

# LSU

Department of  
Biological & Agricultural  
Engineering

## FALL 2021 NEWSLETTER



# DEPARTMENT HIGHLIGHTS

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## Note from the Department Chair

Dear BAE Nation,

I hope that this newsletter finds each of you well. I am reflecting on the fact that this fall, I have completed my 25th year of service in BAE. I have had such an amazing time in BAE, and for me, working with students has been a defining thread of my professional career. It really feels more like a calling than a job. Twenty-five years is considered a “silver anniversary” because of the radiance and brilliance of silver—one need look no further than this newsletter to see the radiance and brilliance of the students in the department.

BE students are earning university distinctions upon graduating that have required their dedication over a period of years, including the Distinguished Communicator Award, the Engaged Citizen Award, and the Distinguished Undergraduate Researcher Award. This spring, another one of our seniors received the Tiger 12 Award, given to only 12 of LSU’s more than 6,000 seniors each year who best embody the spirit of what it means to be an LSU Tiger. Over the years, BE students have received all of these awards at sky-high rates relative to the size of our department. The accomplishments of our students go far beyond the university, with one student winning a national scholarship this year. Additionally, one of our capstone design teams, advised by Dr. Chandra Theegala, was nationally featured for designing a robotic arm for crawfish harvesting. To learn about these accomplishments and more, please read on for details.

The radiance and brilliance in BAE is not confined to the students. In 2020, the faculty collectively published 23 refereed journal articles and garnered about \$2.5 million in grant funding to support research in (among other topics) biomedical engineering, sustainable development and bioenergy, and product and process design. Dr. Philip Jung received a prestigious CAREER award from the National Science Foundation this past spring.

As I think about the past 25 years, I realize that I practice a few guiding principles. One is the quote, “Not everything that counts can be counted, and not everything that can be counted counts.”

In this column, I have been writing about things that can be counted. And yet, it is the things that cannot be counted that keep me excited about going to work every day and that have made my career at LSU so rewarding. Whether it’s the excitement of a new playground communicated by children’s drawings; an unplanned, insightful conversation with a colleague; or watching students’ confidence grow as they master the basics and then the nuances of engineering practice; I am honored, privileged, and energized to bear witness to so many positive transformations and people who have collectively made the world a better place.

I hope that each of you enjoys this newsletter, and as always, please contact me at [mlima1@lsu.edu](mailto:mlima1@lsu.edu) to say hello or share your thoughts about any and all things BAE.

My best,



**Marybeth Lima**

Department Chair,  
Department of Biological &  
Agricultural Engineering

Cliff & Nancy Spanier  
Alumni Professor

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# Advisory Council

Thank you to the BAE Advisory Council for renovating the BESO Lounge. Well used and loved couches and chairs are out and new leather furniture and better lighting welcomed BE's back on campus this Fall.

Per the BAE Advisory Council Rules and Regulations the Mission of the council is:

The mission of the Advisory Council is to advise and counsel the Chairperson and the faculty of the Department of Biological and Agricultural Engineering (BAE) on matters pertaining to academic quality and stature of the Department. The Council will provide counsel on how the Department and the

College can improve relationships and meet the needs of students, industry, commerce, government and the society through best utilization of available resources. This includes actively supporting the Department's Development efforts in securing additional resources through individuals and industry.

If you are interested in joining the Advisory Council please email Nick Totaro, [ntotar1@lsu.edu](mailto:ntotar1@lsu.edu), for more information.



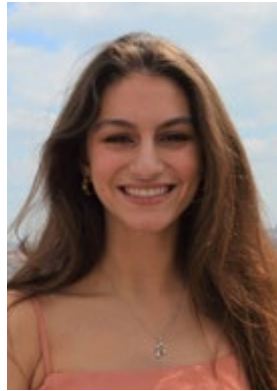
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# BESO Officer Introduction



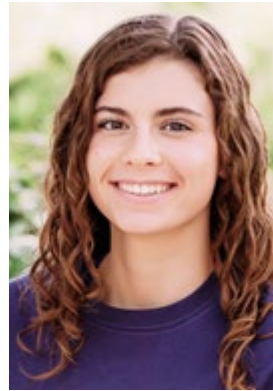
**Alexis Benoit**  
**President**

Fun Fact: I have traveled to eight countries!



**Emily McConnell**  
**Vice President**

Fun Fact: I trained and performed a ballet in NYC one summer.



**Allison Zieschang**  
**Secretary**

Fun fact: I am left-handed.



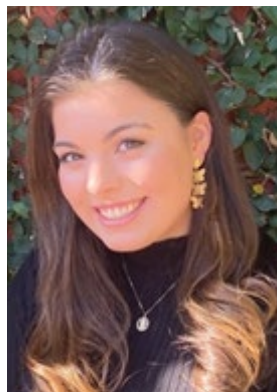
**Nick Alahari**  
**Treasurer**

Fun Fact: I used to play piano competitively.



**Ashton Dalton**  
**Outreach Chair**

Fun Fact: I have been skydiving twice.



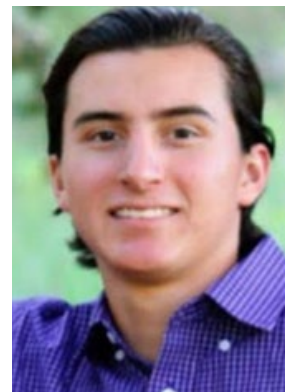
**Ashton Weber**  
**Social Chair**

Fun fact: I've seen the show Friends so many times that I start laughing at the jokes before they are said!



