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LSU

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Dear Friends,

Hello from Baton Rouge and the Cain Department of Chemical Engineering. The 2020–2021 academic year has been challenging. We went from celebrating a national championship in January to the chaos and uncertainty of a pandemic in March. Half of the way through the spring semester, our faculty and students left campus and transitioned to 100% online classes. Our machine shop transitioned from fabricating research equipment to making face masks and medical equipment. It was a remarkable transformation, and I will be eternally grateful to everyone who made it work.

Over the summer, we prepared for a safe reopening of classes this fall and reopened our research laboratories at a reduced density. Our classrooms are occupied at about half of their normal capacity. Undergraduate laboratories are also running at about half of the typical capacity. Most faculty work from home, except when they need to be on campus. Our staff uses a staggered schedule, and everyone wears a mask all the time. It isn't perfect, but it is working.

This whole experience has made everyone more aware of the value of personal interactions in the making of chemical engineers. Whether it is a 1:1 discussion with a professor, talking with a friend in a study group, or a unique experience in a lab, there is something special about in-person experiences that can't be replaced with an online lecture. Our students know this and have told me how grateful they are to have some in-person classes and labs. I tell them to stay positive and to hold course. There is still a lot of uncertainty, but we have seen tough times before. In my opinion, the need for educating chemical engineers and university research is as strong as it has ever been. No matter the challenge, we will make it work. This is what we do!

Best Wishes,

John Flake

John Flake
Affolter Professor, Department Chair

In Memory of Professor Louis J. Thibodeaux

John Flake, Department Chair

I wrote the following short story about Professor Thibodeaux in early August, before hearing the news that he passed away at his home later that month. I am so grateful for his work at LSU and that he allowed us to host a lunch in his honor on the occasion of his 80th birthday.

This past November, we took time to honor a colleague, mentor, teacher, and friend who has made an impact on our lives. This year marks a half-century that Louis has served LSU and academia. It also marked his 80th trip around the sun. So, to honor his service, we invited about 100 of Louis' closest friends to spend time with a dear friend. In addition to family and former students, many faculty and staff from across our campus came to hear his talk at the LSU Center for River Studies.

If you know Louis, you know that he is not the typical chemical engineer. In fact, he has spent most of his life's work fixing problems that were probably created by a chemical engineer. Louis published his first book on chemical transport in the environment, *Environmental Chemodynamics*, in 1979. It quickly became one of the standard textbooks used in many undergraduate and graduate programs, such as chemistry, chemical engineering, environmental engineering, civil engineering, and geosciences. He was one of the first to apply transport principles to the environment, and his work will undoubtably have a lasting impact on the planet. Beyond his research and writings, he has had a wonderful impact in mentoring and teaching. Over the course of his career at LSU and Arkansas, he has taught thousands of undergraduates to think more about what goes on outside the "hurricane fence that surrounds the plant." He has said things like, "I am, therefore, I pollute." He asked questions that made the students think about sustainability and the long-term impacts of what we do. He also challenged our students with the responsibility of safeguarding our only planet. I remember him saying, "there is no Planet B." Beyond teaching undergraduates, he also mentored dozens of graduate students who went on to serve in academia, industry, and business all over the world.

It was heartwarming to see so many of his colleagues and former students at the reception to honor his work. I am grateful for his service and admire his passion for defending and protecting the planet.

Feel free to share your reflections of classes/experiences with Professor Thibodeaux with the department via Facebook, email, or snail mail. If you are interested in supporting a memorial, we are working on a project to keep his name and legacy going for future LSU chemical engineers. Please take a look at our website, send an email, or call us at the department to learn how you can help.

Louis J Thibodeaux, 1939–2020

A Remembrance by Professor KT Valsaraj

Chemical engineering—in general and at LSU in particular—lost a giant of a person in Professor Louis J. Thibodeaux, who passed away on August 18, 2020, after a brief illness. Professor Thibodeaux ("Louis" as he is commonly known) has taught thousands of undergraduates and several graduate students during his term as a faculty member at both the University of Arkansas, Fayetteville, where he began his academic career, an LSU, where he remained a faculty member for more than 30 years until his retirement in 2015. He literally coined the term, "environmental chemodynamics," and made it synonymous with the LSU Chemical Engineering Department through his extensive research, teaching, and service.

Dr. Thibodeaux received his BS, MS, and PhD degrees from the Department of Chemical Engineering at LSU. His BS was in the twin areas of petroleum and chemical engineering. He then began an industrial career at DuPont in South Carolina. Before long, however, he was back at LSU pursuing a PhD. Professor Thibodeaux went on to become a faculty member in the chemical engineering department at the University of Arkansas. In 1985, he returned to LSU as a full professor and also as the director of the EPA Hazardous Waste Research Center. He maintained and improved on the activities of the center, which was renamed the EPA Hazardous Substance Research Center (South and Southeast), and got it renewed twice for a total of 25 years. The center research activities in the areas of hazardous waste treatment and sediment transport its focus.

Dr. Thibodeaux's seminal 1979 book, *Environmental Chemodynamics*, defined the area of environmental transport phenomena. It underwent a revision in 1997 and has been accepted at hundreds of universities, both within and outside the United States. He also wrote more than 200 journal articles and gave hundreds of presentations at various national and international meetings. He was instrumental in providing professional educational activities to hundreds more through the American Institute of Chemical Engineers organization. Professor Thibodeaux was a fellow of AIChE and a recipient of its Lawrence Cecil Award from the AIChE Environmental Division.

At LSU, he was appointed the first Jesse Coates Distinguished Professor, which was named for his PhD advisor, Professor Jesse Coates. At the recent department celebration in honor of his 80th birthday, many of Dr. Thibodeaux's former students and colleagues spoke eloquently about his many contributions to the field of environmental chemical engineering.

Professor Thibodeaux advised many graduate students who have gone on to become faculty members at other universities and industrial concerns worldwide. He was a genuine, honest, and caring professor who touched many lives at LSU and elsewhere.

THE FAB 4

LSU Students Benefit From the Experience of ChE's Industry Veterans

The Cain Department of Chemical Engineering is indeed fortunate to have secured the services of several experienced engineers over the years, as instructors. At present, we have more of them teaching than at any time in our history, and in the aggregate, they represent roughly 250 years of industrial experience. They teach several of the most important classes in our curriculum and bring a perspective that we feel gives our students an edge in the increasingly competitive job market. These Instructors are John Balhoff (Ethyl/Albemarle), Jerry Forest (LyondellBasell and Celanese), Barry Guillory (Dow), Brian Hanley (Air Products, Jaeger Products, Koch-Glitsch, and Aspen Technology), Dave Mongrue (Dow), John Pendergast (Dow), and Harry Toups (Exxon/ExxonMobil). This article discusses the efforts of four of our newer members (Forest, Guillory, Hanley, Pendergast), all of whom are presently teaching core undergraduate classes.

Jerry Forest (BS LSU 1984; MPS Loyola 1995; MBA LSU 1997) is the senior director of process safety for Celanese with 36 years of petrochemical and refining experience at LyondellBasell and Celanese. Celanese has had a 90% reduction in process safety incidents in the last 10 years with award winning programs he created, such as Walk the Line (WTL). WTL has been adopted by more than 50 companies over the world and is helping reduce operator line-up error in industry. Recognition for his original programs has been awarded by several industry groups. He is one of the first 50 Certified Process Safety Professionals from the Center for Chemical Process Safety (CCPS). Jerry serves as the first vice chair of the Safety & Health division of AIChE. As industry chair for the CCPS book *Introduction to Process Safety for Undergraduates and Engineers,* he is presently leading the second edition with input from a group he created, Process Safety in Academia, which consists of several US chemical engineering professors who teach process safety. He has more than a dozen publications in periodicals such as *Process Safety Progress*, *Chemical Processing*, and *Chemical Engineering Education*.

LSU has incorporated process safety throughout the curriculum by offering students AIChE SAChE (Safety and Chemical Engineering Education) certificate courses, an effort led by Jerry. He teaches risk-based process safety in CHE 3171, our first design class, introducing the same concepts that industry teaches early-career engineers. The students complete the course with a toolbox that includes: classification of process safety incidents with API RP 754, source & dispersion modeling, introduction to flammability and chemical reactivity, risk identification and mitigation with HAZOP and LOPA, and an introduction to facility siting. It is Jerry's goal to teach risk-based process safety topics so that students learn how to save lives, protect the environment, and preserve jobs by preventing process safety incidents.

Barry Guillory (BS LSU 1983; MS LSU 1984; registered Professional Engineer; Certified Six Sigma Black Belt) worked in a variety of roles for Dow Chemical over a 32-year career. He led engineering teams implementing capital projects up to $1 billion in size while working internationally in Europe and the Middle East. He uses this experience to show students how to balance technical with economic and safety issues within the project design process, primarily in ChE 3171, but also helping out in other undergraduate classes. In addition to the capital project roles, Barry served as leader of Dow's Computer Aided Engineering organization. This role provided an excellent background to help him identify and implement the most industrially relevant chemical engineering software tools at LSU.

In the chemical engineering design classes, Barry teaches students the industrial best practices used to implement AspenPlus simulation tools to support chemical capital projects. A good example of this would be implementing AspenPlus plant optimization based on capital and operating costs. The AspenPlus training that students receive at LSU provide valuable skills for their careers. This training would also cost several thousand dollars if purchased outside of the LSU classroom. Barry also serves as our undergraduate coordinator.

Brian Hanley (BS Univ. of Massachusetts 1979; PhD Univ. of Minnesota 1987) is currently instructor and professional in residence. He has more than 29 years industrial experience, most recently at Aspen Technology, where he developed state-of-the-art hydraulics/mass transfer models for distillation design and code for tray and packing operability diagrams in distillation. Brian teaches both CHE 2176—Numerical Methods and Programming for Chemical Engineers—and CHE 4151—Unit Operations Design. Some of the things he stresses in CHE 2176 are:

- Proper data presentation techniques.
- Competence using Excel for engineering calculations.
- Programming using Visual Basic for Applications (VBA) within Excel as a means for automating repetitive/tedious calculations that often arise during the solution of engineering problems.
- Laying out solutions for easy understanding by other people/groups (think management).
- Importance of correct calculations and interpretation of calculations to safety.

CHE 4151 is one of the last courses that students take. Brian stresses these things in the course:

- Exposure to the mathematical and design principles for historically important chemical engineering operations that will continue to be important in the future.
- Use knowledge of chemical engineering principles and historical guidelines to make approximations and to understand the applicability/advantages/limitations of these types of approximations.
- Use of standalone simulation software for calculations, as well as the development of solutions within Excel using chemical engineering principles and mathematical/programming techniques.
- Understanding the limitations of any chemical engineering solution.
- Importance of safety considerations in process design/equipment selection.

Here, at LSU Brian has tried to incorporate some of what he's learned through the school of hard knocks into the curriculum. He says, "I want students to have a great understanding of the material we present to them. I want them to realize that deep understanding will only come through their own efforts. We, the faculty, can direct students to important topics and we can impart some knowledge, but, ultimately, students need to take on most of the burden for learning. That is a hard lesson for a lot of students, and it makes school a lot less fun. But I also want them to develop a sense of playfulness and curiosity so that they aren't afraid to pursue what initially might seem like far-fetched ideas. Surprisingly, success here turns out to be a lot more fun than you might expect."

John Pendergast (BS Louisiana Tech 1976; MS Louisiana Tech 1977; registered Professional Engineer; AIChE Fellow) retired from Dow Chemical as a senior fellow in oil and gas, with more than 40 years of broad process research and process engineering leadership across diverse technologies. John began his career in research, and then served in manufacturing as project manager, then as the lead process engineer for several large grass roots manufacturing facilities across the company. John then rejoined research and was named a Fellow in Process Separations, then Senior Fellow in Advanced Materials. His areas of expertise include process intensification, distillation synthesis and optimization, rate-based mass transfer models, hybrid unit operations, reactive distillation, and membrane separations. John has numerous peer-reviewed external publications on subjects ranging from separations with ionic liquids to the implementation of dividing wall columns to reactive membranes. Externally, John served for more than 20 years as vice president of Fractionation Research Inc. for Dow, as well as earlier serving as the Dow representative on the Technical Advisory Committee. He is now consulting across the industry and volunteering in a number of areas and is the principal in J Griffin Consulting LLC.

