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# **BIOLOGICAL AND AGRICULTURAL ENGINEERING**

## ***LIFE LINE***

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Spring 2021



**OUR MISSION IS TO DEVELOP  
SUSTAINABLE WATER, FOOD, ENERGY,  
AND RELATED SYSTEMS THROUGH  
INNOVATION IN TEACHING, RESEARCH,  
EXTENSION, AND ECONOMIC  
DEVELOPMENT VIA TECHNOLOGY TRANSFER.**

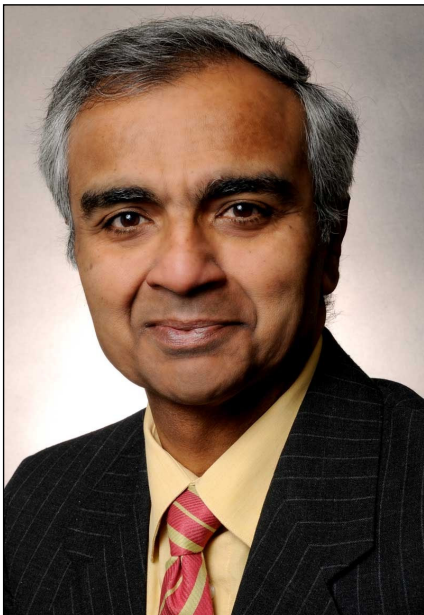
## From the Department Head

The spring semester ended with commencement ceremonies on May 7. Virtual recognition of graduating seniors and scholarship recipients was held on May 6. Thirty six graduates proudly concluded their undergraduate degrees with many to begin employment or graduate education. We await our newest faculty Dongyi Wang to join us boost the Food Engineering programs jointly with the Department of Food Science. The Design Expo was successfully held on April 29 with 40 students on 12 teams showcasing their senior engineering design projects mentored by Drs. Tom Costello, Ben Runkle, Yi Liang, Jun Zhu, Scott Osborn, Chris Henry, Ebenezer Kwofie, Marty Matlock and Kieu Le. Congratulations to our graduates and thanks to our faculty and staff.

Ms. Haley Ellis was honored as a College of Engineering Outstanding Senior *Finalist* and the Biological Engineering *Outstanding Senior*. Dr. Brian Haggard was awarded the College of Engineering Dean's Award of Excellence for *Outstanding Public Service*. Drs. Ben Runkle, Jun Zhu and Scott Osborn were the recipients of department's outstanding teaching, research and service to students awards, respectively and Ms. Leslie Reinhart was named the outstanding staff on April 30. Our Academy annual event was postponed until October due to the pandemic.

Plans are for normal operations to resume in June with Fall classes to be in-person in August. Faculty, staff and students deserve our gratitude for making things work under trying conditions and performing their duties diligently.

Your continued interest in our programs is appreciated. Please send us your news and updates and check us out at [www.bio-agengineering.uark.edu](http://www.bio-agengineering.uark.edu)



Sincerely,  
Lalit Verma

## Food Engineer Aims for Circularity of World Food Systems

Ebenezer Miezah Kwofie sees food production and consumption as linear, with waste products leaking out all along the line. He'd like to turn that line into a loop to create a more sustainable food system worldwide.

Kwofie has joined the University of Arkansas College of Engineering with appointments in the departments of biological and agricultural engineering and chemical engineering. He will also have a research appointment in the department of food science in the Dale Bumpers College of Agricultural, Food and Life Sciences.

The departments of biological and agricultural engineering and food science are also part of the University of Arkansas System Division of Agriculture.

"Dr. Kowfie's focus on sustainable food systems will add valuable capacity to the team on sustainable foods and nutrition to address global food challenges," said Lalit Verma, biological and agricultural engineering department head. "Dr. Jeyam Subbiah and I are working to build a core of excellence in food engineering in the Division of Agriculture and the University of Arkansas."

"Our departments' collaboration on integrated food sustainability requires analysis of profitability, food safety, social impacts and other elements," Subbiah, head of the food science department for the Division of Agriculture and Bumpers College, said. "Our scientists and engineers have to determine how to quantify those metrics, and Dr. Kwofie brings an exciting stock of skills and experience to the task."