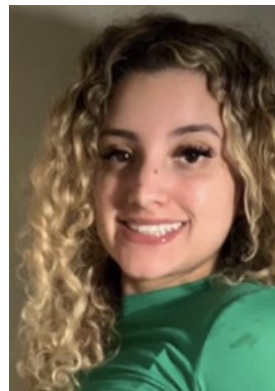
**Emily Spera**  
**Fundraising Chair**

Fun Fact: I have a dog named Nova.



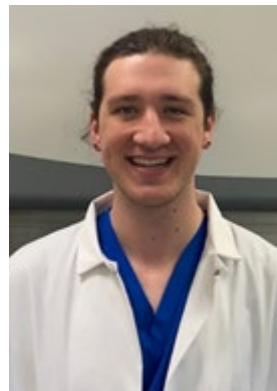
**Matt Davis**  
**Fundraising Chair**

Fun Fact: My top-five favorite bands are Kings of Leon, Pearl Jam, Led Zeppelin, Sublime, and Dave Matthews Band.



**Michele Ruacabrera**  
**Fundraising Chair**

Fun Fact: I was born and raised in Venezuela; therefore, I am bilingual in both Spanish and English.



**Parker Hannan**  
**Fundraising Chair**

Fun Fact: I can, and I have, drawn the map of the third floor of PFT on the back of my hand from memory.

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# BESO Mailander Scholarship Fundraiser Raises Double Its Goal

Thanks to everyone who donated to this year's Mailander Scholarship fundraising effort. Because of your generosity, the department raised \$4,000, double our goal of \$2,000, helping students for years to come.

The Mailander Scholarship is given to a deserving freshman in the Department of Biological & Agricultural Engineering each year. It was created in memory of the late Dr. Michael Mailander, who passed away in 2018.

Dr. Mailander joined LSU in 1985 as an assistant professor in BAE. In 1991, he was promoted to associate professor, specializing in areas that included controls and sensors, fluid

power, precision farming, machine design, power hydraulics, and bio-energy. He also taught BE 1250 Intro to Engineering Methods in the fall, a class for entering freshmen, and BE 2350 Experimental Methods for Engineers in the spring.

Dr. Mailander had a special interest in agricultural technologies. He received patents for the automatic control of a combine threshing cylinder and feed conveyor, in addition to one for an automatic ground speed controller.

Through his teaching and work, Dr. Mailander created lasting relationships with his students and colleagues.

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# Webinar Speaker Series - Dr. Chien-Chi Lin from IUPUI

"We had a great webinar for students and faculty with Dr. Chien-Chi Lin from Indiana University-Purdue University Indianapolis!"



# STUDENT HIGHLIGHTS

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## Benjamin Thomas Named 2021 Astronaut Scholar

Benjamin Thomas was recently selected as a 2021 Astronaut Scholar by the Astronaut Scholarship Foundation, becoming LSU's 12th recipient.

The scholarship recognizes the best and brightest minds in STEM who show initiative, creativity, and excellence in their chosen field. Presented by the Astronaut Scholarship Foundation (ASF), the scholarship provides up to \$15,000 to promising scholars while commemorating the legacy of America's Mercury 7 astronauts—each of whom sponsored and funded to establish the current scholarship program.

Thomas is a rising Ogden Honors College senior studying computational mathematics in the LSU College of Science with a dual degree in biological engineering in the LSU College of Engineering.

Thomas came to LSU with aspirations of becoming a doctor. "I believed that being a doctor was the best career to pursue if I wanted to help change people's lives," Thomas said. "I had already shadowed a general surgeon and volunteered at local hospitals for over 100 hours."

Through his courses and independent research, he became captivated by and discovered a passion for higher-level mathematics and saw its applications in his biological engineering classes, which he realized would allow him to help people in other ways.

"Now, my goal is to use this knowledge of mathematics to create or optimize algorithms that can have major impacts in healthcare, such as automatically detecting the presence of tumors in X-rays, identifying different microbes on a slide, or AI-assisted surgeries," Thomas said.

Most of Thomas's undergraduate research is focused on artificial intelligence (AI). He is currently investigating whether

or not there is an ordered configuration to how viral DNA is packed inside the capsid. At the outset of this AI research, he had no coding experience or knowledge of higher-level mathematics. Through this experience, Thomas has taught himself optimization, numerical linear algebra, probability, and many other topics that play a part in machine learning. He has learned how to code in Python and three other languages, coding different clustering algorithms such as neural networks, self-organizing maps, and generative topographic maps.

For his senior design project in engineering, advised by Dr. Chandra Theegala, Thomas's team designed a prototype arm to aid in crawfish harvesting, a major industry in Louisiana. As the project leader, he was responsible for developing the code that would make the arm work. He said it forced him to learn more advanced coding and how different systems communicate with each other to be able to connect a controller to a Raspberry Pi to tell the arm how to move.

"I believe we exceeded Dr. Theegala's expectations," Thomas said. "He offered me a job to work on the product version over the next year while I finish my last year of school, which is an amazing opportunity closely related to my career goals."