John teaches CHE 2171 Heat and Mass Balances and is now developing a new class, CHE 4420 Separation Process Development. The understanding of heat and material balances is fundamental to the education of a chemical engineer. There are several elements in this course that are the bedrock of many other courses. John believes it is critical that the students understand the underlying principles involved in material balances, both with and without relying on computer tools, as well as key principles in multiphase separations and combustion. These key elements of understanding are only understood deeply by working problems in the area.

The rationale for CHE 4420 is that traditional separations, including distillation, still dominate the chemical and petrochemical industries, the predominant employers of our students. Distillation is estimated to consume 10-15% of the world's energy, and students who complete this class will have the opportunity to make an impact on the company they work for and global energy consumption by understanding separations.

Companies do not implement programs and improvements that do not have a positive return on the company profitability. John teaches students that projects must be successful economically, as well as technically. He stresses that students must look for ways to move the existing infrastructure forward, as well as seeking breakthrough opportunities. There are opportunities to move separations science forward and reduce existing energy consumption by implementing advanced separation synthesis methods using advanced simulation tools, such as Aspen, and a deep understanding of the fundamental principles involved.

Forest

Guillory

Hanley

Pendergast

Process Safety During a Pandemic

When COVID-19 took root in Louisiana, Jerry Forest took the time to put together a video for our students explaining industries' response to the pandemic. Jerry is the senior director of process safety at Celanese. He has more than 35 years of petrochemical and refining experience with a strong manufacturing background in isocyanates, hydrazine propellants, and refining at LyondellBasell and predecessor companies. His mission is to apply his manufacturing experience to process safety to save lives, protect the environment, and preserve jobs by preventing process safety incidents. Jerry volunteers his time as an adjunct instructor in chemical engineering on process safety at LSU. We posted the video on our Facebook page, which can be viewed at https://www.facebook.com/lsu.che/videos/317019965945989/.

McLaughlin Reflects on Contributions to LSU ChE Department

There have been many changes to LSU's Cain Department of Chemical Engineering over the last four decades, but perhaps none more apparent than when LSU ChE Professor Emeritus Ed McLaughlin joined the department in the 1960s. It was a long road from Belfast, Ireland, to Baton Rouge, but McLaughlin's journey to LSU is one that alumni and students can appreciate to this day.

McLaughlin's name is one that every LSU Engineering student wants to hear when their name is called at graduation. Since 1997, the Edward McLaughlin Dean's Medal of Excellence has been awarded to the engineering student with the highest GPA. This year, the McLaughlin Medal will be awarded to Kyle Huber, a mechanical engineering senior who finished his college career with a 4.23 GPA.

McLaughlin appreciates the medal being named after him, but he is also proud of the many feats he accomplished as an LSU ChE professor, researcher, department chair and dean.

It all began in 1967, when then-LSU ChE Department Chair Jesse Coates paid a visit to McLaughlin in London while McLaughlin was serving as the assistant director of engineering at Imperial College, where he had earlier earned his PhD. Coates was aware that McLaughlin would be on sabbatical the next year and asked him to come to LSU to teach.

McLaughlin had already made arrangements to spend his sabbatical at the University of Minnesota, but he asked his family where they preferred to live—the heat or the cold? They unanimously voted to move to the South.

"Back in that day, students would get around campus on the Tiger Train, which consisted of open wagons with side-bench seats and brightly-colored canvas tops, pulled by a farm tractor," McLaughlin said. "The LSU ChE offices were, in most cases, not air-conditioned. No interstate existed at that time. There were country roads to get to campus."

What did impress McLaughlin about LSU, however, was the friendliness of the faculty and the "easy" relationship between faculty and students.

"The engineering students were always motivated and a pleasure to teach," he said.

McLaughlin was also impressed by the students' paths after graduating. He said their successes are what inspired him to seek their support financially and on advisory committees later. As the LSU ChE department chair from 1979 to 1987, McLaughlin brought in people he knew from industry and other areas of engineering whose expertise he trusted; one of whom was Bert Turner, the namesake of LSU's construction management department. McLaughlin was also unafraid to solicit funding from big industries in order to provide the LSU ChE department with new equipment for its labs and to create professorships.

"One of the first things I did was look around and realize we needed salary and equipment," he said.

McLaughlin also put together a ChE newsletter that was typed, folded and mailed to LSU ChE alumni in order to let them know what the department was doing and ask for funding. It turns out two LSU Engineering alumni professors wrote to McLaughlin and asked if they could raise money for professorships to honor the founders of the LSU ChE department, Jesse Coates and Paul Horton. In just a short amount of time, McLaughlin had raised more than $100,000.

"Before I knew it, I was up to my hips in professorships," he said.

McLaughlin was eventually asked to serve as dean of the LSU College of Engineering, which he did from 1987 until his retirement in 1997. His accomplishments during his career included serving as a National Science Foundation foreign scientist from 1967-68, serving as chairman of the Baton Rouge chapter of the American Institute of Chemical Engineers from 1979-80, and serving as a member of the Louisiana Engineering Society.

He still calls Baton Rouge home and resides in the same house he has lived in since moving to the Red Stick in the late 1960s. Though his family (two daughters, one son, and five grandchildren) live out of state, McLaughlin and his wife of 63 years, Aine, choose to stay in Baton Rouge, a city they fell in love with thanks to the Tunica Hills area 50 miles north where they purchased a 200-acre farm many years ago.

"It became my raison d'être," he said.

The young boy from Ballymena, Ireland, has left an indelible mark on LSU, as it has left one on his heart. McLaughlin's hope is to see the LSU ChE department faculty leave their mark as well by making lasting connections to industry leaders that will ensure a bright future for the LSU ChE students.

LEADERSHIP FOR CHEMICAL ENGINEERS

David M. Mongrue

In the fall of 2018, Dr. Flake and I had a serious discussion about offering a new course centered on leadership. I thought this was a great idea, since most of our ChE students are focused on technical subjects and get minimal leadership training. After all, their success or failure professionally will be based on their leadership abilities, which is certainly true for careers that follow a managerial track, but as many will learn, is also very applicable for careers that take a more technical track.

I retired after a 40-year career in the manufacturing industry as an operations vice president for Dow and immediately committed to help teach this course alongside Dr. Flake. The course is primarily based on a book written by Dr. Dennis W. Hess entitled *Leadership by Engineers and Scientists*. The class covered a variety of topics from leadership fundamentals, ethics, time management, building trust and credibility, risk taking, leadership through questions, creating a vision, team building and teamwork, running effective meetings, making decisions, and managing change, conflict management and resolution, communications, and presenting difficult messages.

Besides reading assignments, the coursework focused on case studies and putting some of the principles learned through reading and class discussion into practice. The students learned how to deal with difficult leadership problems. For example, one case study focused on two team members who continuously argued over both trivial and substantive issues, which disrupted the entire team and impacted their overall performance. I believe delving into situations that most will face at some point in their career is where the real learning and skill development occurs.

Although there is generally a right and a wrong way to approach these leadership challenges, they can be successfully addressed differently, depending on the situation and your leadership style. These case studies are typically done in a group setting with teams of four and then reported and discussed. There was an appreciation for how various leadership styles can be successful and effective. To further illustrate this point, we invited five to six industry leaders to specific classes to provide their perspectives and insights on the various leadership topics.

Our students were able to reflect and understand the larger consequences of how leaders can address leadership challenges. Following each class, the homework involved an assessment of a unique case, applying the learning from the topic of that week's class.

We taught the first class in spring 2019 and the most recent class in spring 2020. Each class was made up of 16-17 top ChE students nearing graduation. I was very impressed with the students in both classes. Their engagement and interest was inspirational. At times, naivety was present in their responses to a situation, but as the semester went on, I saw the leadership maturity develop. They were often challenging and inspiring in their thoughts and learned from each other. I even learned a few things after 40 years.

I think their exposure to leadership principles and their application in multiple cases will serve them well as a vehicle for further development of their own leadership values, principles, and philosophies.

We will continue to tweak the class as we gain additional learning from the students on how to improve the material and presentation.

IN THEIR WORDS

Below are a few quotes from students:

"I will reference what I have learned in this class when I start working in early June. Although the magnitude of it is yet to be determined, you have made an impact. Thank you."

"I think the biggest strength, the class is a safe place to make mistakes prior to entering graduate school or industry. We had a week to determine the right course of action and debate it between 15-20 people."

"CHE 4480 Technical Leadership in Chemical Engineering is the perfect supplement to the chemical engineering curriculum at Louisiana State University. The combination of case studies and open discussion has enhanced my perspective on successful leadership, and I will utilize the lessons learned in this class throughout my career."

"This class was extremely beneficial. I feel more confident just having an increased awareness of the topics we learned about. The small class size was very beneficial for discussion and allowed for teamwork and communication. I became closer with all of those in the class, and it made my last semester of school that much better."

"In 2016, I asked David Zimmer (a recent Dow retiree) to help revamp our co-op program. For the first time in 30 years, we started offering all of the ChE classes each semester (fall/spring). This gave students the opportunity to work in the fall or spring without having to sit out two semesters waiting for a class to be offered again. It was a challenging “chicken and egg” problem since we risked cancelling off-semester classes if the enrollment were too low. So, we depended on David to go out and find co-op jobs for our students and to help match our students with jobs. Well, I learned that David Zimmer is a zealous advocate for LSU ChE. In the first year, he more than doubled the co-op jobs available and helped match dozens of our students with employers. He also helped to resurrect a co-op elective course that gives students credit for work related to their co-op experiences. Below is a story from one of the students who benefited from the expanded offerings and the co-op class. I am grateful for David’s work, and I hope the we can continue to grow this."

John Flake, Department Chair

Co-ops in ChE: A Student's Perspective

Estelle Sehers, a ChE senior, shares her thoughts on the value of cooperative experiences in the ChE industry.

“In Fall 2019, I worked a co-op in the Operations Support Department of ExxonMobil’s Baytown, Texas, refinery. I was extremely hesitant to accept my first co-op offer due to my fear of a delayed graduation, but my co-ops absolutely were some of the best learning experiences of my academic career!

“From a technical standpoint, I gained a much deeper understanding of chemical engineering processes that have been reinforced with my academic progression. Most of my projects introduced concepts that I hadn’t covered in my chemical engineering curriculum. I utilized (and learned) many unit operations concepts. Backfilling allowed me to interface and work with process technicians on a daily basis, and I also had the opportunity to help optimize different areas of the unit, such as the product stripper tower’s controls. While optimizing some heat exchangers in the same hydrotreating unit, I gained a better understanding of heat transfer. Another one of my project goals was to develop a plant test procedure to intentionally and safely flood a hydrotreating unit’s product stripper tower to find a true indication of the unit’s tower limits in order to prepare for a real tower flooding event.

“From a personal and professional standpoint, I significantly improved my prioritization of tasks, time management, and technical problem solving. I did my due diligence to ensure my work was up to standard by seeking input and advice from more experienced engineers, and I made sure to double check any project calculations and decisions on projects that I picked up from other people, since ultimately, I became the new owner of the projects and would be responsible for any consequences.

“I gained a much deeper understanding of the importance of utilizing safety tools both at work in the refinery and in my life outside of projects at work. Through working on all my projects, I gained a much deeper appreciation for the necessity and usefulness of process safety and considering safety, health, and environmental factors in all work tasks. I was able to expand my chemical engineering network and meet some great mentors. An added benefit of accepting a co-op is that the chemical engineering department now offers a class with the goal of allowing students to earn three hours of elective credit from the co-op work experience, which helped me refine my presentation skills. By stepping out of my comfort zone to accept my first co-op, I greatly increased my confidence, both in my technical understanding and in my communications with others. I would highly recommend other students to pursue co-op opportunities—it has been one of the smartest decisions I have made!”