### BAEG

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**Biological and Agricultural Engineering Chapter Wins Best School Award for Southeast Region**

The U of A student chapter of the American Society of Agricultural and Biological Engineers was voted the outstanding school by participants of the southeast region during 2020-21 annual rally, held virtually March 27 and hosted by the University of Tennessee at Knoxville. The Southeast Region is made up of 14 schools.

Each school was invited to create a video describing their activities over the academic year. The U of A's winning video was created by Hayden Engelbrecht, a junior from Decatur, Illinois. Engelbrecht serves as social chair for the club.

"While this year was unlike any other, my goal for this video was to highlight the relationships within the club and the initiative we took to maintain engagement even with COVID-19 restrictions," Engelbrecht said. "I'm really proud of all the small things we were able to accomplish this year, and I'm especially excited to see what we can accomplish when we return next fall."

The club is led by president Kristen Trinh, a graduating senior from Fort Smith.

"We are ecstatic that we won this award during this very challenging year," Trinh said. "Thank you, Hayden, for accurately capturing how we all felt and showing how we successfully made the best out of a very difficult situation."

Lalit Verma, head of the Biological and Agricultural Engineering Department, added, "We are very proud of our student club and the leadership provided by club officers under the guidance of club adviser Dr. Scott Osborn. This club has done an amazing job even during the pandemic and made us proud by their outstanding performance at the virtual Student Rally."

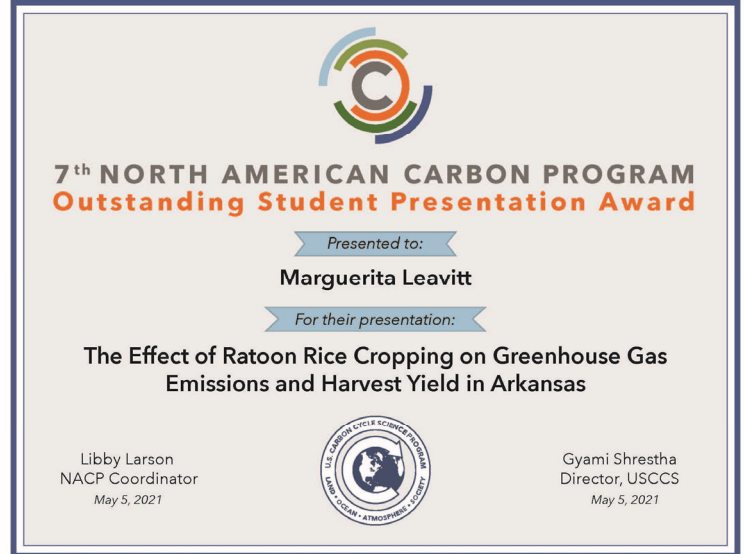
The focus of this year's rally was transitioning from school to employment and career paths for biological engineering students. Participants were also given a virtual tour of the Tennessee Valley Authority River Forecast Center that manages a 49-dam, integrated river system to provide flood-damage reduction, navigation, hydroelectric power, water quality, water supply and recreation.

**Senior Kristen Trinh wins 3rd place in poster competition**

Her poster was titled "Estimating irrigation in rice fields with a water balance approach"



**Leavitt M, Moreno Garcia B, Reavis CW, Reba ML, Runkle BRK,** The effect of ratoon rice cropping on greenhouse gas emissions and harvest yield in Arkansas, North America Carbon Program Open Science Meeting (virtual), March 2021, **Awarded top 5 Outstanding Student Presentation Award**



Ms. Haley Ellis was honored as a College of Engineering Outstanding Senior *Finalist* and the Biological Engineering *Outstanding Senior*.



**U of A Student Named 2021 Udall Scholar**

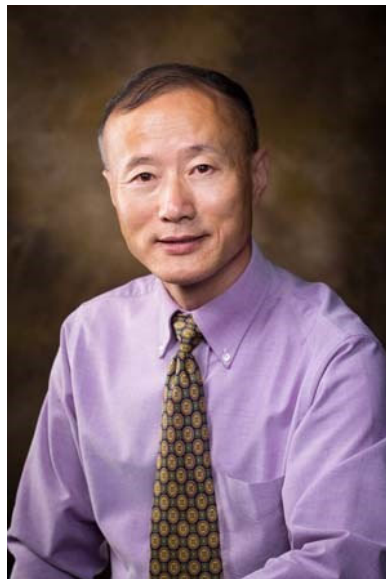
Alexis Barber, an honors student in biological engineering, has been named a Udall Scholar for leadership in environmental sustainability on campus and in the community.