"We are very proud of [Ben for his] hard work and innovative and creative approaches to STEM-related issues," said Jonathan Earle, dean of the Ogden Honors College. "When we say Ogden students will change the world we mean that very literally. The sky's the limit for what [he] can accomplish."

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# Students Design Prosthetic for Catholic High Student

It's incredible the chain of events that a chance meeting can set off.

When LSU Kinesiology Professor of Professional Practice and Athletic Training Program Director Ray Castle stopped by Catholic High School to visit with its head athletic trainer, Eddie Breight, he didn't know he would meet James Robert III, who was born with half of a palm and no fingers on his left hand.

Robert III, who wanted to weight train for track but couldn't effectively because of his left arm, didn't know that Castle would then make a call to Warren Waggenpack, professor of mechanical engineering at LSU, and discuss the possibility of students in LSU's College of Engineering Capstone Design Program designing a prosthetic to solve the problem.

And none of the five LSU students, now graduates—Gary Couturie, Brette Crocker, Cecilia McAlear, Landon Stein, and Amelie Thomas—knew the impact that working on this one project would have on them. But back to the chain of events. Robert III, now a senior at CHS, was active in football, basketball, and track upon entering high school. However, he continuously injured his left hand while playing and eventually settled solely on track. Over time, he noticed that his upper body wasn't developing as fast as his lower body, and while he wanted to work out more, he couldn't effectively because of his hand.

Robert III and his father were on the verge of creating a homemade prosthetic, with the help of a welder friend, that would help him work out when in walked Castle. Literally.

"I mentioned to Eddie [Breight] that there may be a longshot opportunity to help [Robert III] fulfill his aspirations to play ball with a prosthesis (through) the help of LSU," Castle said. "I discussed with him how I had worked with Dr. Waggenpack and several groups in [class] ME 2212 previously, and this may be right up their alley as a project. I immediately went outside and called Dr. Waggenpack, and we briefly discussed the project, which he agreed may be a fantastic project."

The proposal was too late to make the pool from which students are assigned projects in the capstone program during



the 2018-2019 academic year but was put forth again in the Fall 2019 semester. This time it was assigned to a team of five students, who all had it as their first choice to work on.

"Upon first hearing about the project, I knew I had to be on the team," said Couturie, who graduated in May 2020 with bachelor's in mechanical engineering and now works as a data analyst with Project Consulting Services. "At the time, I was pursuing powerlifting as a hobby. Lifting weights had changed my life in some not-so-insignificant ways, and being able to help someone change their life through this hobby as well was a tremendous opportunity to me."

The students worked under the guidance of Mechanical Engineering Professor Hunter Gilber, spending the fall semester developing the conceptual design and getting input from Robert III. They did interviews with him and observed his workouts. They researched existing products and solutions, and they spoke to kinesiology and mechanical engineering faculty, as well as a prosthetist.

"At the beginning of the fall semester, we sat down with [Robert III] to establish his weightlifting goals," said McAlear, who graduated in May 2020 with a bachelor's in biological engineering and is currently working towards her PhD in biomedical engineering at Tulane University. "He was aiming for a maximum deadlift of 450 lbs. and a maximum barbell curl of

100 lbs. [Robert III] has a partial thumb and a middle digit on his left hand, so our prosthesis would need to stabilize and secure the weights for him. For safety reasons, we decided to implement a thumb-activated, quick-releasing mechanism into the prosthesis so the loads lifted could be released as close to instantaneously as possible.

“After several iterations, our brilliant teammate [Coutourie] came up with a design that used capstan mechanical advantage. [Robert III] would thread a strap over the barbell and through three angled capstans, securing the strap (and effectively the load) in place using an optimally positioned spring-loaded toggle clamp. A flick of [Robert III’s] left thumb would release the load from the clamp. Both analysis and testing supported the design.”

The second challenge, McAlear added, was ensuring the prosthesis wouldn’t involuntarily slip from Robert III’s arm when a large load was applied. The team ultimately included a chest strap harness into the design for lifting large weights.

As the team worked on the device during the spring 2020 semester, the COVID-19 pandemic caused LSU to close its campus in mid-March, cutting the fabrication stage of the project short. Luckily, much of the manufacturing was completed fairly quickly in the days leading up to the shutdown. While Couturie said the extra time would have allowed the team to deliver a more aesthetically pleasing and polished prosthetic, the students were happy with the finished product.

In fact, the only person more pleased with the final product when it was delivered in May was Robert III himself.

“When I was first able to use the prosthetic in a full team workout, I honestly cried,” he said. The feeling was almost that of invincibility. Imagine never being able to pick up a spoon to feed yourself, then all of a sudden being able to lift 200 pounds over your head. That day is burned in my memory and will absolutely remain with me for the rest of my days.”

“For his dad and I, it was a proud moment to see him and his team accomplish what he set out to do,” said Deidre Robert, James’ mother. “We had two previous teams that brought forth design, concept and wonderful thoughts but no product. It was a moment of joy to see him fully workout and to see him so happy and fulfilled at that moment.

“We couldn’t ask for a better village of folks at Catholic and LSU to assist James on the journey. From the coaches to the students who touched this project along the way, to the administrators at both schools, we say thank you. Thank you for helping a young man with a desire and a dream to do more and be more.”