Bioengineering 101

St. Joseph Academy Students Get Intro to Bioengineering

Over the course of two weeks this fall, LSU Chemical Engineering Assistant Professor Adam Melvin worked with nearly 60 students from St. Joseph's Academy in Baton Rouge as part of a program he calls Bioengineering 101, in which high schoolers learn about the cancer, bioengineering, and engineering design processes.

Melvin, who has mentored SJA students in his lab prior to this program, partnered with SJA Chemistry Honors teacher Rhonda Baird to divide her three class periods of juniors and seniors into 19 groups of two or three students, teaching the groups at different times over a six-day period.

"The idea of this program is to teach the students about several aspects of engineering design and introduce them to a variety of things that bioengineers can do," Melvin said. "They are then responsible for designing, building, and testing their own systems and collecting data to measure how well it works."

Unlike the ENGage LSU program, which has a larger number of students for just one day, Bioengineering 101 has fewer students over a longer period of time with a detailed plan for each day. On day one, Melvin discusses what engineering is, what engineers do and how they solve problems. On day two, Melvin provides the groundwork for the design challenge, which entails building "cancer trappers," and discusses cancer metastasis, circulating tumor cells, and how engineers can help doctors. At the end of the day, the students are given a mixture of cancer cells and red blood cells, which are mimicked by rice and macaroni noodles. They are then given a list of supplies—plates, bowls, tape, scissors—which they must "purchase" to build their trappers.

"Every supply they acquire has a cost associated with it," Melvin said.

Melvin tells the students to design a system that will give them 70% purity, separating out the rice, and also make it reproduceable at a minimum budget. He also explains the engineering design process—problem, hypothesize, design, build and test—and gives the students four metrics to go by—capture efficiency, purity, throughput and cost. On day three, the SJA students create a design based on the two-component system.

"Every day after that, I give them an additional design parameter," Melvin said. "The first day, it's just rice and macaroni. The fourth day, it's rice, macaroni and penne noodles. The penne represents the immune cells. So just when they think they're almost done, they must take what they've built and improve upon it or build in another direction."

On the fifth day, Melvin increases the volume of the sample from small cups to full-size Solo cups. Finally, on the sixth day, each group presents their projects to a panel of judges comprised of nine SJA teachers. Each class period has a winner who receives a gift card and there is also an overall winner from all sections of Honors Chemistry.

Period 1 winners were Amelia Lambert and Claire Fourroux; Period 2 winners were Carsyn Smith and Ava Kadi; and Period 5 winners, who also won overall, were Jemma Wood, Evelyn Carley, and Anna Miller.

"As I walked around the room and saw the different designs, it was amazing because no two were exactly the same," Baird said. "They weren't all successful but to hear them say, 'Ok, next time we can do it that way,' was a very gratifying experience. Many students commented in the survey given to them at the end that this is what they want to do."

"They were super pumped while doing their presentations," Melvin said. "Some of these students say they want to be bioengineers now and the fact that they were engaged nearly the entire time is pretty impressive. They were coming in after school and during their lunch to improve on their design and collect more data."

Baird also knows something about girls in engineering since she was once a chemical engineering major.

"I was the only girl in my chemical engineering class in college," she said. "Now, my daughter is a senior in mechanical engineering [at Ole Miss] and only one of two girls graduating in that entire department. I want to foster the next generation. I was beyond excited about Bioengineering 101 because I want the girls to be exposed to all of these things. I see how differently a woman's mind works. When engineers are solving problems, the value of a woman at the table to make those decisions is priceless."

Melvin said Bioengineering 101 was designed to teach high school students how biology can be integrated into all the engineering disciplines.

"You can do bioengineering in mechanical, civil and environmental, biological, chemical, and biomedical engineering," he said. "Many of these young students are excited about biology and how it can be used to tackle big-picture problems like human health, energy and the environment. If we can get these girls excited and interested in engineering and they can pick a college that is best for them, then I feel like I've done my job."

The Starting Point

LSU Engineering Professors Mentor SJA Students

It's no secret there are more men than women majoring in engineering and working in the field. In order to decrease this gender gap, LSU Chemical Engineering Assistant Professor Adam Melvin is working with St. Joseph's Academy in Baton Rouge, an all-girls high school, to expose some of their students to engineering.

Each December, Melvin meets with nearly a dozen SJA freshmen and sophomores to discuss engineering and offer interested students the opportunity to work in his lab researching a yearlong project. The experience not only exposes the students to engineering, but also shows them how to maneuver in a predominantly male field.

"I'd like to get more young women involved in engineering," Melvin said. "When I first arrived at LSU in 2015, I was a young faculty member and wanted to get involved in different areas, so when SJA asked if I wanted to mentor these young girls, I said yes."

The SJA students who attend Melvin's talk are part of the school's honors biology class and want to eventually attend medical school.

"Many of them aren't familiar with what engineers do," Melvin said. "So, I've been placing them in labs that have a biology-related type of research."

"When Adam comes to talk to the girls the first day, they're like, 'Wow, you do that in your lab?'," said Jacqueline Savoia, who runs the SJA Science Fair program. "I think that our girls, or young females in general, have a lack of exposure to engineering studies. This partnership is good for LSU to get students involved and good for SJA to give them the opportunity to explore the engineering field."

Since the partnership has grown in the last couple of years, Melvin has enlisted the help of fellow LSU Engineering Professors Chris Arges, James Dorman, Philip Jung, Jimmy Lawrence, Samuel Snow, Xiuping Zu, Bhuvnesh Bharti, and Manas Gartia. Savoia coordinates matching the students with a professor for their project.

"It's an amazing opportunity for them to work in a lab and get hands-on experience while still in high school," Savoia said. "Sometimes the professors branch off of the initial lab research topic and make it more specific to the students' needs. They all do it a little differently, which is cool and interesting."

"It's a really well-organized system that Jacqueline has implemented," Melvin said.

The only requirement from SJA is that these students present their research project at the SJA Science Fair.

For some, like incoming LSU student Rachael Coates of Central, La., their project can eventually lead to state, regional, and international science fairs. Coates, who worked in Melvin's lab as an SJA student, won first place in her category at the state science fair on a project involving immunostaining of cancer cells exposed to fluid shear stress during cancer metastasis. Coates was then invited to the International Science and Engineering Fair in Pittsburgh in 2018.

"The judges were really interested in the project because the device was so new and they really hadn't heard of it," Coates said. "I worked really hard on my presentation for ISEF because I'm not naturally the best presenter. Dr. Melvin helped me with that a bit."

This year is Coates' third summer working in Melvin's lab, where she is continuing her work investigating the role of fluid shear stress on cancer cell mutations, in addition to helping out with a new project developing a 3D-printed plate insert for cancer cell co-culture. Though she was offered scholarships from Tulane University and Johns Hopkins University, Coates chose to come to LSU because of her experience in Melvin's lab.

"Dr. Melvin is the reason I chose LSU," said Coates, who will major in chemical engineering with a biomolecular concentration this fall. "I wanted to work with cancer, and Dr. Melvin was already doing that. I absolutely love working here."

Other SJA students who are working in Melvin's lab this summer are rising juniors Emily Marionneaux and Corrine Carnaggio and rising sophomore Evelyn Carley. Marionneaux's older sister encouraged her to work in Melvin's lab, since she had done it a few years prior.

"My sister said she had a really good experience in Dr. Melvin's lab," Marionneaux said. "She recommended I do it because not a lot of girls do labs or want to do time-consuming projects."

Though Marionneaux plans to eventually earn her law degree, she was still interested in learning her way around a lab and researching cancer.

"I genuinely liked coming here this summer," she said. "It's more than science. It's learning how to talk to professors to get ready for college. Just because it's not something I necessarily plan on majoring in, though you never know, it's still a really good experience."

Since most of the assisting engineering professors are male, Melvin likes to pair each female SJA student with a female LSU Engineering student, so they can see women in engineering.

"It was cool for me to see Haley [an LSU Biological Engineering junior] do well in school," Marionneaux said. "She's been working with me, and it's cool to see a girl in engineering."

"Some of these students really end up making significant contributions," Melvin said. "They end up learning a lot. It's beneficial for them, so they can see what engineering is about, and it's beneficial to the professors, because they get to mentor some amazing high school students."

"The students love it," Savoia said. "Some go and want to be in the lab all the time. I think it's an amazing opportunity for young females to get involved in this career path or just for the exposure. It's a great thing all around."

Nearing the Final Lap

LSU Chemical Engineering Seniors to Swim in Olympic Trials

Studying engineering can be a challenge, but LSU Chemical Engineering seniors Nicole Rozier and Helen Grossman are working to conquer an even greater one. The pair, who are on the LSU Swimming & Diving Team, recently qualified to compete in the Olympic trials next summer, proving that discipline and hard work can earn you a degree and a chance to compete in the Olympic Games.

Rozier and Grossman began swimming competitively at the ages of 6 and 7, respectively, though they actually learned to swim much earlier. Rozier, of Coeur d'Alene, Idaho, began taking swimming lessons when she was just 2 and swam competitively throughout high school. When it came time to choose a college, she toured five campuses to find the right fit.

"In swimming, you get five official visits to colleges your senior year. So, I visited LSU, Ohio State, Boise State, University of Utah and Northern Arizona University," Rozier said. "You're seeing if you fit in with the team and the team is seeing if you would fit in with them. When I visited LSU, I just felt so welcomed and part of the family, even though they were all strangers. The coaches were really nice, and I liked what they stood for and the culture. Choosing LSU was the best decision I ever made, and I haven't regretted it for a second.

"I came to LSU as an undecided major because I really didn't know what I wanted to do," Rozier said. "After talking to people, I realized I'm very passionate about chemistry. I really enjoyed it in high school and I also have a lot of passion for math and physics. I figured chemical engineering was a good combination of all the classes I really enjoyed."

Grossman, of West Long Branch, N.J., first swam at the age of 5, since she lived close to the beach. She, too, swam competitively in high school and came to LSU thanks to a scholarship and a love for the "campus and atmosphere." She chose to study chemical engineering because she liked science and math and had a physics teacher in high school who told her she would be a good engineer because she has good problem-solving skills.

"I definitely wanted to challenge myself in school, so it seemed like a good choice," Grossman said.

Besides their full schedule of chemical engineering classes in Patrick F. Taylor Hall, Rozier and Grossman also fit in swim practice at the LSU Natatorium. A normal week includes 20 hours of swimming, six days a week (including Saturdays), along with three hours of gym time. Three days include "a double," which is two practices in one day. Other days, the pair practices once in the morning or afternoon. Their gym workouts include stretching, Olympic lifts and prehab to prevent injury to the rotator cuff and shoulders.

Though studying and swimming are a lot for Rozier and Grossman, they are able to strike a balance.

"On the days we travel, I plan out a month in advance," Grossman said. "The weeks I'm not missing class, I try to be as vigilant with my work as I can and get as ahead as I can. It gets stressful around midterms and finals when you have to put in some late nights and we still practice during finals week."

Having nearly the same class and swim schedule is a benefit to Rozier and Grossman, who have been side by side since coming to LSU.

"It's definitely good to have someone who understands all of the challenges we go through," Grossman said. "Everyone on the team understands the difficulty and time restraints put on us. Nicole really understands the difficulty of our major and swimming. It's good to have someone who relates to all of that and who I can talk to."

"We've been in classes and practice together for all four years at LSU, so it's really exciting to go to trials with her, too," Rozier said.

During the Olympic trials, set to take place in Omaha, Neb., June 21-28, 2020, Rozier will swim in the 200-meter individual medley, though she also swims the 200m butterfly (as well as the 200m backstroke and 200m breaststroke if needed) for LSU. She has competed in the SEC Championships and made it to the preliminaries and finals every year. Rozier also competed in the U.S. Nationals in July-August 2019 in Palo Alto, Calif. Her best time was 2:16.52 in the 200-IM.

"I want to qualify for the NCAA in March, which is the 30 fastest collegiate swimmers in the U.S.," she said. "I would need to train for another three months after the Olympic trials, though."

