

Message From The Department Head



I just started my 2nd year as Department Head in Agricultural and Biological Engineering (ABE) on July 1. Things were looking up then with respect to COVID-19, and we thought we'd be back to normal come fall, but our hopeful outlook was dampened by COVID's Delta variant, which forced us back to mask-wearing in all buildings at MSU at the start of the semester. While not ideal, our faculty and students have taken it in stride. As I walk the halls of ABE and look in classrooms, I see bright-eyed and engaged students, all wearing masks, and I am so proud of them and our faculty for doing what needs to be done to be safe yet in full learning mode. Official enrollment numbers have not been released yet, but MSU and ABE appear to be holding up well in spite of the pandemic. ABE's freshmen and transfer numbers suggest we'll continue to be at or near record undergraduate enrollment, with graduate student numbers climbing. I can't be certain this is a record, but **ABE graduated 15 M.S. and Ph.D. students among our three majors between August 2020 and July 2021.** Numbers don't tell the entire story. After you've perused this newsletter, see our website (abe.msstate.edu) where you'll find details on student accomplishments and stories about what led them to ABE and how the department has blessed their lives.

One story you'll find on this front page. Two former students of mine, while I was on the faculty in ABE between 1997 and 2004, married and have made a great life together in Florida, David and Lizbeth (Meigs) Childs. And while we have a lot of happy stories of current and former students, we occasionally have sad stories. One of our senior AETB students, Courtney Yates, passed away late in the spring semester, soon before she was to graduate. Her brother, LaDarius, also in AETB, will graduate this December. He and his family have endured great loss, and we in ABE share in their loss and hope to honor Courtney with an endowed memorial scholarship. Stay tuned, in case you would like to contribute. Courtney was an excellent student and person. She was awarded her B.S. degree in AETB posthumously.

As I mentioned in the last newsletter, we have been **hiring new faculty members.** Drs. Amirtaha Taebi, David Vandenneever, and Xin Zhang started in August 2021. You can read about them later herein. New faculty members bring new talents and energy and enable us to broaden our teaching and research portfolio. An example of this is the new course, Introduction to Imaging in Biological Systems, being taught by one of our newest faculty members, Dr. Yuzhen Lu. And while we have taken three steps forward this fall, we took two steps back over the summer. Drs. Anna and John Linhoss left us to go to Auburn University. While we certainly miss them and wish them all the best, I am hopeful to fill their positions in January.

Also mentioned in the last newsletter, we have more students than ever before and find ourselves with inadequate space to meet our needs. We engaged a consultant in the spring to evaluate our situation regarding building expansion. Stay tuned as we consider how to increase resources to improve instruction and magnify our impact on Mississippi and the nation. Again, **my goal is for ABE to have a clearly defined focus on engineering for human well-being** and to be recognized as an outstanding program nationally. We reinvigorated our ABE Advisory Board and met in April and recently in September. We covet their wisdom and are working to implement the ideas they have conveyed to us.

Please let us hear from you as well.

Alex Thomasson



ABE Creates Matches

Lizbeth and David Childs, married since 2006, took winding paths to MSU and used their biological engineering degrees to build careers in coastal engineering and government affairs, respectively. Both point to their experiences at MSU as keys to their success. Lizbeth, who served as an undergraduate research assistant to Dr. Thomasson, credits MSU's faculty and the varied ABE curriculum for preparing her for a career where it is essential to communicate and collaborate with scientists and engineers in other fields. David's background in biological engineering has enabled him to navigate the intersection of environmental science and regulatory policy.

Lizbeth, a Clinton, MS native, always had an interest in the coastal environment, which led her to study biological engineering and then earn an M.S. in coastal engineering from the University of Delaware. "As an undergraduate, I was always supported by my professors on my quest to expand my knowledge base and breadth of experience." She has assisted in shrimp research on a NOAA research vessel out of Pascagoula, studied coral systems in the Turks and Caicos, and engineering design and history in a study abroad program at University of Bristol, where she met her husband David in 2000. After graduation, she interned at Harbor Branch Oceanographic Institute in Fort Pierce, FL. Since 2004, she has been with Atkins, a large engineering consulting firm, working on projects ranging from the design, permitting, and construction of the Navarre Beach fishing pier, to reconstruction of eroded coastlines and the dredging of St. Lucie Inlet.