In the end, the project changed the students’ lives as much as it did Robert III’s.

“I helped a gracious and talented human being fulfill a dream,” McAlear said. “There is no greater feeling than that. This project also helped me feel validated as an engineer.”

“I cannot stress enough how lucky, or special, or whatever you want to call it this team means to me,” said Amelie Thomas, who graduated with a bachelor’s in mechanical engineering in May 2020 and is pursuing an online MBA through Texas A&M International University. “We are close friends, and I hope that we stay that way. I’m very proud of the relationships I have built with this team.”





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## Distinguished Communicators

The LSU Distinguished Communicator program is for self-motivated LSU undergraduates who want to refine their communication skills and excel in their chosen professions. Students who successfully achieve this unique distinction are recognized with a medal at graduation and receive a permanent commendation on their official transcripts, giving them significant leverage in today's job market and other post-graduate pursuits. Upon completion of the program, these students possess the competitive skills and knowledge needed for 21st-century leadership. LSU is one of the only universities in the country recognizing students who excel in communicating within their discipline.

Students receiving the honor in the Spring 2021 semester are listed below with their advisor.

**Kothar Abdelghani** - Advisor: Marybeth Lima

**Nathaly Ysaccis Betancourt** - Advisor: Nick Totaro

**Timothy Dobroski** - Advisor: Nick Totaro

**Kerstyn Harper** - Advisor: Nick Totaro

**John Howe \*** - Advisor: Marybeth Lima

**Grace Nguyen \*** - Advisor: Marybeth Lima

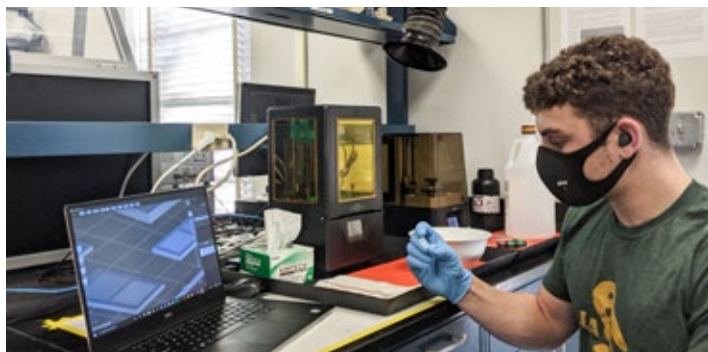
**Sahana Padumane** - Advisor: Yongchan Kwon

*\*Honors students are designated with an asterisk.*

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## 2021 LSU Discover Elevator Pitch Competition

There was a four-way tie for first place between Olivia Hurley, Parker Lawrence, Ashley Patron, and Ignatius Semmes, a senior in BE. All four students received perfect scores across the board from the judges.



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## Dickerson, Jimenez Win Combined Nine Scholarships and Grants

In the last year, Biological Engineering students Sarah Jimenez and Miller Dickerson were awarded nine scholarships and grants, with Jimenez receiving three awards and Dickerson receiving six.

Jimenez earned the Donald W. Clayton Engineering Excellence Award, S&B Engineers Scholarship, and the Maximizing Access to Research Careers (MARC) Program NIGMS, totaling \$23,000.

Dickerson received the S&B Engineers Scholarship, Tau Beta Pi Scholarship, Oaklawn Foundation Scholarship, Albert Halluin Scholarship, Victoria's Secret PINK scholarship, and LSU Discover Research Grant, totaling \$23,000 as well.

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## Distinguished Undergraduate Researcher

In Spring 2021, Sahana Padumane was recognized as a Distinguished Undergraduate Researcher. The designation recognizes the achievements of outstanding LSU undergraduates who participate in a track of educational and research activities leading to a final and public presentation or publication of a faculty-mentored undergraduate scholarly project. Padumane's mentor is Dr. Yongchan Kwon.

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## Antavion Moore Recognized at Virtual Awards Event

LSU Flagship Scholar and Biological Engineering major Antavion Moore was one of the students recognized at the 31st Annual Scholar Awards ceremony, which was held virtually in November 2020. The Flagship Scholarship, funded by individuals, organizations, and alumni chapters, are valued at \$3,500 a year for residents and \$20,500 a year for non-residents. Recipients can earn up to an additional \$1,550 through the President's Student Aide Program by working in one of LSU's on-campus departments.

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## Discover Undergraduate Research Grant Recipients

This summer, six BE students earned LSU Discover research grants, which can be used towards wages, supplies, and travel associated with their projects. The recipients are listed below along with their respective mentors and research project titles.

### Summer 2021 Recipients:

#### Allie Brooks

Major: Biological Engineering

Mentor: Dr. Dorin Boldor

Research: Multiphysics numerical modeling of electromagnetic-driven thermochemical conversion of biomass

#### Miller Dickerson

Major: Biological Engineering

Mentor: Dr. Philip Jung

Research: Screening and selection of chimeras from non-contiguous recombination of laminin globular domains by applying random forest machine learning

#### Parker Hannan, Chloe Heitmeier, and Pearce Copeland

Majors: Biological Engineering, Biological Engineering, and Biological Sciences

Mentor: Dr. Yongchan Kwon

Research: Cell-free reprogramming monolignol biosynthetic pathway

#### Ignatius Semmes

Major: Biological Engineering

Mentor: Dr. Todd Monroe

Research: Development of a 3-D printed open-source sperm counting chamber

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## Engaged Citizens

The Center for Community Engagement, Learning, and Leadership (CCELL), in conjunction with LSU Campus Life, established the Engaged Citizen Program, which seeks to support and recognize the accomplishments of undergraduate students who engage significantly with their communities to address critical community needs.

