. Further, those positively charged fullerenes exerted unprecedented efficiencies, with significant disinfection observed for nano-Molar concentration ranges under visible light. The exciting results were published as a feature article in the journal *Environmental Science & Technology Letters* in 2014. Continuing from this success, the mechanism behind the inexplicable difference between the highly efficient derivatives and the non-performing molecules was explored via collaboration with a research group in the Materials Science and Engineering at Georgia Tech.



A combination of high-tech surface characterization instruments, including high resolution transmission electron microscopy and x-ray photoelectron spectroscopy, and advanced computer simulations were used to probe the different fullerenes for any noticeable difference in surface chemistry. The chemical properties revealed that the aggregation process was very similar chemically across the fullerenes. The electron microscopy combined with the molecular dynamics simulations, however, revealed that minute differences in spacing between fullerenes may have caused the sharp divide between positively and negatively charged fullerene derivatives. This work provided a key piece of knowledge to the niche field of fullerene photo-chemistry, providing a tool to predict what classes of fullerenes will exhibit significant photoactivity in water.



Later, during his time at Michigan State University, Dr. Snow investigated the feasibility of using titanium dioxide (TiO_2), a common photocatalyst, in a combined membrane bio-photoreactor treatment system for wastewater disinfection. The kinetics of hydroxyl radical (OH•) production and quenching in the presence of natural organic matter were studied in depth. Membranes of various nominal pore sizes were used to exclude different amounts and fractions of the natural organic matter. Although quenching of the OH• was expected, the extent of quenching was quite surprising; not even the smallest pore size membranes mitigated the rapid quenching. Extending this line of work, a trip to visit collaborators in Montpellier, France proved invaluable for studying multiple types of membrane bioreactor effluents, including samples from various stages of the filter cleaning processes. Several publications from this work are currently in preparation.

Inspired by these experiences, Dr. Snow's research aims include achieving a better understanding of the dynamic interactions between photoactive materials, target contaminants, and constituents in natural waters. Understanding how different fractions of natural organic matter interact with photocatalysts and photosensitizers will allow filtration or other removal processes to specifically target compounds that exert the greatest interference. Additionally, insights gained from the examination of the photoactive material-target interactions may lead to enhanced designs for targeted removal of pathogens. The application of photo-chemistry for water treatment has always been severely limited by the quenching of radical species by natural constituents. By addressing these issues and overcoming diffusion limitations, Dr. Snow's research group will pave the way for the practical application of advanced photoactive materials for sustainable, solar-driven water treatment. For Dr. Snow, the global need for clean drinking water is a driving motivation for this research, and the advancement of fundamental science is the way forward.

NEW FACULTY SPOTLIGHT

DR. SAMUEL SNOW
ASSISTANT PROFESSOR

On August 15, 2016 Dr. Samuel Snow joined the faculty of the Department of Civil and Environmental Engineering at Louisiana State University as an assistant professor. Dr. Snow has a B.S. in Earth and Atmospheric Science and a Ph.D. in Environmental Engineering, both from the Georgia Institute of Technology. After graduation in 2014, he worked briefly at the Michigan Department of Environmental Quality prior to his appointment as a Postdoctoral Research Associate in Michigan State University's Department of Civil and Environmental Engineering. Dr. Snow has worked in a wide variety of research projects within the broad field of water and the environment, including field studies on salmon habitats, phosphate cycling in marine systems, and evaluating new materials for drinking and wastewater disinfection applications. His current research focus is on understanding the production and quenching of reactive oxygen species in photo-disinfection of natural waters. A driving theme in Dr. Snow's research group is to approach the practical challenge of developing low-cost, sustainable, and robust water treatment systems by investigating the underlying science of the technologies. This research ambition extends to Dr. Snow's teaching interests, where he hopes to provide opportunities for students to apply the environmental technology taught in class to real-world challenges in developing countries.