David, from Huntsville, Alabama, began with an interest in history and English but later changed to biological engineering. He started his professional career as a staff engineer with CH2M Hill, another large engineering firm. After moving to Tallahassee and earning a law degree from Florida State University, he earned a reputation as a top water policy expert, receiving honors from Florida Trend, Best Lawyers in America, Florida Politics, and the Florida Water Environment Association. "Now a Principal with The Vogel Group, I leverage my engineering and law degrees as a registered lobbyist for entities such as Mosaic, SAS Institute, Disney, and the Florida Chamber of Commerce."

The couple still lives in Tallahassee with their children, Martha and John, and their rambunctious dog, Ellie.



Our Faculty

Our New Faculty

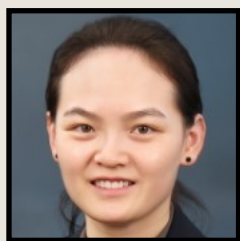


Dr. David Vandenhoeffer:

Growing up in South Africa with a dad who was a civil engineer, Dr. Vandenhoeffer thought engineers were like superheroes, so choosing a career was not difficult.

He earned his B.Eng. in Mechatronic Engineering and his M.S. and Ph.D. in Biomedical Engineering, all from Stellenbosch University.

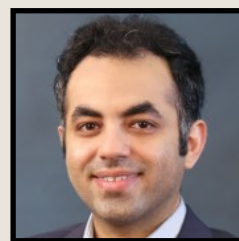
His early work touched on several fields, like respiratory dynamics, medical device development, sports medicine, and biomechanics. He is particularly proud of his biomechanics-related collaboration with the South African national rugby team's kicking coach. He recently began studying neuroscience and human behavior and earned a Postgraduate Diploma in Applied Ethics at Stellenbosch. At MSU, he hopes to continue using EEG recordings to answer questions about the brain such as how it encodes information. Regarding his future students, he says the key quality they need is passion. "You must be enthusiastic to get up every morning and tackle the problem you are working on."



Dr. Xin Zhang:

Originally from China, Dr. Xin Zhang, was first drawn to agriculture because it is essential to sustaining life. She earned her B.S. in Agronomy at Gansu Agricultural University, M.S. in Agriculture at Northwest A&F University, and Ph.D. in Biological and Agricultural Engineering from Washington State University. Her dissertation focused on mechanized and robotic harvesting of specialty crops with technologies such as computer vision and machine learning.

Dr. Zhang hopes to contribute her talents to ABE's mission of improving human welfare through engineering solutions. She believes the three keys to success for her future students are to "acknowledge that you have the primary responsibility for successfully completing your degree, think independently but work well in a team, and strive to meet your deadlines."



Dr. Amirtaha Taebi:

Originally from Iran, Dr. Amirtaha Taebi first became interested in the field of biomedical engineering with hopes of bettering

the quality of life for generations to come. He earned his B.S. in Mechanical Engineering at Sharif University of Technology, M.S. in Biomedical Engineering at Politecnico di Milano, and Ph.D. in Mechanical Engineering at University of Central Florida. His research focuses on developing early non-invasive diagnostic methods and personalized treatments for cardiovascular health.

Dr. Taebi was drawn to MSU because of the opportunity for collaboration with other ABE faculty and research groups on campus. He notes that the three keys to success in biomedical engineering are, "hard work, hard work, and hard work."

Awards

Dr. Chesser: 2021 CALS Excellence in Teaching Lower Division Award

Dr. Priddy: Georgia Tech Alumni Association's 40 Under 40, MSU College of Engineering Academy of Distinguished Teachers, Donald Zacharias Early Career Undergraduate Teaching Excellence Award

Dr. Simpson: Shackouls Honors College Honors Council Teaching Award

Dr. Tagert: MSU ORED's Faculty Leadership Development Institute

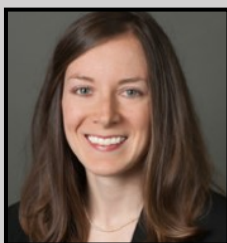
Grants

Dr. Simpson: NSF BRITE Program, "Examining the Role of Mechanotransduction in SMC Phenotype Modulation", \$560,000