Grossman will compete in the 100m butterfly at the Olympic trials, though she also does the 50m and 100m sprint freestyle for LSU. Her best time in the 100m fly is 1:00.68. She also competed in the SEC Championships and made it to the preliminaries and finals each year for LSU. Grossman tried to qualify for the 2012 and 2016 Olympic trials but was disappointed when her times weren't fast enough. This year turned out differently, however.

Both are excited about the thought of making it to the 2020 Olympics in Tokyo but aren't getting their hopes up.

"It would be really, really cool to compete in the Olympics," Rozier said. "If I could finish out my career in the Olympics, that would be incredible. Honestly, I'm just proud of myself for making it this far. I was able to push myself and work as hard as I could, so to get there is something I'm really proud of. My parents are also really excited. They've been with me the whole time, always coming to my meets and cheering me on, driving me to practices at five in the morning. They're excited to have something special come out of it. They will be at the trials."

"Going to the Olympics would be an unrealistic goal for me," Grossman said. "I'm just excited to have made the trials and be able to compete. This will probably be the highest level I ever compete at. It will be a really good way to end my swimming career. The trials will be the most Olympians I'll ever be around, so it will be a really exciting atmosphere. My parents are really excited they finally get to watch me at the trials."

Supposing Rozier and Grossman don't make it to the Olympics, they plan on using their chemical engineering degrees to find jobs in Houston, which has become an unofficial hub for former LSU swimmers.

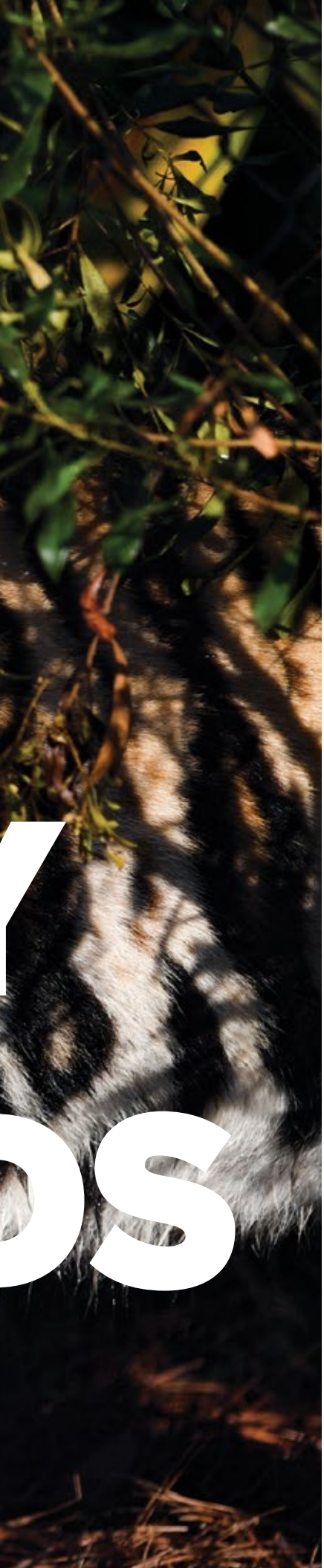
"Once the trials are over, I'll be done swimming," Grossman said. "I think it will be a really hard transition. I definitely think I'll always swim but I'm going to take a small break. It would be awesome to spend some time in Houston to live near people I already know."

"My dream would be to live in Houston, since I've been there many times for meets and it's really homey and nice with a lot to do," Rozier said. "Right now, I'm looking for a job where I can start getting experience and find out what I enjoy doing, since I wasn't able to get an internship while swimming over the summer."

With all of the time spent in the water and classroom, one wonders just what keeps these ladies going.

"I'm a very competitive person, so it's helpful to have swimming as an outlet for any frustrations," Rozier said. "A big part of it is being part of a team. They're like my family. Being on a team with people you're super close with is really fun and something to look forward to every day. You're practicing with your best friends."

FACULTY
AWARD



2020 Murray Raney Award

The Organic Reaction Catalysis Society named Dr. Jerry Spivey recipient of the 2020 Murray Raney Award for his significant contributions to advance the development and characterization of heterogeneous catalysts for applications such as environmental catalysis and synthesis of chemical intermediates from simple carbon feedstocks like methane.

Spivey received his BS and MS degrees from NC State University and his PhD from LSU in 1980. He worked at Albemarle (Baton Rouge) from 1974–1980, carrying out his PhD requirements and meeting the PhD residence requirement in 1978. He was director of process research at RTI (1980–2000), joining the NC State faculty in 2000, and then LSU in 2003. He served as director of LSU's Center for Atomic-level Catalyst Design from 2009–2015, a multi-organization dedicated to advancing both computational and experimental heterogeneous catalysts. He was named a Fellow of the Royal Society of Chemistry (Cambridge, UK) in 2007 and is editor-in-chief of Catalysis Today (Elsevier).

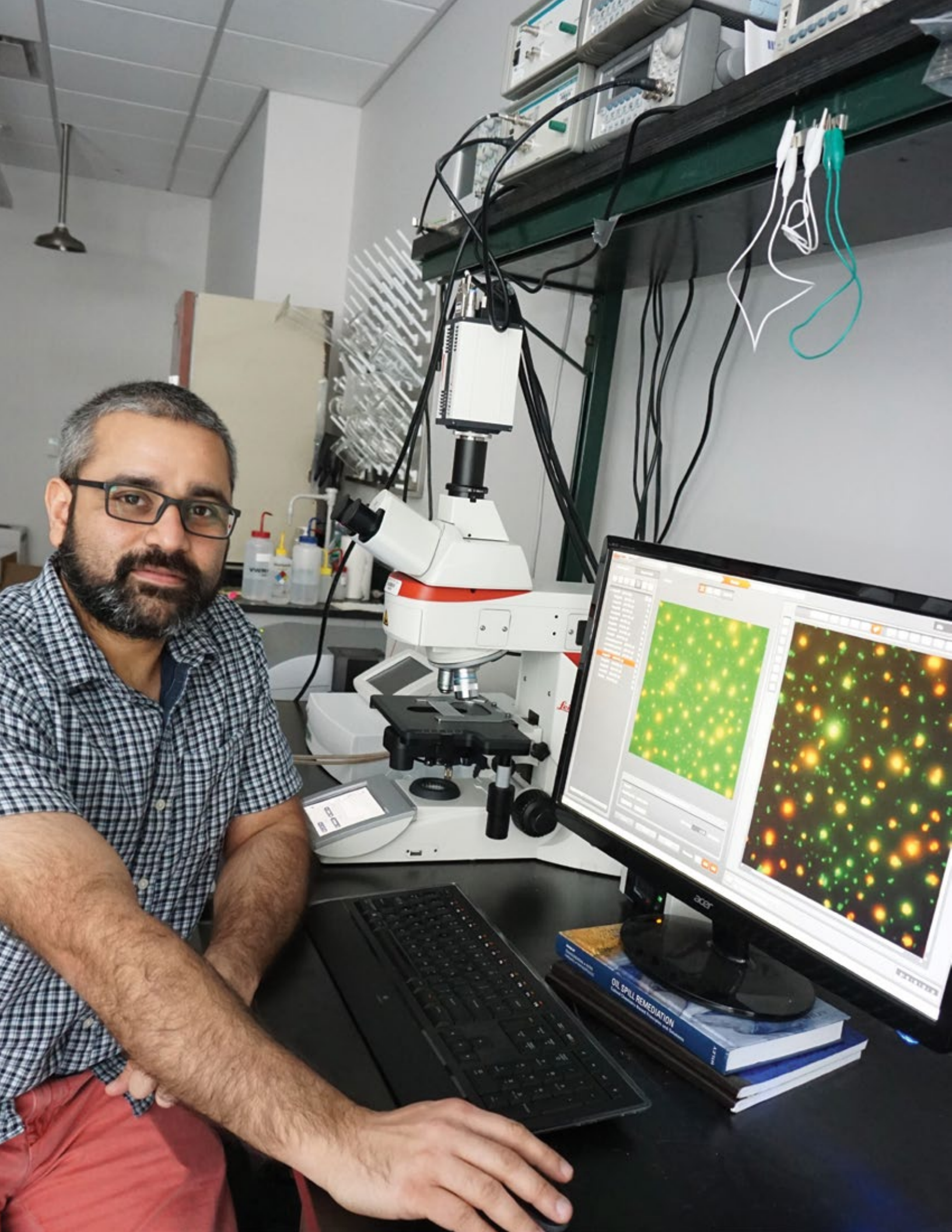
This award is administered by ORCS and generously funded by Grace Catalysts Technologies.

2020 Dow Excellence in Teaching Award

Each year, Dow funds an award to recognize a faculty member who has exhibited excellence in teaching. Three finalists are chosen by the senior class, and they are recognized at our annual awards banquet. We have asked students to recognize them individually. Dr. Adam Melvin is this year's recipient.

As this year's recipient, Melvin received a monetary award, and his name was emblazoned on the plaque memorializing past recipients in the display case outside the Lopez Chemical Engineering Suite in Patrick F. Taylor Hall.

The Excellence in Teaching Award was started in 1988 with financial support from Dow Chemical USA and is intended to recognize the chemical engineering professor that graduating seniors consider to be the most outstanding teacher in courses they have taken from the department during their time at LSU.


OIL SPILL REMEDIATION

Bhuvnesh Bharti

Chemical Engineering Professor Receives NSF CAREER Award for Particle Transport Research: Impacts Include Tumor Treatment & Locating Fossil Fuels

Assistant Professor of Chemical Engineering Bhuvnesh Bharti has been awarded the National Science Foundation's CAREER Award for his research, "Helical propulsion for tunneling through porous membranes."

The award is $556,200 over five years.

The aim of the research is to better understand the underlying mechanisms of active particle transport through complex environments. This knowledge would then influence a diverse array of research fields. It could also affect the treatment of tumors and subsurface mapping of geological rocks to detect fossil fuels.

"Most tumor sites are surrounded by an interstitium; it is a cross-linked, gel-like porous structure composed of collagen, microfibrilla, elastics, and other biomolecules," Bharti said. "Currently used particles for targeted delivery [of tumor treatment] are inefficient in penetrating through this media. Development of new nanoparticles based on the principles [in this project] may enable efficient navigation of the interstitium.

"Secondly, replacing currently used Brownian (or randomly moving) particles in geological subsurface mapping with active colloids may improve the detection of fossil fuel reserves. Active particles able to navigate through porous rocks will be required in significantly smaller amounts than Brownian colloids, thus reducing the associated cost and potential environmental impact associated with oilfield mapping."

How these particles can be used is clear, but where do they come and how are they produced?

Bharti develops new colloidal particles with complex propulsion trajectories with potentially functional benefits. These particles are envisioned as micro devices and robots capable of performing complex mechanical tasks at a micron-length scale. A metal surface patch is then added to the particle using a metal vapor deposition technique developed by other scientists in the field. Following this, external AC electrical fields are used to induce propulsion and swimming in the particles. The patch allows Bharti to control the motion of the particles.

Bharti's research will also be incorporated into a new undergraduate course he developed two years ago titled, "Colloids and Interfacial Engineering," or ChE 4425. The course will introduce undergraduate students to the concept of micro robotics, specifically focusing on the principle of directing motion at such a scale.

"Swimming of particles at the micron scale is equivalent to a human swimming in honey," Bharti said. "Therefore, it presents a set of additional scientific challenges that need to be tackled to design swimming and propulsion of particles."

Additionally, the CAREER Award will financially support one student from Baton Rouge Community College to work with Bharti on the development of helically propelled micro particles, introducing him or her to the field of microrobotics. Bharti also plans to start working with students at the Louisiana School for the Visually Impaired this fall, introducing them to the concept of self-propulsion and swimming at a micro scale and how it applies to things like biomedicine and healthcare.

Assembling Low-Symmetry Magnetic Microstructures: Work Published in Science Advances

Bharti and a pair of his graduate students were recently published in *Science Advances*, with their article, *Magnetic Field–Driven Assembly and Reconfiguration of Multicomponent Supraparticles*, appearing in the May issue.

The article—written by Bharti; Ahmed Al Harraq, a second-year PhD candidate; and Jin Lee, a fourth-year PhD candidate—presents a fundamentally new concept of assembling and synthesizing micron-scale particles with unique structure, which is not achievable by any other method. This may open new routes to synthesize basic building block units involved in our everyday life.