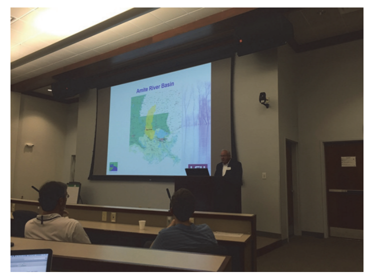
PHOTOACTIVITY AND TOXICITY OF FUNCTIONALIZED FULLERENES

Buckminsterfullerenes, also known as bucky-balls or fullerenes for short, were first discovered as a novel carbon allotrope by a trio of scientists in 1985, prompting a cascade of promising research based on the molecule's unique properties. One particularly interesting property of C_{60} (the most common form of the fullerene) is its ability to efficiently photosensitize singlet oxygen ($^1O_2$), a reactive form of molecular oxygen capable of reacting with and destroying viruses and bacteria. Environmental engineers and scientists looked to fullerenes as novel materials for light-mediated disinfection strategies. When introduced to water, however, fullerenes aggregate and become automated water and sediment delivery system as well as over 15 sensors to measure water levels along the river and in the Gulf of Mexico. When complete, the model will be approximately 90 ft X 120 ft in size and there will be 20 high-resolution projectors that will be used to project data and information, such as the location of critical ports, land loss projections, physical and numerical model results, etc., onto the model platform.

The CRS will also have multiple spaces that designed for promoting collaboration and interactions among academic, agency and industry scientists and engineers. There will be rooms that are designed for holding workshops and small conferences and office space for staff, students and collaborators as well as informal meeting and gathering spaces. Finally, the CRS will also have a ~2000 sq ft hydraulics lab space (*pictured below)* that can be utilized by LSU scientists and engineers for coastal- and river-related physical modeling experiments.

Installation and construction of the exhibit space and the physical model is expected to take approximately 4-5 months, and the opening of the facility is expected to be in the spring of 2017. More information and details about the facility can be obtained from Rudy Simoneaux, PE, the CPRA Project Manager, or Clint Willson, PhD, PE, the CRS Director.

AMITE RIVER FLOOD WORKSHOP



The LSU Center for River Studies (CRS) and the Amite River Basic Commission co-hosted a workshop on the August 2016 storm event. This workshop was well attended by representatives from FEMA (Region 6), USGS LA Water Science Center, the Lower Mississippi River Forecast Center, USACE (New Orleans District), NOAA National Water Center, The Water Institute for the Gulf, the LSU Center for Coastal Resiliency, LA Sea Grant, as well as private practice and academic engineers and scientists. The focus was on the rainfall and flood event, data collection and analysis, and current state of numerical modeling in the basin.

LSU Center for Coastal Resiliency Awarded $1.3 Million in Grants

LSU Center for Coastal Resiliency (CCR), led by CEE Professor **Scott Hagen**, was recently awarded $1.3 million in grants to support critical research that will advance the tools and processes to assess risks to coastal areas. With the support from the NOAA National Center for Coastal Ocean Science, CCR will build upon its previous NOAA-funded efforts and those successful outcomes and strategies. One strategy has been to directly involve coastal resource managers early and throughout the assessment process. Resource managers' input has informed the development and application of large-scale, high-definition computer models that can predict the coastal dynamics of sea level rise and assess hydrodynamic and ecological impacts at the coastal land margin. This research examines the impacts from the coastal dynamics of sea level rise through integrated field assessments and models representing tides, wind-wave, storm surge, coastal morphology, overland and biological processes.

In collaboration with the Dauphin Island Sea Lab, the University of Central Florida, the University of South Carolina and Texas A&M University-Corpus Christi, CCR researchers aim to refine, enhance and extend their models as well as link the economic impact and value of ecosystem services to the coastal dynamics of sea level rise.

CCR also received a grant to quantify the dynamic effects of sea level rise and projected landscape changes on storm surge in Hampton Roads, Virginia (second only to New Orleans as the most vulnerable area to relative sea level rise in the United States). Results from this project will be centered on scenario projections of nuisance flooding at high tide, storm surge depth and extend under a suite of storm conditions, sea level rise rates, landscape changes and possible management actions. CCR will partner with the Northern Gulf Institute of Mississippi State University on this project.

CEE Faculty Perform Reconnaissance of 2016 Louisiana Flooding

In August, 2016, catastrophic flooding inundated southern Louisiana and resulted in damage to at least 60,000 homes, evacuation of more than 20,000 people and 13 deaths near Baton Rouge. This extreme event was the result of prolonged rainfall — exceeding two feet, in some locations — that overwhelmed local flood control systems and poured into residential and commercial areas. **Dr. Navid Jafari**, CEE assistant professor in coastal engineering, organized a team in Louisiana to survey the damage and assess the performance of public infrastructure.