Dr. Wijewardane: USDA NRCS, "Use of Mid-infrared Spectroscopy for Hydrological Soil Property Estimation in MS and TX", \$249,944

Dr. Paz: USDA, "Decision Support Tools to Address Sustainable Water Management Issues in the MS Delta", \$167,209

Spotlight



Dr. Lauren Priddy: Growing up in Mississippi as a Bulldog fan and receiving her B.S. and M.S. from the ABE department, it was always Dr. Priddy's dream to come back to MSU. Since returning from Georgia Tech to join the faculty in 2016, her lab's research has involved the fabrication of customized, load-bearing polymer and metal scaffolds for bone healing, and hydrogel-based composite materials for enhanced delivery of antimicrobial therapeutics. She strives to create a collaborative, more diverse, equitable, and inclusive environment in which her students can thrive. "I am excited not only about developing technologies that enhance healthcare but also about inspiring the next generation of bioengineers."

Dr. LaShan Simpson: Originally from Clinton, South Carolina, Dr. Simpson pursued her degrees at Clemson University before coming to MSU in 2013. She was drawn to MSU when she first visited campus, as well as the ABE department where she immediately felt she had a new home. Since joining the faculty 8 years ago, Dr. Simpson has stayed at MSU because of her love for her students who she refers to as her "babies." Having amassed numerous teaching and service awards in addition to being a beloved mentor, she loves seeing her students succeed. "My favorite teaching memories are the times my students report back to me about getting into medical school, graduate school, or getting a job."



Dr. Mary Love Tagert: A member of the faculty since January 2013, Dr. Tagert's favorite part of working in the department has been the people. She believes the expertise in the department is very diverse, but the faculty have always been very close and willing to lend a helping hand to one another. While it is rewarding to get papers published and grants funded, she feels she has accomplished something if she can help farmers and stakeholders address a problem. "My favorite teaching memories are when my graduate students have gotten their dream job or been accepted into their first-choice Ph.D. program. It has been a joy to watch my students succeed and move on to pursue successful career paths."

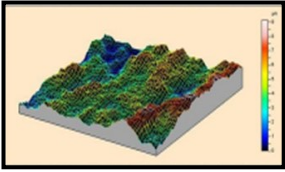
Student Design and Research Projects

Senior Design

Antibacterial Nanopatterned Surface Derived from Natural Insect Wings

Authors: Emily Moore, Rachel McDonald, Megan Armstrong, Alicia Viveros, Nikole Skaines, & Nicholas Borow

Novel research in biomedical engineering involves using the nanoscale surface characteristics of natural insect wings to produce microbial resistance. Using Grade 2 titanium and hydrothermal etching, nanopillars were formed on a billet surface to resemble the structural topography of a dragonfly wing. These nanopillars render the surface antimicrobial by causing damage to gram-positive and gram-negative bacteria cell membranes. Billets etched in a 6-hour hydrothermal test provided the most desirable height and surface roughness characteristics of all billets tested and also had the highest level of biofilm resistance.



3D Mobile: 2D LIDAR and Target Tracking Camera for Guiding 3D Additive and Subtractive Methods

Authors: Braden Garrison, Jackson Holland, Addy Hughes, Gentry Meinecke, Nate Risley, & Sara Skrocki

LiDAR is a time-of-flight sensing method using pulsed laser beams to determine distances and directions of objects. Current uses for LiDAR include object detection for autonomous vehicles, crop mapping, and topographical analysis. In this work, a 2D LiDAR sensor mounted on a test stand was used to locate and track an object, and wireless communication was used to provide guidance information to the vehicle the object was mounted on. A 3D-printed cube was placed on top of a small robotic vehicle, and the LiDAR sensor was able to provide 3D point cloud data to the robot, enabling it to perform the task of traveling in a straight line, turning 180°, and returning on the same path.



Insulated Syringe for Temperature Sensitive Applications

Authors: Kaylee Bundy, Shea Byrum, Claire Cross, Ashleigh Nicaise, & Madison Taylor

Initial fluid temperature approaches room temperature rapidly once drawn into a standard syringe. The production of an insulated syringe would help maintain optimum formula temperatures when hand-feeding young animals and ensure that vaccines stay within the CDC recommended temperature range until administration. An insulated syringe was designed in Autodesk Inventor and printed in polylactic acid (PLA) with a 1 cm gap between the walls of the syringe, filled with polyurethane closed cell foam. When fluids were drawn in, this syringe had a slower fluid temperature change than standard syringes and other design options, showing that a high-quality insulated syringe could be developed to maintain formula temperatures.



