MISSISSIPPI STATE UNIVERSITY™
DEPARTMENT OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

Spring 2025

NEWSLETTER

Department of Agricultural and Biological Engineering

Department Head letter

Dear ABE friends and family,

I'll keep my column short so you can focus on the exciting things highlighted later. With the recent changes in the federal government, universities are dealing with more uncertainty than usual in terms of funding and various policies, but we are working hard with the expectation that we'll reach a new normal soon. An approaching challenge is the so-called "enrollment cliff," which is expected to start next year as fewer and fewer students will be graduating from high school for the foreseeable future. So far, our student numbers have held steady in our undergraduate degree programs, and our graduate-student numbers are way up. So, I'm not worried, but we'll work hard in recruiting, particularly for our new undergraduate Biosystems Engineering (BSE) program, which we want to see grow substantially. If you know of students who might be a fit for any of our programs – BSE, Biomedical Engineering (BME), or Agricultural Engineering Technology and Business (AETB) – please send them our way.

Something to note is that we have hired two new staff members. Brandon Vineyard, who studied at University of Southern Mississippi and later worked in their office of research, is our new grants and contracts specialist. He'll be helping our faculty members submit research proposals, and his work will be extremely helpful as we grow our research program and attract graduate students. Also, Zack Murphy (see later article) has come on board to support our student advising efforts. As a current and former ABE student, he understands our programs and students, and we are thrilled to have him. If you are in the building, please drop in and introduce yourself to Brandon and Zack.

We are approaching the end of the Spring-2025 semester, and we'll see another 100 or so students graduate in the coming week. ABE continues to have some of the best students at MSU, and virtually all of them will go on to work in positions in their chosen field or continue their studies in graduate or professional school. You can read about several of them later in this newsletter.

Wishing you all the best!

J. Alex Thomasson, Ph.D.
ABE Department Head & Professor

Alumni Spotlight

Colonel Adam Rudolphi

"The article below includes Colonel Adam Rudolphi's views, which do not reflect the position of the U.S. Air Force."

Adam Rudolphi graduated from MSU with a B.S. in Biological Engineering on December 15, 2000, and the very next day he was commissioned as a Second Lieutenant in the U.S. Air Force (USAF). He just marked his 24th year of service, serving as Chief of Helicopter Requirements for USAF Global Strike Command. In that role he looks for gaps in the command's helicopter-fleet capability and obtains resources to close those gaps. Most of Adam's USAF career has been spent flying helicopters for combat search and rescue, but he has also dabbled in acquisition (his current job), computer networks, and nuclear surety. As he has gained experience and seniority, his level of responsibility has increased. He has also taught many Airmen on military posts and the battlefields of Iraq and Afghanistan.

Adam says his MSU experience helped prepare him for a USAF career by nurturing three critical skills: creative problem solving, communication, and perseverance.

Creative Problem Solving. Adam hasn't calculated the velocity of a viscous fluid through a pipe, measured the tensile strength of a member under load, or solved a differential equation since graduation. Yet, his time at MSU gave him tools that enable him to look at the world from an uncommon perspective, with a better understanding of how the world works, such as how temperatures affect the performance of a GE 701 turbine engine, how particulates are energized by the downwash of rotor blades during a landing, and how energy transferred from projectiles can have a devastating effect on their targets. Critical thinking and the ability to solve problems are essential to a successful military career.

Communication. Adam notes that a person may have the cure for cancer worked out in his mind, but unless he can communicate that idea to others, it is useless. In school, he viewed writing assignments as tasks to suffer through in order to graduate. He particularly remembers the writing required for his senior design project, now realizing how much he learned through those assignments. He views writing as a pure form of communication that, with his practice at MSU, enabled him to vastly improve his verbal communication.

Perseverance. Adam admits he was not a great student, graduating with a mediocre GPA after 5.5 years of slogging through his coursework. Choosing to play three hours of ultimate frisbee on Tuesday evenings, for example, led to lessons like having to re-take Calculus 2 and 3. With tongue in cheek, he quotes John Wayne: "Life is hard, but it is harder when you are stupid." Adam is thankful for these lessons, which taught him perseverance. He learned that turning in assignments on time, showing up to class, and having a good attitude enabled him to get by. For Adam, getting a degree was a means to an end; his goal was a commission in the Air Force, which required a degree.