Dr. Brian Haggard was awarded the College of Engineering Dean's Award of Excellence for *Outstanding Public Service*.



Drs. Ben Runkle, Jun Zhu and Scott Osborn were the recipients of department's outstanding teaching, research and service to students awards.





Students get together in Wilson Park. Jambalaya provided by Dr. Costello!





## Division of Agriculture Works with Local Brewery to Improve Carbonization of Craft Beer



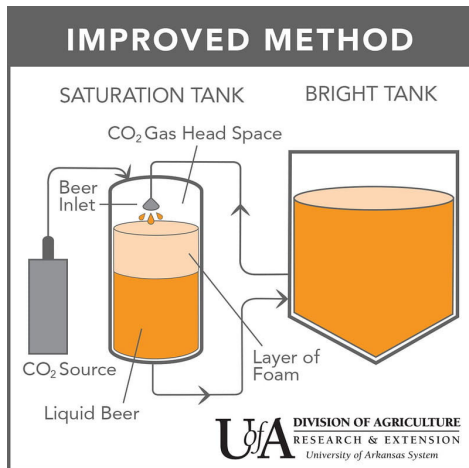
FAYETTEVILLE, Ark. — Improved carbonation techniques from the University of Arkansas System Division of Agriculture could pay bubbly dividends for craft beer brewers in the state.

Carbonation is a critical step in the beer brewing process, said Scott Osborn, associate professor of biological and agricultural engineering for the Arkansas Agricultural Experiment Station, the research arm of the Division of Agriculture. For craft brewers, achieving the correct level of carbon dioxide is a time-consuming and expensive operation.

Osborn developed a new carbonation method that could simplify the once labor-intensive process and reduce the amount of carbon dioxide leaked to the atmosphere. This technique may also mean a better tasting beer.

Core Brewing and Distillery Co., a Springdale, Ark., craft brewery, gave Osborn an opportunity to test the system in a production setting.

Osborn started looking at issues with the craft brewing carbonation process in 2015, he said. His research interests include evaluating systems for dissolving gases into liquids. This expertise naturally applied to tackling a costly carbonation problem for craft beer breweries.



### Gas problem

Carbonation is one of the final steps for craft brewers. Breweries traditionally carbonate beer in a large tank, called the bright tank. This is a temperature-controlled vessel where beer is stored in preparation for packaging. CO<sub>2</sub> is introduced through a metal device called a “carb stone” that releases tiny bubbles of carbon dioxide into the beer. But much of the gas can escape into the air, Osborn said.

“They can waste up to about half of the CO<sub>2</sub> that they are buying,” Osborn said. “That is not only wasted expense, but also a greenhouse gas.”

When the gas leaves, it can also strip out flavor volatiles that give beer subtle tastes, Osborn said.

The carbonation process has to be conducted with careful monitoring of CO<sub>2</sub> concentration to achieve the desired level of carbonation while avoiding over-carbonation.

### A solution

In the process developed by Osborn, beer is pumped from the bright tank into another tank pressurized with CO<sub>2</sub>, inducing carbonation. Bright tank pressure is measured continuously with a pressure gauge, and this value is entered into an equation to calculate CO<sub>2</sub> concentration, eliminating repeated and costly testing for carbonation levels.

The reading can also be automated so that a computer can shut everything off, Osborn said.

Core Brewing has been integral to developing the technology, giving input on how the operations work and how much automation they want, Osborn said.

“There is a lot of art and craftsmanship in craft brewing,” Osborn said. “Brewers want a connection with their process, they do not want computers making it.”

### MEDIA CONTACT

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# Cellulosic Nanomaterial May Help Solve Problem of Herbicide Drift

Joseph Batta-Mpouma and Gurshagan Kandhola found a tiny solution to a big problem.

Batta-Mpouma says up to 70 million pounds of herbicides are lost to the environment each year in the United States, according to Environmental Protection Agency estimates.