Research

AutoTacTill Platform

Author: Grace Friday, M.S. student in Engineering Technology

Grace Friday, a native of Savannah, Georgia, completed her B.S. in AETB at MSU in May 2021 before continuing as a Graduate Research Assistant under the direction of Dr. Wes Lowe. With sponsorship from Cotton Incorporated, she is exploring a new approach to site-specific weed management. Sensors that can detect weeds in the furrow and a hydraulic system have been attached to a John Deere cultivator, creating a system that digs only where weeds are found. This project is focused on mitigating concerns about herbicide resistant weeds and on practices that retain soil moisture and maintain soil health. With the recent addition of a herbicide sprayer attachment, Grace has tested combinations of weed management techniques on cotton. At MSU's R.R. Foil Plant Science Research Center she tested the sensors' functionality and gathered the data necessary to advance the understanding of weed management.



Materials Testing of Commercial Lay-Flat Irrigation Tubing

Author: Dru Carey, M.S. student in Engineering Technology

Dru Carey of Olive Branch, Mississippi, completed his B.S. in AETB at MSU in May 2020 before signing on as a Graduate Research Assistant under the direction of Dr. Wes Lowe. Having previously served as an undergraduate researcher with Dr. Joel Paz, Dru has been involved in multiple departmental projects and connected with industry and academic professionals as he pursues his M.S. in Engineering Technology. His thesis project focuses on evaluating the material properties of commercial lay-flat irrigation tubing. Specifically, he studies how varying pressure in the lay-flat tubing effects the punched outlet hole. A major cause of failure throughout the growing season incorrect sizing of the irrigation tubing in a field. An outcome of this project is to create a user guide for farmers to help choose the optimal diameter and thickness of lay-flat irrigation tubing based on a variety of factors. The current testing setup uses a section of tubing with a single outlet hole, which is run through a sequence of increasing and decreasing pressures enabling determination of the pressure conditions associated with failure for different thicknesses of lay-flat irrigation tubing. The eventual user guide will aid in selection of the best diameter and thickness for irrigation tubing.



Our Students

Awards

2021-2022 MSGCC NASA Fellowship

Anna Marie Clay, Ph.D.: Biomedical Engineering.

2021 Mississippi Engineering Society Scholarship

KarLee McNeel, B.S.: Biomedical Engineering.

2021 Society of Biomaterials C. William Hall Scholarship

Kaylee Bundy, B.S.: Biomedical Engineering.

1st Place in Spring 2021 Undergraduate Research Symposium

Cristina Griffith, B.S.: AETB/Agribusiness.

Inaugural McKay Orthopaedic Research Conference Grant

Kailey Clinton, B.S.: Biomedical Engineering.

Integrative and Multidisciplinary Pain and Aging Research Training (IMPART) NIH T32 Postdoctoral Fellowship

Folly Patterson, Ph.D.: Biomedical Engineering

1st Place in 2021 ASABE Boyd-Scott Graduate Research Award Competition

Guoming Li, Ph.D.: AETB.

Graduate Student Defenses

Rohit Pathak, Ph.D. Engineering Technology: “Development of data processing tool for precision agriculture and delivery system to end user” (**Spring 2021**)

Guoming Li, Ph.D. Engineering Technology: “Developing and applying precision animal farming tools for poultry behavior monitoring” (**Spring 2021**)

Meredith Brock, M.S. Biological Engineering: “Analysis of surface water for irrigation in the Big Sunflower River Watershed” (**Spring 2021**)

Razieh Barzin, Ph.D. Biological Engineering: “Yield Prediction and Leaf Nitrogen Estimation Using UAS Imagery and In-field Crop Sensor at Different Phenological” (**Spring 2021**)

Raul Osorio, Ph.D. Biological Engineering: “Assessment and Optimization of marsh terracing for wetland restoration in the northern Gulf of Mexico using remote sensing and a wave model approach” (**August 2021**)

Pratik Parajuli, Ph.D. Biological Engineering: “Development and Evaluation of Ground and Aerial Robotics Systems in Commercial Poultry Houses” (**August 2021**)

