

LSU

Department of
Biological & Agricultural
Engineering

FALL 2020 NEWSLETTER



DEPARTMENT HIGHLIGHTS

Department Chair Year in Review

Year in Review– 2019-2020

W.D. Constant

The Department of Biological and Agricultural Engineering has had a very successful and active year of growth during 2019-2020. Research and extension funding has continued to develop, with an average of about \$245,000/year awarded per faculty member. Total awards from 2016-2023 total more than \$9 million. BAE has continuing awards of \$7.49 million (\$204,000 A&M) and new awards in 2019 of \$1.56 million (\$81,000 A&M). Average amounts spent in 2019-2020 are almost \$3 million or \$245,000/year/faculty member, which is much higher than last year. The major funding was obtained by Drs. Astete, Boldor, Monroe, Reichel, and Sabliov from federal (NIFA, NSF, USDA, NIH) and state (BOR, LIFT, DHH, Sea Grant) agencies. Total refereed journal publications for 2019 were 26, being a net number (17 AgCenter) only counting publications by more than one departmental faculty member once. In addition to funding and publications, faculty received two patents, six invention disclosures, and submitted a total of 53 (37 AgCenter) proposals.

Notable faculty awards included Instructor Excellence award, TAF Teaching award (Totaro), Excellence in Teamwork award from LSU AgCenter Healthy Bodies Initiative (Lima), Fulbright Scholar award (Sabliov), and LSU Distinguished Faculty Award (Boldor). Also, Mr. McClure received an outstanding service award as a research associate. BASF donated a significant amount of laboratory equipment to the department from a recently closed facility north of Baton Rouge, including sinks, hoods, venting and blowers, and laboratory tables. Akbar Zamin, one of our undergraduates, received a Goldwater Scholarship.

Enrollment and graduation numbers are remaining steady in the undergraduate program, and positive changes have occurred in the graduate programs. The new PhD in BE start-

ed in August 2018 with 11 students enrolled. The first two of our PhD students have completed degree requirements, and Spring Commencement in May had a large BS graduating class of 41 students. Fast Path, our BS/MD/PhD program, has generated significant interest since 2015, with 16 students now enrolled in the BS and MD parts of the program. We are working closely with LSU-HSC New Orleans administration to ensure success of this new program.

Graduate enrollment is steady in 2019 with two master's and 14 PhD students currently enrolled. We expect this drop from the typical 20-plus students to increase rapidly, as four new faculty have startup funds for GAs, and faculty are pursuing additional grants. Total undergraduate enrollment held steady at 315 in Fall 2019. Very early admit numbers for Fall 2020 indicate a possible increase of 15% in the freshman class, so we may see another step up in enrollment, but it's too early to tell at this point.

The department has now taken a very active role to engage LSU resources, BAE alumni, and the local industry to enhance our students' experiences both before and after graduation. In partnership with the Olinde Career Center, activities such as career discovery, resume building and Careers2Geaux account creation, personality tests and SWOT analysis, and mock interviews have been incorporated into the curriculum. BESO remains very active, now the LSU Student Chapter of the BioMedical Engineering Society (BMES), and remains a part of the American Society for Agricultural and Biological Engineers (ASABE). Since there are many small biomedical companies in the United States, we are developing a virtual career fair with a focus on biotechnology for 2020, so that those with limited resources can participate and see our students in a virtual environment. Hopefully, it will grow to interest more biotechnology companies to attend LSU's Career Expo on campus.

The BAE Advisory Council has established a new member program and a growing enrichment fund to be used for council directives. The first of which is remodeling the BESO student lounge. With the council's influence, more outside companies and partnerships with LSU-HSC have been established. With the support of BAE alumni, many classroom visits and some video conferences occurred in several upper-level design electives.

In closing, many challenges have been overcome by faculty, staff, and students as we worked through the COVID-19 pandemic these past spring and summer semesters and prepare for Fall 2020 classes. We are hopeful that our LSU BAE family will all be together for the fall semester, following LSU and state guidance, when the time comes. Take care and stay safe.

In Memory of Charles Severance

The obituary for our friend, alumnus, and former colleague Charles Severance was published in *The Advocate*.

<https://obits.theadvocate.com/obituaries/theadvocate/obituary.aspx?n=charles-e-severance&pid=195824155>

A giving page has been set up through the LSU Foundation for Mr. Charles Severance. Anyone wishing to make a memorial donation to the Charles Severance Fellowship can do so by clicking the link www.lsufoundation.org/severance.