"One such example is electronic paper, where Janus particles analogous to the ones we use in our work are used to switch between black and white to simulate ink," Bharti said. "Our method of assembly may provide a pathway to improve electronic paper by increasing its resolution."

"We believe that the development of highly scalable 'bottom-up' approaches to material synthesis is crucial to unplug the innovation and invention of such functional devices," added Al Harraq. "Our contribution is in the use of an external magnetic field to structure matter in the mesoscale, which is composed of particles one thousand times smaller than a grain of salt."

The physical properties of a material are governed by the assembly of its constituents. For example, both diamond and coal are chemically carbon, but the difference in assembly makes one structure a diamond and the other coal. In Bharti's group, the trio are developing principles of guiding the assembly of particles into functional materials.

"In a sense, natural materials at the microscale, such as tissues and cells, represent the ultimate suprastructure," Al Harraq said. "They form without any external driving force; i.e., they self-assemble with a very high degree of complexity. Think for example of the internal structure of a cell with its organelles or of brain tissues composed of neurons and synapses.

"When it comes to artificial assembly driven by external forces, we are still far from the level of complexity," Bharti said. "This is mainly because we face a dichotomy when trying to connect microparticles. When we do it fast, we get relatively simple structures. The more interesting, asymmetric clusters are obtained by slow techniques that are hard to scale. Our work sits somewhere in between these two extremes and the method we proposed can be used to assemble low-symmetry supraparticles (which are a type of suprastructure) in a few seconds, using very small magnetic fields."

LSU ChE Professors Arges, Romagnoli Use AI to Study Fuel Cells

Though fuel cell technology has been studied by researchers worldwide for the past 150 years, LSU Chemical Engineering Assistant Professor Chris Arges is about to change the landscape of renewable energy. He recently received a $500,000, two-year grant from the U.S. Department of Energy to optimize materials manufacturing for fuel cells—environmentally friendly power sources, as they only emit water.

The project's objective is to develop machine learning (ML) and artificial intelligence (AI) tools for accelerating the materials discovery, design, and processing for intermediate-temperature (200 °C) polymer electrolyte membrane fuel cells (IT-PEMFCs).

To be successful, Arges will generate large sets of data using unique high-throughput experimental methods (HTEM) in his lab. By partnering with LSU ChE Endowed Chair and Professor Jose Romagnoli (co-investigator), the ML/AI tools can then use the data for model development and optimization that will improve the performance and manufacturing of materials used in fuel cells. This project falls under the DOE Advanced Manufacturing Office's plan to strengthen U.S. manufacturing competitiveness.

"The question is if we can generate materials' property data where we can use computational tools to look at trends and develop good models that would guide the future design and processing of those materials," Arges said.

Arges believes the fuel cell performance, cost and size can be improved by operating the fuel cell at higher temperatures. Although today's low-temperature fuel cells are superior in terms of efficiency for converting fuel into work over internal combustion engines (50% versus 20%), they still generate waste heat that needs to be managed so that water in the membrane isn't evaporated, leading to catastrophic failure of the fuel cell.

By moving to a high-temperature membrane that doesn't require water, the fuel cell can operate at elevated temperatures, leading to better heat rejection and thus, potentially eliminating the need for a costly radiator that occupies space in the vehicle.

While some automotive manufacturers currently use fuel cell technology, it isn't ready for primetime due to high costs and limited hydrogen refueling stations. Arges hopes to change that with his research.

"Fuel cell electric vehicle producers want to get rid of the ancillary units like the humidifier and radiator," Arges said. "To do that, you need a higher temperature cell and proton-conducting membranes that conduct without water. That's where our membrane research fits in."

Arges and Romagnoli's project has garnered support from membrane manufacturer Xergy, Los Alamos National Laboratory, 3M, and Toyota, the latter of which currently uses fuel cells in its Mirai vehicle.

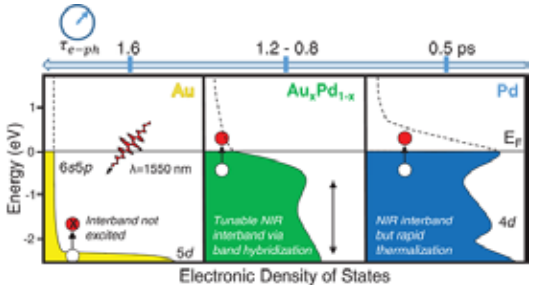
Toyota plans to have a smaller fuel cell stack for its next fuel cell vehicle. Improving the fuel cell efficiency and reducing its size may enable the vehicle to drive 700 miles before refilling with hydrogen, alleviating the burden of building many hydrogen refueling stations.

Arges' research could very well change the landscape as to how fuel cell materials are developed and manufactured.

"By developing ML/AI computational tools, it is posited that the timeline for improving IT-PEMFCs using advanced materials can be reduced from 15-20 years to 4-5 years," he said. "Additionally, we keep discovering that there are a lot of other applications that these membranes are useful for, so we're real excited to get this project rolling and to build off our previous successes."

LSU-Led Research Team Shows Alloys Could Excel at Detecting Infrared Light

A group of researchers from LSU, Argonne National Laboratory and Drexel University have discovered an alloy that has practical application in the ultrafast detection of near-infrared light, which is important to the military for missile defense systems and night vision goggles.



The research was published in the latest issue of *Advanced Materials* in a paper titled, *Noble-Transition Alloy Excels at Hot-Carrier Generation in the Near Infrared*.

The project was led by LSU Chemical Engineering Assistant Professor Kevin McPeak and his graduate student Sara Stofela, in collaboration with LSU Chemical Engineering Professor William Shelton, LSU Chemical Engineering graduate students Tiago Leite and Daniel Willis, LSU Physics Professor Phillip Sprunger, LSU Center for Advanced Microstructures & Devices Professor Orhan Kizilkaya, Benjamin Diroll with Argonne National Laboratory's Center for Nanoscale Materials, and Mohammad Taheri and Professor Jason Baxter with Drexel University's Department of Chemical and Biological Engineering.

The group's work, which took place over four years, focused on developing a material that excels at generating hot carriers when excited with near-infrared light.

Near-infrared light cannot be seen by the human eye, making it useful for the military in reconnaissance missions. Hot carriers are electrons and holes, which are above and below, respectively, the equilibrium energy of the system. Since these carriers are above the equilibrium energy of the system, they can be used to drive an electrical circuit.

The problem, however, is finding a material that will offer both hot-carrier generation and a sufficient carrier lifetime so that the electrons and holes can be collected from the metal. Single-element metals struggle to do this well. There is, however, as the team discovered, an alloy that fits the bill.

"We explored an alloy of gold and palladium in this paper," McPeak said. "Au (or gold) has been heavily studied for the generation of hot carriers by other groups, especially in under visible light. Pd (or palladium) can generate a lot of carriers in the near-infrared but they decay very rapidly because the carriers scatter off each other. The hot carriers decay so fast in Pd that they can't be extracted quick enough to drive an electric circuit.

"We show that by alloying Au and Pd we can both extend the lifetime of the carriers in Pd and increase the number of carriers from Au. These alloy materials have practical applications in the ultrafast detection of near-infrared light, which is important to the military for intelligence, surveillance, and reconnaissance systems."

LIFT² Grant

Grants are necessary for projects, such as the one Adam Melvin is working on. Melvin recently received a $50,000 LIFT² grant to design a 3D-printed plate insert that will enable LSU Biological Engineering Assistant Professor Liz Martin and her senior design team of students to culture multiple cells at a time, also called a co-culture, which will aid in cancer research.

"I work really closely with Liz, and she wanted her team to come up with a way to culture more than one cell line at a time," Melvin said. "There's a lot of interest in this, because, if you think about the cells in your body, it's not just one cell type. There are complex interactions, but most of the standard approaches for culturing cells is just one at a time. Liz looped me in because she wanted a technology made. She's a cancer biologist."

Melvin and the senior design team fabricated the 3D-printed plate insert in the Chevron Center for Engineering Education, located in Patrick F. Taylor Hall.

"We went through several versions and ended up getting this really cool, cheap insert that we would just put into a dish and use to culture cells," Melvin said. "It's a lot cheaper and easier to produce than existing methods."

Melvin is currently working with Andy Maas at LSU's Innovation & Technology Commercialization to develop a patent.

ACS Applied Energy Materials

PhD candidate Gokul Venugopalan from the Arges group published a paper, *Stable and Highly Conductive Polycation—Polybenzimidazole Membrane Blends for Intermediate Temperature Polymer Electrolyte Membrane Fuel Cells*, in *ACS Applied Energy Materials* on anhydrous, high temperature polymer electrolyte membranes for fuel cells. The new membranes were produced from phosphoric acid doped polycation-polybenzimidazole blends, and they demonstrate remarkably high proton conductivity and thermal stability. Competitive fuel cell performance was attained with the new membranes at the challenging condition of 220°C without water, and the fuel cell was stable over 100 hours at 180°C. The work was sponsored by LSU Lift², LA Board of Regents (Proof-of-Concept/Prototyping Fund), and the 3M Non-Tenured Faculty Award. The work included contributions from researchers at the University of Virginia.

ACS Applied Materials & Interfaces

PhD candidate Daniel Willis and Prof. Kevin McPeak published an article, *Critical Coupling of Visible Light Extends Hot-Electron Lifetimes for H2O2 Synthesis*, in *ACS Applied Materials & Interfaces*.

ACS Materials Letters

Working with researchers at Case Western University, PhD candidate Subarna Kole and co-workers from the Arges Lab show that peptide modified electrodes and solvent vapor annealing influence the microstructure of anion conducting thin films with subsequent impact on ionic conductivity. The insights from the research have impact to ionomer-based electrode binders for fuel cells, electrolyzers, sensors, and other electrochemical technologies. Their article, entitled *Peptide-Modified Electrode Surfaces for Promoting Anion Exchange Ionomer Microphase Separation and Ionic Conductivity* was published in *ACS Materials Letters*.

ACS Sensors

Professors Adam Melvin and James Dorman and PhD Candidate Khashayar Bajgiran published an article, *Dipole-Modulated Downconversion Nanoparticles as Label-Free Biological Sensors*, in *ACS Sensors*.

Journal of the American Chemical Society

Professor Jimmy Lawrence published an article, *Polymer Stereocomplexation as a Scalable Platform for Nanoparticle Assembly*, in the *Journal of the American Chemical Society*.

Molecular Systems Design & Engineering

PhD candidate Matthew Jordan published an article, *Promoting Water-Splitting in Janus Bipolar Ion-Exchange Resin Wafers for Electrodeionization*, in *Molecular Systems Design & Engineering*. The increased rate of water splitting fosters regeneration of the ion-exchange resin bed without the need for chemicals. Further, it is useful in niche applications, such as organic acid capture, and silica removal from water.

npj Clean Water

PhD candidate Varada Menon Palakkal from the Arges Lab published an article, *Advancing Electrodeionization With Conductive Ionomer Binders That Immobilize Ion-Exchange Resin Particles Into Porous Wafer Substrates*, in Nature's *npj Clean Water*. This report highlights a 25% improvement in desalination rate while also achieving about 10% reduction in energy use with new resin wafer materials. The work was part of a collaboration with the Applied Materials Division of Argonne National Laboratory. The new resin wafer materials were realized using an innovative manufacturing process that allowed the substitution of a polyethylene adhesive with an ionomer adhesive. These adhesives immobilize ion-exchange resin particles into porous beds. As a result, the ionomer binder resin wafers showed a 3x increase in ionic conductivity without sacrificing porosity.

Technology Innovation

Prof. KT Valsaraj coedited an NAI (National Academy of Inventors) journal publication, *Technology Innovation*, titled *NAI Presents T&I: Connecting the Innovation Community*.