"Global crop production suffers immensely from the off-target drift of herbicides," Batta-Mpouma said. "Herbicides that miss their target, or that volatilize and drift after application, damage sensitive crops. It can lead to over-spraying and environmental pollution."

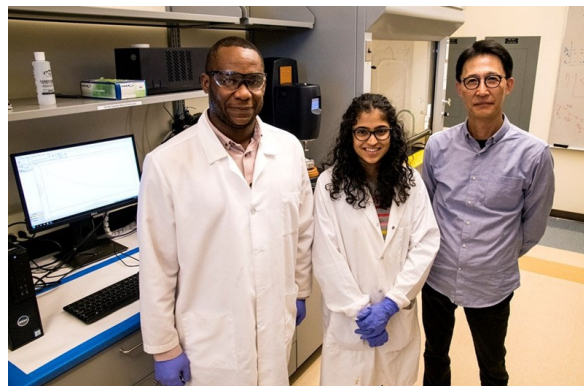
To keep those herbicides on target and on the ground, Batta-Mpouma and Kandhola developed a unique formulation of biodegradable nanomaterials derived from cellulosic waste, like sawdust. The formulation is designed to be added as an adjuvant to herbicide spray mixtures to reduce drift.

The Arkansas Agricultural Experiment Station research was initially supported by the Center for Advanced Surface Engineering under the National Science Foundation's Established Program to Stimulate Competitive Research (EPSCoR) grant. The grant was awarded through the Arkansas EPSCoR program, ASSET III, administered through the Arkansas Economic Development Commission.

Later the project earned a \$50,000 U of A Chancellor's Fund grant to continue advancing the technology.

Batta-Mpouma is a doctoral candidate in the materials science and engineering program at the U of A. He is a senior research assistant to Jin-Woo Kim, professor of biological and agricultural engineering for the Agricultural Experiment Station, the research arm of the University of Arkansas System Division of Agriculture, and the U of A's College of Engineering.

Kandhola has completed her doctoral degree in biological engineering and is a post-doctoral fellow in Kim's research group. She is partnering with Batta-Mpouma in a commercial venture to bring the nanocellulosic technology for herbicide drift control to market.



Doctoral candidate Joseph Batta-Mpouma and post-doctoral researcher Gurshagan Kandhola created a company to commercialize cellulosic nanomaterials for agricultural use. They developed the particles in their graduate research working with Arkansas Agricultural Experiment Station researcher Jin-Woo Kim. Batta-Mpouma developed their business plan in a Walton College entrepreneur class. (UA System Division of Agriculture photo by Fred Miller)





## Congratulation to the Class of 2021!

### Undergraduates:

Rachel Rose Koehler  
Kaden Belcher  
Caroline Grace Wilson  
Kristen Trinh  
Haley Ellis  
Daisy Mota  
Juan Arguijo  
Courtney Austin  
Isaac Bertels  
Charis Lykins  
Chandler Trotter  
Rebecca Widdowson  
Kelsea Crabb  
Lara Tarr  
Alexie Pope

Alex Anderson  
Austin Weeks  
Jake Krier  
Gil Thomas  
Christian Hitt  
Tatiana Castillo Hernandez  
Maxwell Criswell  
Marret Lineberry  
Jesse Morrison  
Hunter Brown  
Zane Mallicote  
Chandler Trotter  
Spencer Johnson  
Olivia Liedel

Brent Miller  
Clay Michael Schuler  
Anthony R. Zadoorian  
Evan Byrd  
Jordan Concanower  
Joshua Pierce  
Karina Arellano  
Sydney Bowman  
Jacob Fisher  
Lukes Huffman  
Tarah Inema  
Ian Klein  
Angel Meneses  
Ryan Sklar

# Scholarship Donation Opportunities

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Joel T. Walker Memorial Scholarship Fund \$ \_\_\_\_\_

Carl L. Griffis Memorial Scholarship Fund \$ \_\_\_\_\_

Biological and Agricultural Engineering General Scholarship Fund \$ \_\_\_\_\_

Biological and Agricultural Engineering Student Support Fund \$ \_\_\_\_\_

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*Have a great year!*