Jada Boone, M.S. Biomedical Engineering: “Sclerostin as a Potential Therapy for Medial Vascular Calcification through the Inhibition of the WNT/ β -Catenin Pathway” (**August 2021**)

Allison Healy, M.S. Biomedical Engineering: “The Role of a Sickled micro-environment in Cardiac Dysfunction”

Weitong Chen, Ph.D. Biomedical Engineering: “Characterization of 3D Printed Polyester Scaffolds Modified by Nano-Hydroxyapatite for Bone Tissue Engineering” (**August 2021**)

Folly Patterson, Ph.D. Biomedical Engineering: “Pain and Inflammation Due to Whole-Body Vibration in a Rat Model” (**August 2021**)

Spotlight



LaDarrius Yates is a senior in AETB. Originally from Woodland, MS, LaDarrius grew up working on his family farm, but his ultimate goal was attending nursing school. After struggling in a nursing program, a distraught LaDarrius began to seek God for guidance. He shared his thoughts about farming with a friend who pointed LaDarrius to Dr. Paz., who told him about AETB. Once at MSU, “I gained a group of extended family members in my professors and peers. In spring 2021, I lost my sister, Courtney, in a tragic accident. During that difficult period, MSU and ABE were right there to support my family and me. From this experience, I realized that MSU is more than a school, it’s a family.” Upon graduation in December, LaDarrius hopes to work for a company where he can act on his passion for helping people.



Dipesh Nepal is a Ph.D. student in Biological Engineering. A native of Kathmandu, Nepal, Dipesh earned his B.S. in Civil Engineering at Tribhuvan University in Nepal and his M.S. in Hydropower Development at the Norwegian University of Science and Technology. With an academic background in water resources, Dipesh came to MSU to pursue his research interest in the ABE department. Serving as Vice President of the Nepalese Student Association, Dipesh believes you can find everything you need at MSU. “As a PhD student, I can take whatever course I need in my research area and utilize various resources across campus. The university receives students from many nations, which provides me with the exciting opportunity to exchange my culture with others.”



Lauryn Carr is a junior in Biomedical Engineering. A native of Memphis, Tennessee, Lauryn came to MSU as a legacy student, with an aunt and cousin who had been MSU athletes. She quickly fit in. “From giving tours to prospective students as a Roadrunner to volunteering off campus at the J. L. King Center, I have loved learning about Mississippi State and all the wonderful opportunities the campus has to offer, as well as getting plugged into Starkville as a whole.” A member of the Honors College, Lauryn initially planned to attend medical school until interning with a federal judge in Memphis. There she found a passion for law and gained insight into how the courts operate. After graduating with a degree in BME with a minor in Sociology, Lauryn plans to attend law school to become a patent attorney or intellectual property lawyer.

Giving to ABE

We now have a giving page on the ABE website! It gives alumni and friends the opportunity to easily give to ABE. Below, you will find a list of giving opportunities, but we would appreciate gifts in any amount as we invest in the next generation of scholars. The QR code, at right, will take you to our giving page.



Teaching

- ◆ Named Scholarship Endowment
- Amount: \$25,000
- ◆ Named Graduate Fellowship Endowment
- Amount: \$250,000
- ◆ Engineering Senior Design Support
- Amount: \$100 or more

General

- ◆ Departmental Excellence Fund
- Amount: Any amount appreciated
- ◆ Endowed Professorship
- Amount: \$500,000
- ◆ Endowed Chair
- Amount: \$1,500,000



Research

- ◆ Field Equipment Donations
- Company donations of used agricultural equipment for student education and research.
- ◆ Mechanical Design Shop Materials
- Amount: \$1,000
- ◆ CNC Laser Cutter/Engraver
- Amount: \$10,000
- ◆ Natural Resources and Environment Research, Laboratory Equipment
- Amount: \$5,000
- ◆ Agricultural Sensing/Analytics/Robotics Equipment
- Amount: \$5,000
- ◆ Biomedical Sensing/Analytics/Robotics Equipment
- Amount: \$5,000
- ◆ Biomedical Materials Equipment
- Amount: \$5,000
- ◆ Real-Time PCR Equipment
- Amount: \$5,000
- ◆ Plate Reader
- Amount: \$15,000