He doesn't advocate simply squeaking by, but he makes the point that sometimes one has to slog through a difficult process to reach the goal. He points to President Calvin Coolidge, who summarized these lessons succinctly:

> **Nothing in this world can take the place of persistence. Talent will not: nothing is more common than unsuccessful men with talent. Genius will not; unrewarded genius is almost a proverb. Education will not: the world is full of educated derelicts. Persistence and determination alone are omnipotent.**

Adam's father Mike has had the greatest influence on his life choices. Mike was at different times an engineer for the Tennessee Valley Authority (TVA) and for NASA. Referring to his dad as an exceptional person, Adam never fully grasped how fortunate he was to be Mike's son until his mid-thirties. He says, "if I can be half the man he was, I will have led a tremendous life. He has also been influenced by his brother Ben, also an ABE graduate and 22 months Adam's junior, who actually joined the Air Force before Adam and inspired him to join as well. [See an excellent article on Adam's brother, Ben Rudolphi, here: https://www.moody.af.mil/News/Article-Display/Article/3893906/4000-hours-and-counting-flying-tiger-a-10-pilot-hits-notable-milestone/]

Adam enjoyed team sports as a youth, thinking at the time they were fun, but now he realized that he mainly enjoyed the feelings of common purpose, mutual support, and self-sacrifice. He likens military to team sports in that regard. Adam worked part-time while a student in ABE, appreciating the flexible work schedule. ROTC, which helped pay for his schooling, was also like a job for him. He advises students of today to write down the things they need to get done over the short term, prioritize the list, and execute each item according to its priority. He notes that many type-A people want everything they do to be perfect, "but there's not enough time for that. Sometimes good enough is good enough."

A noteworthy leadership position Adam held in his youth was as Boy Scout Troop leader on a trip to Philmont Scout Ranch in summer 1994. The Troop spent 12 days carrying 40 to 60-pound packs through the New Mexico mountains, often covering 12 miles a day. Adam was responsible for choosing the routing, assigning daily chores, selecting campsites, and assigning who carried which gear. Telling your buddy who's carrying a 50-pound pack that he needs to carry 5 additional pounds of water was hard to do, he says. Adam learned that being in charge of people means being responsible for them. "Being a leader is challenging but can be tremendously rewarding. If you have been in an organization devoid of leadership, it should be clear that people need leaders." Adam's most rewarding leadership experience as an adult was as squadron commander of 37th Helicopter Squadron at FE Warren AFB, WY.

Adam considers the age-old question, are great leaders born, or made? His answer to the question is, "yes. I don't think any individual would be successful if they were given a position of leadership without developing leadership skills in positions of lesser authority and responsibility first. I also know a lot of people don't have the requisite traits of a leader and should not be in positions of responsibility. The best leaders are those who love their teams. I liken it to great parents, who know they have to draw a hard line with their children from time to time in order to train them to be resilient and strong when they go out into the world. These parents are also able to embrace their children with kindness when they face setbacks. The same goes for great leaders, who sometimes must use the stick to drive their team and sometimes use the carrot to encourage them. Whatever tool they use, they select it because they love their team, not themselves."

Adam is guided by a scripture verse, 1 Corinthians 2:2. His goal in life is to not let his own desires dominate over the providential plan laid out for him. He stays connected with his creator through daily prayer. He also thinks it is essential to do a critical analysis of himself every 3 to 5 years. He writes down goals and achievements and assesses where he has fallen short and where he has exceeded expectations. He also believes that in challenging himself with something new every five years or so to get out of his comfort zone. Adam will retire from the Air Force in a few years and hopes to move on to a second career where he can teach young people to be leaders. He wants a work schedule that will allow him to spend ample time with his wife and children. And he wants to continue to fly in some capacity.

Faculty & Staff Spotlight

Dr. Daniel Chesser

Dr. Daniel Chesser, a three-time graduate at MSU, has been a dedicated ABE employee since 1999, starting as a student worker and then serving in roles from field research technician to ABE Shop Manager, before joining the faculty in 2018. He was recently promoted to Associate Professor and provides leadership in applied agricultural engineering research and teaching within the AETB program.