STUDENT HIGHLIGHTS

May 2020 Graduates

Kori Anderson	Spencer Lemoine
James Blake	Zachary Lehmann
Christopher Bologna	Andy Lin
Leandre Bonmardion	Zoe Maartin
Adrianna Copeland	John Marzullo
Adriana Deras	Cameron Matherne
Kenzie Dupont	Cecilia McAlear
Jennifer Encarnacion	Victoria Parsley
Jarred Favrot	Jordan Remont
Faye Foret	Barrick Roberts
Tanishq Goribidanur	Trey Schexnayder
Roman Hundley	Nicholas Seagraves
Sayma Hanif	Samantha Seetharama
Savannah Heath	Prianca Shrestha
Nathan Istre	Meghan Sills
Sayou Ketcha	Austin Smith
Kallie Kilchrist	Lidia Elena Soto Handal
Timothy King	Jonathan Thomas
Akua Kumi	Thomas Tran
Tiffany Le	Britt Young
Tris Lear	Syed Zamin

Engaged Citizen Distinctions

James Blake
Jordan Remont
Akua Kumi

To read the full list of LSU graduates who earned this distinction, click https://www.lsu.edu/academicaffairs/ccell/about_ccell/stories/ecp_spring2020.php

Distinguished Communicators

Adrianna Copeland
Tiffany Le
Jordan Remont

Distinguished Undergraduate Researcher

Timothy King

To read the full list of LSU undergraduates who earned this honor, click <https://sites01.lsu.edu/wp/discover/distinguished-researchers/>

Tiger Twelve Award

Akua Kumi

To read the full list of honorees click <https://lsu.edu/studentaffairs/traditions/tiger-twelve.php>

Discover Day 2020 Individual Award Winner

Victoria Byrd

To see the full list of presenters from Discover Day, click <https://sites01.lsu.edu/wp/discover/discoverday/>

Discover Day Summer 2020 Research Grant Recipients

Jake Fontenot and Adam Bao, along with editing assistance from Dr. Jung, wrote a proposal, planned a budget, and each wrote a personal statement in hopes of receiving funding for the 3D-Bioprinted Disease model project. On June 3, they received confirmation of their acceptance and will receive \$2,500 worth of funding for the Summer 2020 semester.

Visit <https://sites01.lsu.edu/wp/discover/research-grants/> and scroll down the page to see the Discover Day summer 2020 research grant recipients

Meagan Moore—2020 Inspire Award

Courtesy of LSU Ethics Institute

The LSU Ethics Institute Inspire Award for Exemplary Ethical Action recognizes students who help another individual or group, stand up for a cause or belief, or otherwise exhibit extraordinary ethical leadership. Amid the COVID-19 pandemic, two undergraduate students have particularly stood out for stepping up and using their skills and knowledge to provide crucial help to their community. We are pleased to award the 2020 Inspire Award to Meagan Moore and Max Cole for their dedication to making Personal Protective Equipment (PPE) to protect first responders throughout Louisiana during the ongoing COVID-19 pandemic.

Moore and Cole were nominated by Dr. Wayne Newhauser, the director of medical and health physics and holder of the Dr. Charles M. Smith Chair of Medical Physics at LSU. As concerns about the severity of the pandemic grew in Louisiana and after LSU closed campus, Dr. Newhauser recognized a need for ventilator filters and other PPE for first responders throughout the state. Supported by the Bella Bowman Foundation, LSU, and Lamar Outdoor Advertising, a new nonprofit was formed, OneLouisianaNow!, comprising a 13-member leadership team and more than 80 volunteers. The first members to join the team were Moore and Cole, followed by Cathlin Disotell (LSU alumnus), Frank Womack (research specialist, LSU Physics and Astronomy), Nicholas Lombardo (research specialist, LSU Chemical Engineering), and Dr. Newhauser's wife Heike and sons Sven (LSU Mechanical Engineering) and Nils (LSU Laboratory School).

The volunteers worked quickly, meeting regularly in Dr. Newhauser's garage and working 8 to 10-hour days. They created the prototypes for ventilator filters, as well as face shields,

masks, and gowns, and mass production of these items has since begun in the LSU PMAC and other LSU laboratories. The garage operation yielded more than 3,400 items of PPE, which were successfully distributed to hospitals in the greater New Orleans and Baton Rouge areas in the first few weeks. Early mass production on the LSU campus yielded approximately 5,000 items per week.