Students who earned the Engaged Citizen distinction during the Spring 2021 and Summer 2021 periods are listed below.

### May 2021:

**Kothar Abdelghani**—Baton Rouge, Louisiana

**Nathaly Ysaccis Betancourt**—Caracas, Venezuela

**Eva Gatune**—Clayton, Delaware

**Adam Howe**—Baton Rouge, Louisiana

### August 2021:

**Lizabeth “Libby” Breaux**—Frisco, Texas

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## Betancourt Named to Tiger Twelve

Nathaly Ysaccis Betancourt, a native of Maturin, Venezuela, and a Spring 2021 BE graduate, was honored with the Tiger Twelve distinction. Since 2003, LSU has presented the Tiger Twelve honor to 12 students graduating each calendar year. Students selected as members of the Tiger Twelve are undergraduate seniors who contribute positively to the life of the campus, surrounding community, and society; and who demonstrate commitment to intellectual achievement, inclusive excellence, leadership in campus life, and service. All must carry at least a 2.5 cumulative GPA. This year’s class GPA average was 3.79.

## BE Student Interns with L’Oreal



LSU Biological Engineering junior Miller Dickerson loves makeup just as much as the next woman, but her main interest as a summer intern at the L’Oréal plant in North Little Rock, Arkansas, is to save the environment.

Dickerson, who hails from Hot Springs, Arkansas, is interning in L’Oréal’s Environmental Health & Safety Department and says she has had an amazing experience so far.

“I’m learning about industrial wastewater treatment, plant safety, employee training, and L’Oréal’s sustainability initiatives,” she said. “I’m working on a huge waste reduction project in conjunction with the packaging engineers that will potentially save tons of waste annually, as well as money. I’ve been able to do lots of different things so far, and I can’t wait to learn more.”

L’Oréal is the world’s largest cosmetics company that develops products concentrating on hair color, hair care, skin care, sun protection, make-up, and perfume. The company, founded in 1909 by Eugene Schueller in Paris, sees billions of dollars in revenue each year. Some of the company’s subsidiaries are Lancôme, Maybelline, Garnier, Urban Decay, Yves Saint Laurent, Prada, and more.

Over the years, L’Oréal has committed to creating less waste, managing water sustainability, fighting climate change, re-

specting biodiversity, preserving natural resources, foregoing animal testing, and investing in nature.

L’Oréal NLR is the company’s largest global manufacturing plant. The facility is one of five in North America, with its 450 employees producing more than 250 million color cosmetics annually. The 800,000-square-foot facility uses a nearby hydroelectric plant for its energy and, in 2017, installed a 3,528-panel solar array that provides the plant with 10% of its power. The plant has also attained a 100% waste-recovery rate, meaning nothing is sent to a landfill.

“I am so impressed with L’Oréal’s commitment to our environment,” Dickerson said. “I think seeing a large company take the initiative to make a difference is so amazing. The average person can do their part and it might not make a huge difference, but a big company can make positive changes at mass. As L’Oréal is a leader in sustainability, I believe other companies are following, and this is a great step towards a cleaner future.”

Dickerson’s internship is also a way for her to combine her love of femininity with STEM studies.

“I am a member of Society of Women Engineers (SWE) at LSU, Tau Beta Pi engineering honor society, Delta Gamma sorority, and a campus representative for Victoria’s Secret PINK,” she said. “A STEM role in the beauty industry was super appealing because it bridged my diverse interests.”

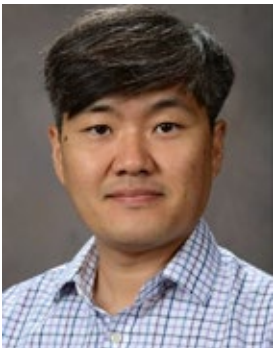
After she graduates in 2023, Dickerson hopes to pursue a medical degree or PhD, even though she is enjoying her time in the cosmetics field this summer.

“I applied for this internship to see how I could use my degree outside of the classroom,” she said. “I’ve been on the fence about what field I want to go into after I graduate, and I figured this would help me narrow that down. I am so thankful for the opportunity to explore the STEM field further, especially within the beauty industry.”

# ENGINEERING RESEARCH AND DESIGN HIGHLIGHTS

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## Jung Wins CAREER Award for Work in Engineering, Testing Designer Proteins



Assistant Professor of Biological Engineering Philip Jung has received the National Science Foundation CAREER Award for his project, “Engineering Laminin Globular Domains for Accelerated Cardiomyocyte Proliferation: Validation With a 3D-Bioprinted In Vitro Infarct Model.”

The award is for \$442,451 and extends until March 2026.

Jung’s project aims to engineer designer proteins to stimulate the proliferation of cardiomyocytes, or cardiac muscle cells, which aid in recovery after myocardial infarction, or heart attack. The heart contains 2-3 billion cardiac muscle cells, which account for less than a third of the total cell number in the left ventricle, alone—and if there is any critical damage to the heart resulting in the loss of those cells, there is no way to get them back.