2019 PUBLISHED ARTICLES

ACS Materials Letters | *Peptide-Modified Electrode Surfaces for Promoting Anion Exchange Ionomer Microphase Separation and Ionic Conductivity* | Z. Su, S. Kole, V.M. Palakkal, L. Harden, C.-o. Kim, G. Nair, C.G. Arges, J.N. Rennera

Nano Letters | *Role of Defects in Ion Transport in Block Copolymer Electrolytes* | Y. Kambe, C.G. Arges, D. Czaplewski, M. Dolejsi, S. Krishnan, M. Stoykovich, J.J. de Pablo, P.F. Neaely

Molecular Systems Design & Engineering | *Ionic Conductivity and Counterion Condensation in Nanoconfined Polycation and Polyanion Brushes Prepared From Block Copolymer Templates* | C.G. Arges, K. Li, L. Zhang, Y. Kambe, G.-p. Wu, B. Lwoya, J.N.L. Albert, P.F. Nealeya, R. Kumara

Electrochimica Acta | *Capacitive Concentration Flow Cells for Efficient Salinity Energy Recovery With Carbonized Peat Moss Electrodes* | H. Zhu, W. Xu, G. Tan, E. Whiddon, Y. Wang, C.G. Arges, X. Zhu

Nature Communications | *Directed Propulsion of Spherical Particles Along Three Dimensional Helical Trajectories* | J. G. Lee, A. M. Brooks, W. A. Shelton, K. J. M. Bishop, B. Bharti

*Macromolecular Rapid Communications** | *Directed Printing and Reconfiguration of Thermoresponsive Silica-pNIPAM Nanocomposites* | Y. Guo, J. A. Belgodere, Y. Ma, J. P. Jung, B. Bharti
*Journal Cover

Journal of Physical Chemistry | *Directed Pore Uptake and Phase Separation of Surfactant Solutions under Confinement* | Y. Wu, Y. Ma, L. He, G. Rother, W. A. Shelton, B. Bharti

Soft Matter | *pH-Induced Reorientation of Cytochrome C on Silica Nanoparticles* | J. Meissner, Y. Wu, J. Jestin, W. A. Shelton, G. H. Findenegg, B. Bharti

Inform | *Smart Soft Materials Based on Fatty Acids* | A.-L. Fameau, B. Bharti, O. D. Velev

Journal of Catalysis | *Rapid Screening of Ternary Rare-Earth—Transition Metal Catalysts for Dry Reforming of Methane and Characterization of Final Structures* | C. Jiang, M.R. Akkullu, B. Li, J.C. Davila, M.J. Janik, K.M. Dooley

Journal of Physical Chemistry | *Effect of Moisture on Dopant Segregation in Solid Hosts* | P. Darapaneni, N.S. Moura, D. Harry, D.A. Cullen, K.M. Dooley, J.A. Dorman

Progress in Natural Science: Materials International | *Boosting Charge Collection Efficiency Via Large-Area Free-Standing Ag/ZnO Core-Shell Nanowire Array Electrodes* | Y. Feng, P. Kim, C.A. Nemitz, K.D. Kim, Y. Park, K. Leo, J.A. Dorman, J. Weickert

Crystals | *Controlling the Spatial Direction of Hydrothermally Grown Rutile TiO_2 Nanocrystals by the Orientation of Seed Crystals* | J. Kalb, J.A. Dorman, S. Siroky, L. Schmidt-Mende

Journal of Physical Chemistry C | *Effects of Weak Electric Field on the Photoluminescence Behavior of Bi_3+-Doped YVO_4: Eu_3+ Core-Shell Nanoparticles* | K.R. Bajgiran, P. Darapaneni, A.T. Melvin, J.A. Dorman

Nanoscale | *Stabilizing the B-site oxidation state in ABO 3 perovskite nanoparticles* | T. Ofoegbuna, P. Darapaneni, S. Sahu, C. Plaisance, J.A. Dorman

Journal of Polymer Science Part A: Polymer Chemistry | *Scalable Synthesis of an Architectural Library of Well-Defined Poly (Acrylic Acid) Derivatives: Role of Structure on Dispersant Performance* | D.J. Lunn, S. Seo, S.H. Lee, R.B. Zerdan, K.M. Mattson, N.J. Treat, A.J. McGrath, W.R. Gutekunst, J. Lawrence, A. Abdilla, A. Anastasaki, A.S. Knight, B.V.K.J. Schmidt, M.W. Bates, P.G. Clark, J.P. DeRocher, A.K. Van Dyk, C.J. Hawker

Macromolecules | *Metal-Free Synthesis of Poly (silyl ether) s under Ambient Conditions* | C.S. Sample, S.H. Lee, M.W. Bates, J.M. Ren, J. Lawrence, V. Lensch, J.A. Gerbec, C.M. Bates, S. Li, C.J. Hawker

Optics Express | *Correlation of Circular Differential Optical Absorption With Geometric Chirality in Plasmonic Meta-Atoms* | J.C. Wilson, P. Gutsche, S. Herrmann, S. Burger, K.M. McPeak

Analytical Biochemistry | *Static Microdroplet Array Generated by Spraying and Analyzed With Automated Microscopy and Image Processing* | C. Danielson, G. Pappas, L. Phelps, A.T. Melvin, K. Park

Biochemical Engineering Journal | *Direct Quantification of DUB Activity in Intact Cells Using a Protease-Resistant, Cell Permeable, Peptide-Based Reporter* | N. Safa, J.H. Pettigrew, T.J. Gauthier, A.T. Melvin

PLOS ONE | *FluoroCellTrack: An algorithm for automated analysis of high-throughput droplet microfluidic data* | M. Vaithiyanathan, N. Safa, A.T. Melvin

Analytical & Bioanalytical Chemistry | *Population-Based Analysis of Cell Penetrating Peptide Uptake in a Microfluidic Droplet Trapping Array* | N. Safa, M. Vaithiyanathan, S. Sombolestani, S. Charles, A.T. Melvin

Analytical & Bioanalytical Chemistry | *Luminescent Nanomaterials for Droplet Tracking in a Microfluidic Trapping Array* | M. Vaithiyanathan, K.R. Bajgiran, P. Darapaneni, N. Safa, J.A. Dorman, A.T. Melvin

Chemical Engineering Education | *ENGage LSU: How to Organize and Implement an Engineering Outreach Day for Middle Schoolers* | A.T. Melvin, A. Steele

Chemical Engineering Science | *Study of Granular Self-Organization Inside a Cylinder Driven by an Orbital-Shaker Using Discrete Element Method* | J. Yu, C. Wu, Y. Li, S. Ghosh, J.B. Joshi, M. Tyagi, K. Nandakumar

Powder Technology | *Effect of Schmidt Number and D/d Ratio on Mass Transfer through Gas-Solid and Liquid-Solid Packed Beds: Direct Numerical Simulations* | S. Bale, S.S. Tiwari, K. Nandakumar, J.B. Joshi

Physics of Fluids | Insights into the Physics of Dominating Frequency Modes for Flow past a Stationary Sphere: Direct Numerical Simulations | S.S. Tiwari, S. Bale, A.W. Patwardhan, K. Nandakumar, J.B. Joshi

Journal of Fluids Engineering | Effective Geometric Algorithms for Immersed Boundary Method Using Signed Distance Field | C. Zhang, C. Wu, K. Nandakumar

Powder Technology | *Flow Past a Single Stationary Sphere, 1. Experimental and Numerical Techniques* | S.S. Tiwari, E. Pal, E. Minocha, A.W. Patwardhan, K. Nandakumar, J.B. Joshi

Powder Technology | *Flow Past a Single Stationary Sphere, 2. Regime Mapping and Effect of External Disturbances* | S.S. Tiwari, E. Pal, S. Bale, E. Minocha, A.W. Patwardhan, K. Nandakumar, J.B. Joshi

Journal of Microwave Power & Electromagnetic Energy | *Numerical Modeling of Microwave Heating of a Porous Catalyst Bed* | P. Muley, K. Nandakumar, D. Boldor

Chemical Engineering Journal | *Study of a Toroidal-Helical Pipe as an Innovative Static Mixer in Laminar Flows* | C. Zhang, A.R. Farrell, K. Nandakumar

ChemRxiv | *A New Computational Interface for Catalysis* | P. Kravchenko, C. Plaisance, D. Hibbitts

Journal of Natural Gas Science & Engineering | *Operability Assessment on Alternative Natural Gas Liquids Recovery Schemes* | J.A. Chebeir, S.D. Salas, J.A. Romagnoli

Chemical Engineering Transactions | *A Deep Learning Approach on Industrial Pyrolysis Reactor Monitoring* | Y. Zhu, Y. Zhan, J.A. Romagnoli

Chemical Engineering Transactions | *Simulation-based Optimization and Control of a Natural Gas Liquids Recovery Unit* | J.A. Chebeir, S.D. Salas, J.A. Romagnoli

Chemical Engineering Transactions | *A Comparative Study of Different Deep Learning Approaches for the Prediction of Natural Gas Demand in the United States* | V. Manee, J.A. Chebeir, J.A. Romagnoli

Industrial & Engineering Chemistry Research | *A Deep Learning Approach for Process Data Visualization Using t-Distributed Stochastic Neighbor Embedding* | W. Zhu, Z.T. Webb, K. Mao, J.A. Romagnoli

Processes | *Data-Driven Estimation of Significant Kinetic Parameters Applied to the Synthesis of Polyolefins* | S.D. Salas, A.L.T. Brandão, J.B.P. Soares, J.A. Romagnoli

Applied Thermal Engineering | *Joint Dynamic Data Reconciliation/Parameter Estimation: Application to an Industrial Pyrolysis Reactor* | G. Fadda, J.A. Chebeir, S.D. Salas, J.A. Romagnoli

Computers & Chemical Engineering | *A Geometric Observer Design for a Semi-Batch Free-Radical Polymerization System* | S.D. Salas, J.A. Romagnoli, S. Tronci, R. Baratti

Journal of Process Control | *Continuous Control of a Polymerization System With Deep Reinforcement Learning* | Y. Ma, W. Zhu, M.G. Benton, J.A. Romagnoli

AIChE Journal | *Deep Learning for Pyrolysis Reactor Monitoring: From Thermal Imaging Toward Smart Monitoring System* | W. Zhu, Y. Ma, M.G. Benton, J.A. Romagnoli, Y. Zhan

Applied Thermal Engineering | *An Environment for Topology Analysis and Data Reconciliation of the Pre-Heat Train in an Industrial Refinery* | J.A. Chebeir, Z.T. Webb, J.A. Romagnoli

Processes | *Modeling/Simulation of the Dividing Wall Column by Using the Rigorous Model* | C. Zhai, Q. Liu, J.A. Romagnoli, W. Sun

Physical Review B | *Flat-Band Magnetism and Helical Magnetic Order in Nidoped $SrCo_2As_2$* | Y. Li, Z. Liu, Z. Xu, Y. Song, Y. Huang, D. Shen, N. Ma, A. Li, S. Chi, M. Frontzek, H. Cao, Q. Huang, W. Wang, Y. Xie, R. Zhang, Y. Rong, W.A. Shelton, D.P. Young, J.F. DiTusa, P. Dai

arXiv | *Importance of van der Waals Interactions for Ab Initio Studies of Topological Insulators* | K. Shirali, W.A. Shelton, I. Vekhter

Physics Review B | *Anomalous Magnetic Behavior of $Ba_2 CoO_4$ With Isolated CoO_4 Tetrahedra* | Q. Zhang, G. Cao, F. Ye, H.Cao, M. Matsuda, D.A. Tennant, S. Chi, S.E. Nagler, W.A. Shelton, R. Jin, E.W. Plummer, J. Zhang

Catalysis Today | *Sulfated Hafnia as a Support for Mo Oxide: A Novel Catalyst for Methane Dehydroaromatization* | M.A. Abedin, S. Kanitkar, S. Bhattar, J.J. Spivey

Industrial & Engineering Chemistry Research | *110th Anniversary: Dry Reforming of Methane over Ni-and Sr-Substituted Lanthanum Zirconate Pyrochlore Catalysts: Effect of Ni Loading* | S. Bhattar, A. Krishnakumar, S. Kanitkar, A. Abedin, D. Shekhawat, D.J. Haynes, J.J. Spivey