While we have immense gratitude for the entire group of volunteers, we would like to especially recognize Moore and Cole for their efforts. Amid great turmoil and uncertainty, after shifting to online classes and having their normal lives as students completely upended, both rose to the challenge and put their community in front of their own concerns. We are thrilled that Dr. Newhauser nominated them for the Inspire Award, which recognizes students who have engaged in exemplary ethical conduct with a \$1,000 scholarship. In Dr. Newhauser's nomination, he noted that "The students showed initiative and commitment to a fledgling initiative to help healthcare professionals in their hour of need...they demonstrated exemplary ethical conduct by putting the needs of others before their own."

Moore, daughter of Michael and Kathryn Moore, is a senior in biological engineering. She is from Baton Rouge, and as she continues her studies in biological engineering, she also serves as the assistant director of the STEM Lab at St. Joseph's Academy. Cole is a senior studying physics at LSU. He is from Dallas and the son of Michelle and Laurence Cole. This fall, he will pursue a PhD in Medical Physics at LSU. We are pleased to recognize their efforts with the Inspire Award and wish them well in their future endeavors.

RESEARCH HIGHLIGHTS

LSU BE, Med School Research Link Between Obesity, Breast Cancer

LSU BE Assistant Professor Elizabeth Martin and LSU School of Medicine in New Orleans Associate Professor Frank Lau were recently awarded a \$100,000 internal grant for a study on how the obese tissue environment alters response to breast cancer therapy.

Louisiana has the third-highest female breast cancer death rate in the United States and was ranked as having one of the highest obesity rates in 2018, statistics that prompted Lau and Martin to research whether obesity creates a tumor environment that supports chemotherapy resistance in breast cancer patients.

Martin has worked on breast cancer research at LSU for the past four years, so it made sense for her to pair up with Lau, a clinical surgeon, who is an expert in adipose (fatty) tissue. Lau developed a method to culture white adipose tissue while Martin and her students work with Lau to insert breast cancer cells and evaluate how the tissue environment is remodeled. “One of the reasons breast cancer is so hard to treat is there are many different components to the stromal environment, which makes it tricky to identify how a patient will respond to therapy,” Martin said.

There are many factors that can alter responsive therapy to breast cancer, such as race, age, and obesity, which is the area Martin and her team are choosing to focus on. Compared to lean tissue, obese tissue has more inflammation and higher levels of collagen deposits, which can lead to fibrosis. Martin wants to discover if a collagen-rich environment makes breast cancer more aggressive.

“Studies have shown that breast cancer cells growing in a lab become more aggressive if they are on a stiff collagen-dense

tissue matrix,” she said. “So, we want to see if it correlates in real tissues.”

Martin’s team, made up of LSU BE PhD candidate Ethan Byrne and LSU BE undergraduates Morgan Doyle and Janusz Wojcik, will compare samples of lean and obese tissue to compare how the breast cancer cells behave in each one.

“What we think is happening is that when a tumor develops, the cells start invading tissue,” Byrne said. “The cells then degrade the tissue and as they’re taking it down, replace it with something that better suits them. They will also induce the cells around them to start changing the collagen content. The cells then start controlling everything.”

Byrne, who has worked with cancer cells in Martin’s lab for the past two summers, also trained in Lau’s lab last summer.

“They are culturing human breast tissue in between sheets of stem cells that anchor tissue down and allow for long-term growth in culture,” Byrne said. “Once the samples have been collected, we decellularize the samples and look at the fine microstructures and how they’re remodeled during tumor progression.”

Though a cure for breast cancer has yet to be found, the quest for more informed treatment options based on understanding the tissue environment of a tumor lives on through Martin and Lau’s research.

“This model allows us to more personalize our understanding of breast cancer drug resistance,” Martin said.

Sabliov Guest on Nano Matters

If you missed it, check out this episode of Nano Matters. LSU BAE Professor Cristina Sabliov explains how nanotechnology can improve pesticide delivery. She also discusses her work on a polymeric nanoparticle delivery system that could reduce the environmental impact of pesticides.

https://www.youtube.com/watch?feature=youtu.be&utm_content=&utm_medium=email&utm_name=&utm_source=govdelivery&utm_term=&v=xrXaYB40J2I

Kevin Hoffseth Researches Soybean Quality

Promotion Board to improve the soybean grading process, titled, Analyzing Soybean Quality With Automated Image Processing. Hoffseth has been working with input from soybean producers and LSU AgCenter to identify drawbacks in the current process to determine soybean grades. Currently, variation in evaluation leads to inefficiency and frustration for the producers, and the project seeks to apply automatic methods of image processing and analysis to evaluate visual indicators of soybean quality. Per the U.S. Department of Agriculture, the inspection process provides various factor information used to determine grade and further information on the condition of the soybeans.