“If we can figure out any single way to increase the proliferation of cardiomyocytes, even at a small scale, that would be significant help for patients suffering from heart failure,” Jung said. “Traditionally, cell and stem cell therapies have been attempted to replenish the lost cardiomyocytes. However, this comes with immune rejection at varying degrees.

“The new method I proposed here is to engineer the native protein (called the extracellular matrix) to stimulate the proliferation of cardiomyocytes. If successful, we may have another strategy to grow more cardiomyocytes without the complication of preparing cells, potentially avoiding immunological rejection.”

The other main aspect of the project, once a pool of computationally-generated chimeras is prepared, is to build machine-learning models to screen and select them. The current process can be costly and time-consuming. Jung’s project could change that.

“Creation, screening, and selection of chimeras take a lot of time and effort,” Jung said. “This is very challenging, since the number we talk about [of chimeras] is millions to billions. This experiment has to be repeated multiple times. So, we want to save this time and effort significantly so that we can do molecular evaluation in our lab.

“Computationally-generated chimeras will be selected and screened with trained data. We are training the data with publicly available sequences. After this learning process, we will need to validate the performance of the engineered proteins...the idea in the proposal is to develop in vitro models (engineered cardiac tissue) with 3D bioprinting. We also propose to apply adaptive optimization to identify the best parameters of 3D bioprinting, scaffold biomaterials, and cardiac cells.”

Jung’s work will also make its way to local K-12 students and college undergraduates.

“For K-12 students, I am planning to show that tissue engineering is not science fiction anymore and one of the important strategies in modern medicine,” he said. “For undergraduate students, I already have two of my design-elective classes certified for the C-I (communication intensive) curriculum, where the final projects are to investigate tissue or stem cell bioengineering strategies for their favorite target tissue or organ throughout a semester.”

# BE Seniors Design Robotic Arm for Crawfish Harvesting



Crawfish harvesting is a way of life that goes back to the late 1800s in South Louisiana. It's a skill handed down from generation to generation that not only keeps the tradition alive but also puts smiles on the faces of Louisianans who enjoy the fruits of the harvesters' labor. Realizing the importance of this tradition, yet wanting to innovate it, a team of senior LSU Biological and Agricultural Engineering students recently designed a robotic arm that can help with the harvest.

Each year, more than 100 million pounds of crawfish are harvested in South Louisiana between the months of March and June, with the Atchafalaya Basin seeing more than 800 harvesters each season. It's a labor-intensive line of work that requires only one person per boat, meaning the crawfish farmer must drive the boat with his or her foot and simultaneously pick up, empty, and rebait the traps.

The LSU BE team says its arm could save workers time and money and possibly prevent back injuries.

"I don't think there's anything wrong with the way crawfish is currently harvested, but if there's a possibility to improve the way we are harvesting, we should try," LSU BE senior Ben Thomas of Crowley, Louisiana, said. "The main reason to build the arm is to improve speed, which would increase

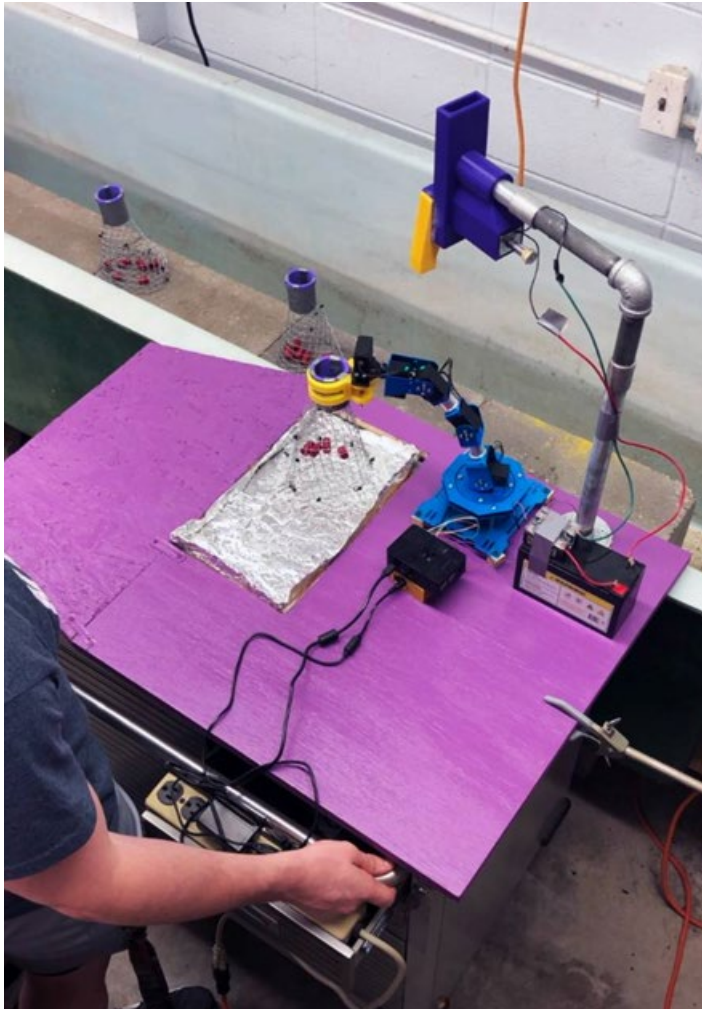
productivity. Most agricultural production is trying to be automated to increase yield, and with the growth of the crawfish industry, we thought we'd give it a try."