The team looked at various sites in Livingston Parish, Ascension Parish, and areas along the Amite River. Initial findings suggest the public infrastructure performed fairly well, but there were some problem areas. For example, a levee near Sorrento that overtopped during the flood did not show evidence of significant erosion. However, the team thinks the way the levee was constructed had the inadvertent effect of channeling floodwaters directly into a nearby housing development. A closer look at interactions between rainfall-induced flooding and vertical structures, such as levees, is needed.

In other locations, the team found bridge abutments and piers that experienced some scour (the removal of soil caused by floodwaters diverting and accelerating around these obstructions). Some residential areas experienced scouring as well.

"We observed significant scour and erosion of a residential community located on the Amite River near French Settlement, Louisiana. The combination of high water, river bend, and already damaged bulkheads allowed the river to scour beneath the foundation of these homes, destroying boat homes and leaving several homes overhanging the Amite River in critical condition." says Jafar

In spite of public infrastructure performing as expected, the overall impact of this flood was more devastating than the 2011 flood. In 2011, the Mississippi River flooded due to upper Midwest rainfall. In 2016, the flooding resulted from local rainfall. This difference is significant because the origin of the rainfall determines where the water gets channeled into the flood control system.

"If flood levels in the Mississippi River are high as they were in 2011, the U.S. Army Corps of Engineers can open the Morganza Spillway to divert flow to the Atchafalaya Basin, thus bypassing flow away from New Orleans." says Jafari. (*pictured left*) "The Bonnet Carre Spillway is another diversion to Lake Pontchatrain that further reduces the Mississippi's flow before New Orleans. In January 2011, this spillway was opened to divert the deluge from the Midwest to Lake Pontchartrain and finally to the Gulf of Mexico. Both structures work to relieve upstream pressure so the river levels are sufficiently managed by the time the flood reaches New Orleans. The 2016 flood was totally different than 2011. It didn't impact the Mississippi River at all so the spillways were not opened."

Instead, local flood control systems—which include a diversion into the much smaller Lake Maurepas —were quickly overwhelmed in 2016. A state of emergency was declared as thousands of homes and businesses were inundated with water. The flood was, according to the Red Cross, the worst natural disaster since Hurricane Sandy.

During the 2016 trip, the research team encountered another effect of the flooding: a massive amount of waste generation from inundated homes. Although not part of their original research goals, the scale of the problem was such that it has been added to their plans for further study.

"We didn't go down there thinking we would look at storm related waste in particular" says Jafari. "However, just going down the street after street, it was unbelievable. Basically, every house emptied out everything from the house including the walls, appliances, furniture, fixtures, etc., and placed it near the curb for collection. It was like a tunnel of debris on each side of the street, all the way down."

There is a need to better predict debris volumes from extreme events so that efficient and sustainable management of waste debris can be developed and coordinated to accelerate pickup. The team plans to document the waste generation and disposal process so that more accurate estimates of resources needed in the aftermath of future disasters can be made.

The reconnaissance team will publish a report with their findings in the coming months. Other members of the team include: Dr. Murad Abu-Farsakh, Louisiana Transportation Research Center (LTRC); Dr. Shengli Chen, CEE; Milad Saghebfar, LTRC; Dr. Jeff Beasley, School of Plant, Environmental, and Soil Sciences; Dr. Kory Konsoer, Department of Geography and Anthropology; and Brian Harris, CEE doctoral student.

FACULTY HIGHLIGHTS (CONT. PG 15)

Congratulations to **Dr. Clint Willson** on being selected for the College of Engineering Award for Instructor of Excellence (Longwell Award). This award is set up to recognize the contribution of our faculty who participate in the early years of a student journey in our College. These early years play a critical role in undergraduate retention and set the tone for our students' future success.

Dr. Louay Mohammad, Irma-Louise Rush Stewart Professor, was recently elected Chair of the Louisiana Chapter of the American Society of Civil Engineers Louisiana Section Transportation and Development Institute. He was also selected to serve as a member of National Academies of Sciences, Engineering, and Medicine, Transportation Research Board Project Panel 48-02 on "Tack Coat Specifications, Materials, and Construction Practices" in July 2016.