Soybeans may be classified as one of five grades, from No. 1–4 to U.S. Sample Grade, highest to lowest, respectively, and may have additional special grade modifiers. The basis of determination of the overall soybean grade is formed by properly evaluating quality factors categorized as: distinctly low quality, heating, infested, odor, garlicky, kind of grain, moisture, purple mottled or stained, stones, test weight, U.S. sample grade factors, heat damage, damaged kernels, soybeans of other colors, and splits. A number of these factors are identified through visual inspection and are prime candidates for use of image processing and analysis techniques utilized in broader machine vision applications. Hoffseth believes results will aid the grain inspection process, reduce individual inspector fatigue, and should help in maintaining a consistent and accurate grading process.

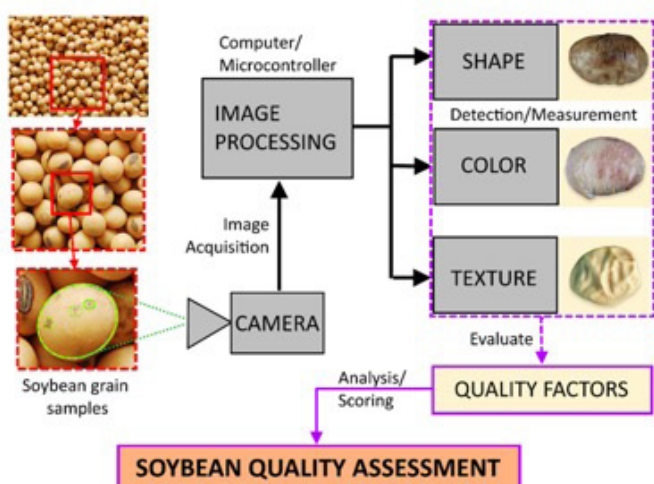


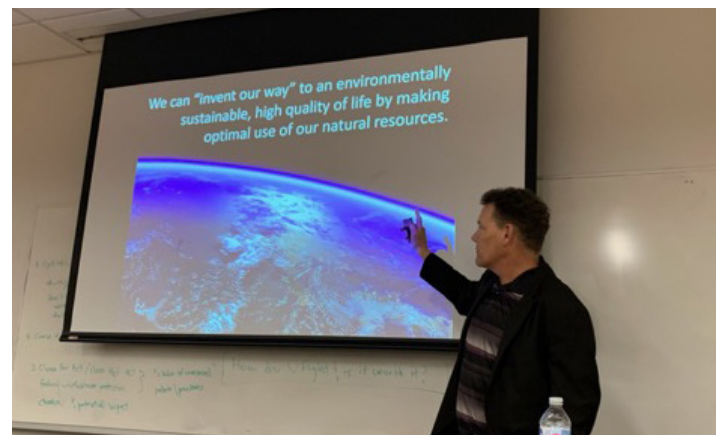
Figure 1: Schematic of proposed approach to analyze soybean quality using automated image processing techniques.

Dr. Bill Orts Seminar Speaker

Dr. William Orts, bioproducts research leader at USDA’s Western Regional Research Center in Albany, California, gave a wide-ranging seminar to the BAE department on February 12. In addition to BAE faculty and graduate students, several faculty from the Colleges of Engineering and Agriculture, and industry partners participated. The seminar was sponsored by the BAE Advisory Council in an effort to raise awareness across the LSU campus of related research activities taking place in BAE.

Dr. Orts covered a wide range of WRRRC research studies targeting the utilization of agricultural biomass streams, which are byproducts of processing the wide variety of crops produced in the western U.S.. Examples of the topics discussed were the development of single-use, biodegradable food containers and utensils; the development of biocomposites from almond shells that could substitute for recycled plastics; uses for sugars derived from almond hulls; and various nanocomposites and nanofibers derived from agricultural biomass streams. Dr. Orts also discussed the engineering and economic challenges of developing commercial-scale production systems for these novel products, and, in closing, he reminded the audience of the many career opportunities for engineers, chemists, economists, modelers, etc., that will be required to form the teams needed to make these products a commercial success.

This was the first of a series of keynote BAE seminars in which nationally prominent speakers will be invited to address the faculty, students, and friends of BAE. Announcements will be forthcoming, and all are invited to attend.



Dr. Bill Orts addresses BAE faculty, staff, and others on February 12.