Thomas, along with five other LSU BE seniors—Hayden Waldvogel and Bryan Tassin of New Orleans; David Vercher of Alexandria, Louisiana; Sarah Mitchell of Denham Springs, Louisiana; and Damien Glaser of Baton Rouge—worked under LSU BAE Professor Chandra Theegala to complete this USDA project that Theegala procured last year.

"Due to COVID, I could not find a suitable graduate student in 2020, so I decided to put a group of senior design students to work on a miniature prototype," Theegala said. "I limited the scope to a small robotic arm that is commercially available. Each student focused on a particular component of the project."

Thomas did the programming and coding and was in charge of controlling the motion of the arm. Waldvogel designed and fabricated the trap rebaiting system by utilizing a 12-volt solenoid to push a bait pellet down a ramp into the trap. Tassin did background research and handled the team's time management, which included filling out reports, scheduling meetings, and keeping up with deadlines. Vercher helped

design the automated bait reloading device and shared his knowledge of living and working on a crawfish farm. Mitchell designed and printed a 3D custom gripper, along with smaller pieces needed for testing; and Glaser was in charge of the budget, ordering parts, and helping set up the testing tank.



The harvesting arm, which was built to one-third the scale of a commercial crawfish trap, is controlled by a Playstation 4 controller. It directs the arm to grab the trap, dump, rebait, and place the trap back down. The only part that isn't autonomous is aligning the arm with the trap.

“The hope is to have it be entirely autonomous, being able to align itself on a moving boat,” Thomas said.

The team’s test results show that the design is 87.78% reliable in picking up traps at an average of 18.3 seconds, roughly as fast as a person.

“If the arm could be fully autonomous, the grabbing time could be reduced by a significant amount, since in an ideal situation, the boat would never stop and the arm’s reach would be able to grab the trap towards the front of the boat,” Thomas said.

Whether or not the crawfish industry embraces the idea of using a robotic arm for harvesting, the LSU team enjoyed its experience working together and coming up with an idea that could be beneficial to their home state.

“This project was very interesting to me because of the impact it could have on a major industry,” Tassin said. “It has always been my goal to create something that could have a major impact on the world in some way.”

“The crawfish industry in Louisiana alone is massive, and to be involved in something that is ingrained within our culture is pretty neat,” Mitchell said. “I think it will be exciting to see the finished product in the future and be able to say I was part of the team that created a prototype for this.”

“This project was especially exciting to me because I know the impact it could potentially have on my own crawfish farm in the future,” Vercher said. “We all had impeccable teamwork skills that allowed us to work together efficiently. I couldn’t have asked for a better team.”

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# Graduate Program Highlights:

## Graduate Student Spotlight:



Jeehye Kim holds a PhD in biological engineering from LSU and an MS in bioscience and technology from Korea University. Since 2012, she has worked on formulation and process development, nanotechnology-based drug delivery, and protein synthesis with an emphasis on cell-free system. She recently

moved to Boston with her cat to start a new career in the biopharmaceutical industry.

In the BAE, Jeehye worked with Dr. Yong-Chan Kwon in the field of synthetic biology. She valued his laboratory's flexible and collaborative work environment. She developed a protein biomanufacturing platform and achieved a 15.2-fold increased protein production yield. Jeehye has seven

peer-reviewed publications and 112 citations. In 2020, her oral presentation abstract was selected for the AIChE graduate student award session., and she made three oral and two poster conference presentations on her PhD work. In 2021, Jeehye began work as a research associate and demonstrated the synthesized protein functionality by protein interactions using SPR, as well as achieved a controlled protein release from a nanogel matrix.

Before her PhD, Jeehye worked at the Biomaterials & Tissue Engineering Lab at Konkuk University as a lab manager. She developed formulations of nanoemulsion to a larger scale for product commercialization. She also provided mentorship and training to graduate students and generated progress reports centered on a nanoparticle project. Before that, she worked at Korea University to develop a nano delivery system for a cosmetics company and improved the skin permeability of a model drug by up to 160%.

When not working, Jeehye enjoys hiking, traveling, and taking a long nap with her cat at home.

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## May 2021

### Grad Student Graduates

#### **Jason Eades**

Degree: MS BAE  
Advisor: Todd Monroe  
Start Date: Fall 2016  
Grad. Date: August 2021  
Employer: TAMU; PhD

#### **Jeehye Kim**

Degree: PhD BE  
Advisor: Yongchan Kwon  
Start Date: Fall 2016  
Grad. Date: May 2021  
Employer: Post-doc, BAE, LSU

#### **Katie Hamel**

Degree: PhD BE  
Advisor: Elizabeth Martin  
Start Date: Fall 2016  
Grad. Date: May 2021  
Employer: Lab manager, Obatala Sciences

#### **Fallon Salinas Gonzales**

Degree: PhD BE  
Advisor: Cristina Sabliov  
Start Date: Fall 2018  
Grad. Date: May 2021  
Employer: Eurofins