Catalysis Today | *Reaction Engineering & Catalysis Issue in Honor of Professor Dragomir Bukur: Introduction and Review* | N.O. Elbashir, A. Chatla, A. Lemonidou, J.J. Spivey

Applied Catalysis A: General | *Methane Dehydroaromatization Over Molybdenum Supported on Sulfated Zirconia Catalysts* | S. Kanitkar, M.A. Abedin, S. Bhattar, J.J. Spivey

International Journal of Hydrogen Energy | *Dry Reforming of Methane With Isotopic Gas Mixture Over Ni-Based Pyrochlore Catalyst* | N. Kumar, S. Kanitkar, Z. Wang, D. Haynes, D. Shekhawat, J.J. Spivey

Journal of Physical Chemistry C | *Effect of H_2 Preadsorption on CO Interactions With a Co/Re/Zr/SiO_2-Based Catalyst: In Situ DRIFTS Study* | N. Kumar, G.G. Stanley, J.J. Spivey

ACS Earth & Space Chemistry | *Chemical Durability of Iodoapatite in Aqueous Solution* | Z. Zhang, W.L. Ebert, T. Yao, J. Lian, K.T. Valsaraj, J. Wang

Atmospheres | *Temporal Change of Air Quality Observed During a Festival Season in Kannur, India* | T. Nishanth, C.T. Reshmi, M.K. Satheesh Kumar, Balachandramohan, K.T. Valsaraj

Journal of Nuclear Materials | *Effect of Solution Chemistry on the Iodine Release from Iodoapatite in Aqueous Environments* | Z. Zhang, L. Gustin, W. Xei, J. Lian, K.T. Valsaraj, J. Wang

Proceedings of the Combustion Institute | *Polycyclic Aromatic Hydrocarbons Formation and Growth During the Supercritical Pyrolysis of 1-Octene* | E.A. Hurst, N.B. Poddar, K. Vutukuru, S.V. Kalpathy, M.J. Wornat

Applied Energy | *Bioalcohol Production From Acidogenic Products via a Two-Step Process: A Case Study of Butyric Acid to Butanol* | S.H. Cho, J. Kim, J. Han, D. Lee, H.J. Kim, Y.T. Kim, X. Cheng, Y. Xu, J. Lee, E.E. Kwon

Catalysis Science & Technology | *CO_2 Electrochemical Reduction at Thiolate-Modified Bulk Au Electrodes* | Y. Fang, X. Cheng, J.C. Flake, Y. Xu

Journal of Physical Chemistry C | *Coupling of Acetaldehyde to Crotonaldehyde on CeO_{2-x}(111): Bifunctional Mechanism and Role of Oxygen Vacancies* | C. Zhao, C. Watt, P. Kent, S.H. Overbury, D.R. Mullins, F. Calaza, A. Savara, Y. Xu

Chemical Physics Letters | *Efficiency Enhancements of a Restricted Stochastic Search Algorithm for Locating Local and Global Minima* | W.C. McKee, S.H. Rawal, Y. Xu

Physical Chemistry Chemical Physics | *Reaction Pathways for HCN on Transition Metal Surfaces* | M. Abdel-Rahman, X. Feng, M. Muir, K. Ghale, Y. Xu, M. Trenary

Energy Storage Materials | *Defect Engineering Activating (Boosting) Zinc Storage Capacity of MoS_2* | W. Xu, C. Sun, K. Zhao, X. Cheng, S.H. Rawal, Y. Xu, Y. Wang

2019 SPONSORED RESEARCH AWARDS

Argonne National Laboratory–USDOE | *Resin-Wafers With Mosaic Ion-Exchange Resins for Electrodeionization and Membrane Capacitive Deionization and Advanced Wafer and Surface Functionalized Membrane Material for Selective Separations* | Christopher G. Arges (PI)

LSU Board of Supervisors | *3D Plate Insert for Dynamic Co-Culture* | Adam T. Melvin (PI)

Shanghai Supezet Engineering Technology Corp., Ltd. | *Intelligent Monitoring System for Ethylene Cracking Units* | Jose A. Romagnoli (PI)

American Chemical Society Petroleum Research Fund | *Understanding the Effect of Nanoconfinement on the Assembly and Temperature Induced Demixing of Surfactants* | Bhuvnesh Bharti (PI)

LA Board of Regents | *Computational Investigation of Transition Metal Sulfides for Overcoming the Challenges of Electrocatalytic CO_2 Reduction* | Craig Plaisance (PI)

LA Board of Regents | *Enhancing the Capabilities of the Shared Laboratory for Macro - and Bio- Macromolecular Research (SLMBR)* | Christopher G. Arges (Co-PI)

LA Board of Regents | *Electrochemical Reactor for Upgrading Low Molecular Weight Alkanes* | Christopher G. Arges (PI)

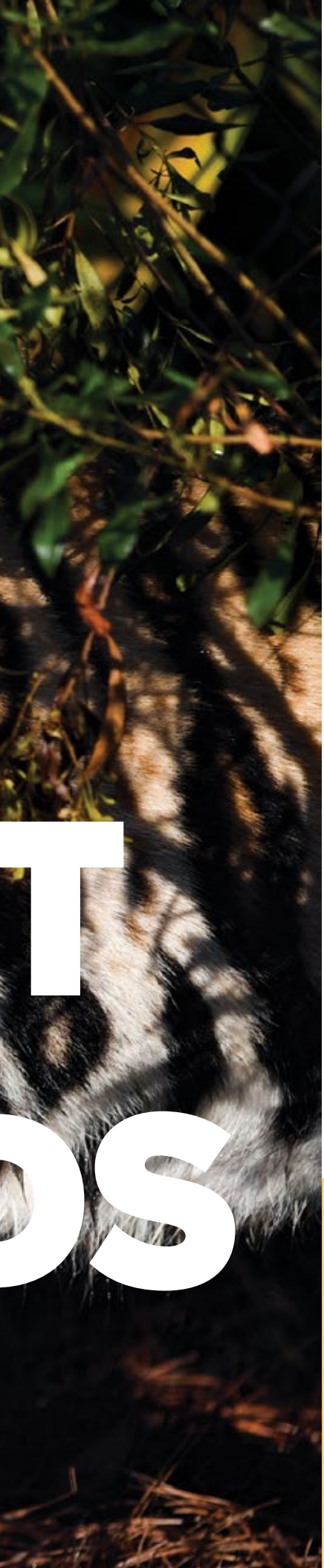
LA Board of Regents | *Thiol Acrylate-Based Materials for 3D Cell Culturing in a Microfluidic Device* | Adam T. Melvin (PI)

The National Science Foundation (NSF) | *REU Site: Developing entrepreneurs in energy storage, catalysis, and biofuels* | Michael G. Benton (PI) and Adam T. Melvin (Co-PI)

The National Science Foundation (NSF) | *CAREER: Degron-based substrates: A novel toolkit for biosensing and targeted inhibition* | Adam T. Melvin (PI)

Pennsylvania State University | *Conversion of CO2 to High-Value Chemical Intermediates: Vinyl Acetate* | James J. Spivey (PI), Ye Xu (Co-PI), and Kunlun Ding (Co-PI)

STUDENT AWARD



WE ARE FIERCE

We, the LSU Cain Department of Chemical Engineering, have a long history of stressing excellence in both instructional and research efforts and remain committed to excellence in all endeavors.

We are proud of the state-of-the-art facilities on campus that foster learning and research, create an unforgettable student experience, and produce alumni who change the world.

Several members of the chemical engineering faculty have received local or national recognition for outstanding teaching and achievement. They are also active in local and national professional societies. Faculty members are involved in a variety of research areas stressing matters of importance to Louisiana and the nation, including environmental engineering, reaction engineering, catalysis, polymer and textile processing, electrochemical engineering, and biochemical engineering. The faculty also collaborate with colleagues from other departments within the university on joint projects and grants. The breadth of background among the faculty and the ongoing research relevant to the ever-changing needs of the chemical engineer ensure that students receive an up-to-date and thorough education.

Congratulations go to all our graduating seniors for completing the most difficult curriculum on LSU's campus! On May 15, the student leadership of the LSU AIChE Student Chapter—Gloria Alvarado, Henry Kantrow, and Kelly Robertson—hosted a virtual ChE Awards Ceremony honoring our outstanding student and faculty achievements. Please take a moment to watch this video (https://www.facebook.com/lsu.che/videos/245101573404598/) they put together to honor this year's graduates and award recipients. It's been a difficult and unusual semester, but this goes to show you that the spirit of our students is as solid as it's ever been. Congratulations again, and we look forward to seeing you in the future making the world a better place to live!

2020 BEST COLLEGES gradreports

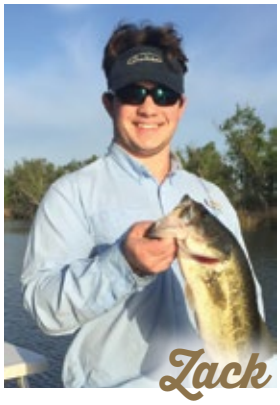
Gradreports.com listed the LSU Cain Department of Chemical Engineering ninth overall in the nation in terms of our graduates' salaries one year after graduation.

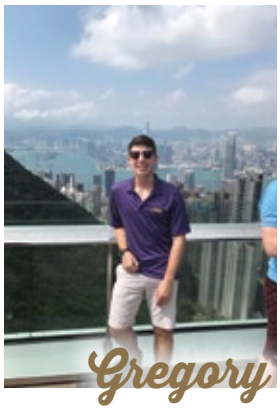
The full list is available at https://www.gradreports.com/best-colleges/chemical-engineering.

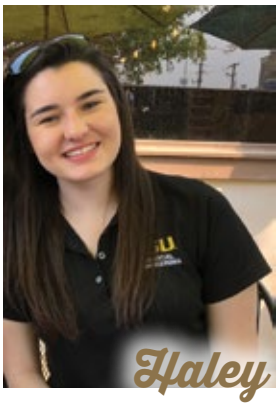
Per gradreports.com, these are the best 25 colleges that offer a bachelor's degree in chemical engineering based on median salary one year after graduation. Tuition, median salaries, and median debt were reported by the U.S. Department of Education.

Cain Department of Chemical Engineering Chair Award

This is awarded to students earn their BS degree in eight semesters without receiving a “W” grade. This year’s recipients are Jonathan Bruna, Bridget Cadigan, Kelly Cohen, Timothy Craig, Sarah Jones, Yusef Kana, Stephen Lambert, Peyton Liner, Jonathan Lucas, Aaron Malik, Evan McDermitt, Trey Poirrier, Zachary Prejean, Michael Rodehorst, Gregory Roy, Allen Sievert, Trenton Spinosa, Haley Strong, and William Wade.







Wetzel Award

For those of you who don't know Dr. David Wetzel, he was a member of the LSU faculty for more than 30 years. He taught more than 3,000 students throughout his career and inspired many prospective engineers to find success. Many of these students describe Dr. Wetzel as not only an effective instructor but also a mentor and friend. The Cain Department of Chemical Engineering established the David M. Wetzel Fund in his honor to support this legacy award. This is awarded to an outstanding female sophomore who is chosen by a faculty panel, including Dr. Wetzel, and receives a $500 prize along with a certificate.

The recipient of the award this year is Gloria Tan.

Jesse Coates Award

Jesse Coates was the chemical engineering department chair from 1955 to 1967 and from 1969 to 1970. He is a charter member of the College of Engineering Hall of Distinction. This award goes to the graduating senior who is chosen from a pool of seniors with a GPA above a 3.5 and who has been actively involved in professional, campus, and community activities throughout his/her undergraduate career. The top three candidates are put to a vote of the department faculty. This year's recipient is Emma Joslin.

Chemical Engineering Junior Award

This is awarded to a student who finished with a GPA of 4.0 or higher after completing 90 hours of the ChE curriculum. Awardees receive a $250 prize and a certificate. This year's recipient is Emma Joslin.

American Institute of Chemical Engineers LSU Student Chapter Senior Award

This is awarded to the graduating senior with the highest GPA at graduation. The awardee recieves a certificate and has his/her name engraved on a permanent plaque. This year's recipient is Emma Joslin.