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## May 2021

### Grad Student Hires

#### **Eban Hanna**

Degree: MS BAE  
Advisor: Cristina Sabliov  
Start Date: Spring 2021

#### **Cameron Matherne**

Degree: MS Non-Thesis  
Advisor: Elizabeth Martin  
Start Date: Spring 2021  
Employer: PBMRC, BR, LA

#### **Jack North**

Degree: MS BAE  
Advisor: Todd Monroe  
Start Date: Summer 2021

#### **Claire Lanclos**

Degree: PhD BE  
Advisor: Yongchan Kwon  
Start Date: Fall 2021

#### **Spencer Lemoine**

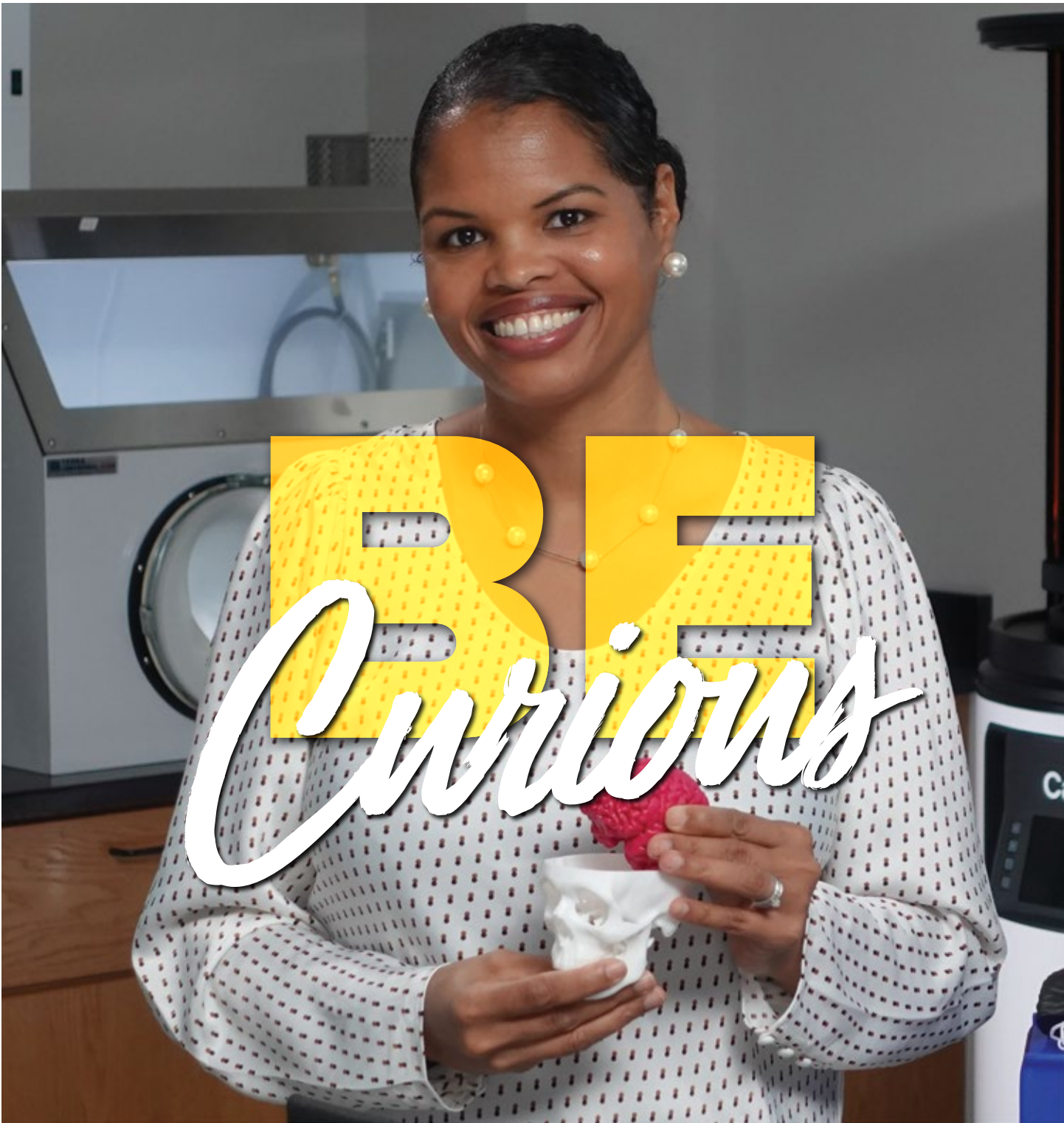
Degree: PhD BE  
Advisor: Todd Monroe  
Start Date: Fall 2021

#### **Adejoke Deborah Adewumi**

Degree: PhD BE  
Advisor: Dorin Boldor  
Start Date: Fall 2021

#### **Kewir Fannyuy Veeyee**

Degree: PhD BE  
Advisor: Cristina Sabliov  
Start Date: Fall 2021



As an LSU BE student, I had a welcoming community of peers and a dedicated faculty who encouraged us to think critically. The BE curriculum ignited a spark in me for problem solving, which led me to pursue a Ph.D. in Biomedical Engineering.

**Dr. Lakiesha Williams,**  
Associate Professor in Biomedical Engineering at the University of Florida,  
is studying traumatic brain injury and developing technologies to decrease  
brain trauma in athletes.

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