American Institute of Chemists Award

This is awarded to a graduating senior who has exhibited outstanding scholastic achievement, leadership, ability, and character throughout his/her undergraduate career. The awardee is chosen from a pool of seniors with a GPA above a 3.5. The top three candidates are put to a vote of the department faculty.

The recipient of this award is Jonathan Bruna.

Natalia da Silva Moura Selected for Coates Research Scholar Award

PhD candidate Natalia da Silva Moura received the 2019–2020 Coates Research Scholar Award. The award reimburses up to $5,000 of eligible expenses to support her research efforts. Natalia is a member of the Dorman research group.

Jarrod Larriviere Secures LSU Discover Fall 2019 Research Grant Award

Jarod Larriviere is one of LSU Discover's Fall 2019 Research Grant recipients. He is majoring in chemical engineering, and his research focuses on "Molten Salt Synthesis Process for the Doping of Ceria-based Perovskites Will Induce Strain Within a Dense Cubic Structure with Conductive Pathways Through Oxide Ion Vacancies."

Sara F. Stofela Earns MRS Fall 2019 EL01 Symposium Poster Award

Sara F. Stofela, a PhD candidate in Professor Kevin McPeak's research group, received an MRS Fall 2019 EL01 Symposium Poster Award.

Matthew Jordan Receives US DoE Office of Science Graduate Student Research (SCGSR) Award

Matthew Jordan received the US Department of Energy's Office of Science Graduate Student Research (SCGSR) Award. This is a prestigious honor. Matthew will receive research support to investigate materials for electrochemical separations at Argonne National Laboratory for one year.

Jonathan Bruna Successfully Defends Honors Thesis

Jonathan Bruna successfully defended his honors thesis and graduated this spring with a BS in Chemical Engineering. Jonathan conducted research under Dr. Noémie Elgrishi (Chemistry) for the past three years. His thesis work focused on the use of molecular nano-capsules to improve the efficiency of catalyst in reducing carbon dioxide and other harmful emissions. This work won 2nd Place in the American Institute of Chemical Engineers Southern Regional Conference presentation competition and will soon be published. Jonathan is interested in pursuing a career or graduate school focusing on green energy research and production.

AIChE Scholarship
Raquel Domingos

Alan M. Raymond Endowed Scholarship
Morgan Donaldson

Baker Hughes Endowed Scholarship
Mallory Madere
Sonja Nguyen

BASF Team Chemistry Scholarship
Olivia Arcemont
Aubry Hymel

Board of Regents Graduate Fellowship
MaCayla Caso
Hannah Hymel
Miriam Nnadili

BP Scholarship for Energy in Engineering #2
Michele Rua Cabrera
Roman Corripio

Chemical Engineering General Scholarship
Benjamin Cross
Rebecca Degeneres
Suzannah Mahoney

Chevron Energy Leaders Scholarship in Engineering
Abigail Batten
Jake Broggi
Jacob Carden
Emma Chaney
Jacob Colvin
Christopher Ferrier
Cade Giambrone
Cole McCullough
Keran Nguyen
Isaiah Williams
Alice Xie

Chevron Graduate Student Assistantship
Natalia da Silva Moura

Chevron Summer Scholars or President's Millennial Scholars Program
Diamond Tate

Clara & Frank R. Groves Sr. Engineering Scholarship
Nathaniel Anderson
Britain Saunier

Coates Conference Travel Award
Ashraf Abedin
Sara F. Stofela
Yusheng Guo
Jin Gyun Lee
Yan Ma
Tochukwu Ofoegbuna
Khashayar R. Bajgiran
Saurin Rawal
Gokul Venugopalan
Yao Wu

Coates Research Scholar Award
Natalia da Silva Moura

ConocoPhillips Scholarship in Engineering
Thao Ngo
Andrew Vu

David S. & Martha L. Bunnell Scholarship
Joshua Hewitt

Dissertation Year Fellowship
Pragathi Darapaneni
Saurin Rawal

Earl & Maryanne Evans Scholarship for Engineering Excellence
Eva Coman

Economic Development Award
Zhizhong "John" Ding
Sharareh Heidarian
Jin Gyun Lee

Eugene R. Cox Scholarship
Luke Ieyoub

ExxonMobil Diversity Scholarship
Gloria Alvarado
Dwayne Keller
Karina Ramirez Rodriguez

Flagship Graduate Assistantship
Tochukwu Ofoegbuna
Bahnam Safavinia
Daniel Willis

Floyd S. Edmiston Jr. Endowed Memorial Scholarship
Darby Maloch

Gary & Dakin Dubroc Scholarship Endowment for Engineering
Hannah Roppolo

Gene Purdue Lowe Scholarship
Melvin Argrave
Abigail Batten
Samuel Batten
Emma Chaney
Jacob Colvin
Christopher Ferrier
Aubry Hymel
Henry Kantrow
Jacob Lagrange
Stephen Leblanc
Kevin Nguyen
Justin Nijoka
Marie Polk
Victor Rodriguez-Ortiz

George A. Daniels Graduate Fellowship
Kazi Aurnob
Luis Briceno-Mena
Waan Chulakham
Sara Figueiredo Stofela
Andrea Gavilanes
Rezwanul Islam
Matthew Jordan
Dennis Ogbonna
Andrew Okafor
Alireza Rahnama
Debaroty Roy
Bernard Whajah

Gerard Family Undergraduate Scholarship
Emma Joslin
David Quiring
Haley Strong
Marin Thomas

Gordon A. & Mary Cain Graduate Assistantship
Karthik Vutukuru

Halliburton Scholars Program
Morgan Donaldson
Sarah Glass
Sarah Jones
Lucille Verster

Hargrove Foundation Scholarship
Gloria Alvarado

Henry G. Abbott Scholarship
Kristina Gutierrez

Houston-LSU Engineering Scholarship
Britain Saunier

Huel D. Perkins Diversity Fellowship
Amber Pete

Leo Broering Memorial Scholarship
Nihal Agrawal

Leo C. Comeaux Chemical Engineering Scholarship
Zachary Prejean

Leonel E. & Helen L. Tustison Scholarship
Nhi Tran

Lubrizol Scholarship
Bridget Cadigan
Chrolos Sedky

Mable & Boykin W. Pegues Scholarship
Rachael Coates
Christopher Ferrier
Cameron Martin
Hannah Porta

Mark & Laurie Sutton Scholarship
Justin Chambers
Catherine Harper

NACME Scholarship
Jessica Sims
Sherlyn Villarreal

O. Dewitt Duncan Jr. Endowed Scholarship
Nathaniel Anderson
Olivia Arcemont
Jordan Cantrell
Benjamin Clement
Dylan Holmes
Kristen Stegall

Paul M. Horton Memorial Undergraduate Scholarship
Bruce Huynh
Marian Luzier

Paul N. Howell Endowed Memorial Scholarship
Anna Sheffield

Phillips 66 Fuel for the Future Scholarship
Gloria Alvarado
Michele Rua Cabrera
Jimmy Doan
Abigail Ferrell
Emma Joslin
Estelle Seghers
Isaiah Williams
Alice Xie

R.L. Hartman Memorial Scholarship
Sherlyn Villarreal

Ram N. Bhatia Scholarship
Yusef Kana

Ryan D. Fontenot Scholarship
Trevor Thrasher

S&B Engineers Brookshire Scholarship in Engineering
Emmanuel Adebanjo
Fitsum Areaya
William Baudouin
Gena Bergeron
Justin Blanchard
Kelsey Blosser
Janice Bourgeois
Taylor Brown
Jonathan Bruna
Matthew Bryant
Bridget Cadigan
Jacob Carden
Kelly Cohen
Megan Collongues
Theron Cooper
Kyle Costanza
Kathryn Craft
Timothy Craig
Benjamin Cross
Joseph Daigle
Tran Dang
Daniel Dean
Rebecca Degeneres
Tristan Dorgan
Rumaan Ebrahim
Abdulrahman Ezzir
Terra Harris
Paul Hebert
Gabriela Coronel Hernandez
Dylan Holmes
David Janis
Hayden Johnson
Tyler Johnson
Garrett Jones
Sarah Jones
Emma Joslin
Yusef Kana
Jubril Kogas
Joseph Lane
Jarod Larriviere
Megan Le
Christopher Leblanc
Parker LeBlanc
Amoni McNair
Grace Mierl
Mason Miranda
Sonja Nguyen
Thu Nguyen
Bethany Oubre
Schuyler Pablico
Nathan Penalber
Trang Pham,
Victoria Pham
Zachary Prejean
David Quiring
Eric Reviere
Kory Robert
Emma Roger
Anthony Salvaggio
Trey Sampson
Britain Saunier
Casey Schibler
Ryan Scroggins
Chrolos Sedky
Andrew Shelton
Kristen Stegall
Haley Strong
Noah Taylor
Allison Terry
Marin Thomas
John Tooraen
Austin Watts

Scholarship for MEP Students in Chemical Engineering
Mason Miranda
Karina Ramirez Rodriguez

Society for Women in Engineering Scholarship
Raquel Domingos

Suzanne & Jamal al-Barzinji Engineering Scholarship
Nihal Agrawal

Science without Borders Fellowship
Sara Figueiredo Stofela

Thomas H. Hopkins Scholarship
Evan Casper
Anthony Sagnard

Tiger Athletic Foundation Scholarship
Olivia Arcemont
Melvin Argrave
Jaime Keller
Joseph Lahaye
Kelly Robertson

Traditions Scholarship in Engineering
Thomas Abrahams
Nihal Agrawal
Darby Maloch
Estelle Seghers

Walter G. Middleton Jr. Endowed Scholarship
Emma Carpenter
Sarah Jones
Hannah Roppolo
Alice Xie

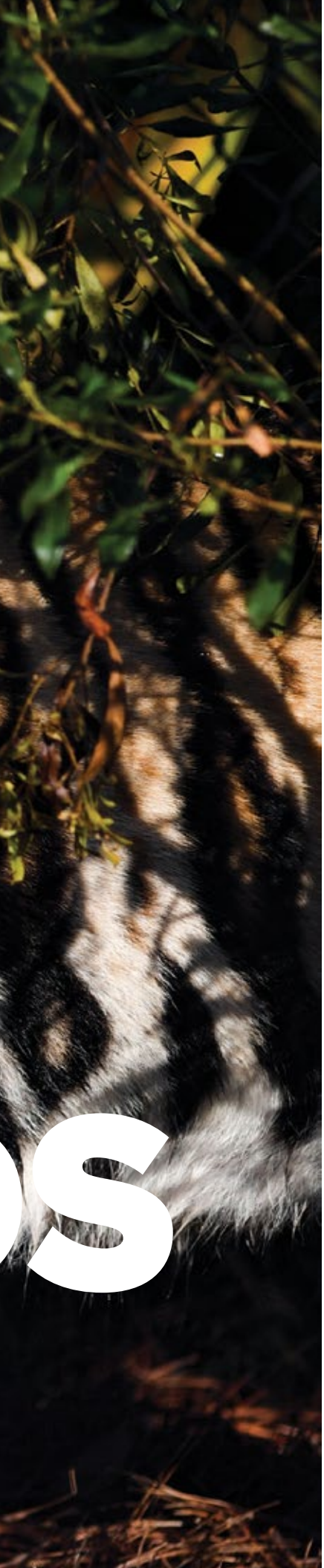
William A. Brookshire Graduate Assistantship in Chemical Engineering
Yan Ma
Vidhyadhar Manee
Ben Peterson

William E. McFatter Endowed Scholarship
Abdulrahman Ezzir
Abigail Ferrell

Willow Johnston Memorial Scholarship
Gloria Tan

2019–20

GRAD



Doctor of Philosophy in Chemical Engineering

Xun Cheng
Pragathi Darapaneni
Daniel Guedes de Oliveira
Zhizhong Ding
Sara Karol Figueiredo Stofela
Sai Sankar Ganesan
Elizabeth Anne Hurst
Changyi Jiang
Manibarathi Vaithiyanathan
Laibao Zhang

Master of Science in Chemical Engineering

Veda Thipparthi

Bachelor of Science in Chemical Engineering

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