Dr. Chesser's research centers on precision agriculture machinery and technology systems, as well as the management and evaluation of controlled environment animal production systems, specifically in broiler housing and production. He teaches key AETB courses including Technology Design I & II and Building Construction, infusing hands-on learning with real-world engineering applications. With over 20 years of experience in mechanical systems design, 3D CAD/CAM, autonomous systems, and environmental sensing and controls, he equips students with both technical expertise and practical problem-solving skills. Beyond the classroom, Dr. Chesser is actively engaged in shaping student success through professional development and career preparation initiatives. As Undergraduate Coordinator for AETB and Graduate Coordinator for the Engineering Technology Master's and Ph.D. programs, he works closely with students to help them define and achieve their academic and professional goals.

Dr. Steve Elder

Dr. Steve Elder earned B.S., M.S., and Ph.D. degrees in biomedical engineering from Duke University, the University of Iowa, and the University of Michigan, respectively. He joined the ABE faculty as an Assistant Professor in 1999 and was promoted to Associate Professor in 2004 and then Professor in 2010. He serves as Undergraduate and Graduate Coordinator for ABE's engineering programs. His research focus is in orthopedics, and his current research has two specific thrusts related to human joints.

First, he is working on synthetic-polymer based in situ forming of microparticles for the release of a natural compound (punicalagin) from pomegranates, which his lab is investigating as a potential disease-modifying osteoarthritis drug. This project is supported by the National Institutes of Health. Second, he is working to optimize an electrospun cell scaffold to augment a cartilage restorative procedure in the knee. This project is supported by the Mississippi Agriculture and Forestry Experiment Station. Dr. Elder routinely collaborates with veterinary surgeons on projects that involve mechanical testing of fracture-fixation constructs. He particularly enjoys advising undergraduate students working on their capstone design projects, and training undergraduate research assistants. Dr. Elder has become a 3D-printing enthusiast and finds helping students turn their design ideas into a reality highly rewarding.

Zack Murphy

Zack Murphy recently joined ABE as Assistant Coordinator. In this role, he is the primary contact for undergraduate students in advising matters, assisting them with course registration, class recommendations, and career advice while working closely with Drs. Elder and Chesser. In addition to his full-time departmental responsibilities, Zack is pursuing an M.S. in BME, conducting research in Dr. Vandenheever's aptly named lab, the "Neural Engineering Research Division (NERD)." Zack uses electroencephalography (EEG) to capture real-time brain-signal data during experiments. His research focuses on developing methods to detect the early cognitive decline associated with frontotemporal dementia. As part of this work, he is writing custom software to enhance EEG data analysis for the lab's experiments. Upon completing his M.S. degree, Zack intends to pursue a Ph.D., furthering his commitment to advancing research that benefits Mississippians, and hopefully continuing his role in advising ABE students.

Undergraduate Student Spotlight

Anslee Boyd is an AETB senior from Sandhill, MS with a concentration in Precision Agriculture. Her dad is also an AETB graduate, and his stories and experiences were what first sparked her interest in the program. Since her freshman year, Anslee has made the most of her time in ABE, working as a Land Surveying teaching assistant for Drs. Paz and Lowe, and now serving as MSU's ASABE student chapter president and holding a position on the executive board for the ASABE International Student Branch. Her role in the ASABE student chapter has been central to the club's rekindling and recent growth and has provided national visibility for ABE. Over the course of her undergraduate studies, Anslee's favorite thing about being a student in ABE is the friendships she has made. The sense of community in ABE and at MSU has shaped her time in Starkville and encouraged her to grow personally and professionally. Upon graduation, Anslee will start an M.S. degree program involving research on using spray drones in soybean production, in partnership with the Plant and Soil Sciences (PSS) department and the Agricultural Autonomy Institute (AAI).

Elijah Gregory, a BSE senior from Smithville, MS, enjoys tackling complex engineering problems by developing innovative solutions. While studying at MSU, Elijah has worked at MIssissippi Peanut Supply in Aberdeen, MS, where he has used his growing knowledge of agriculture and engineering to improve how things are done. He believes his studies and employment, which has given him firsthand experience in business operations, have enabled him to develop skills that will last throughout his lifetime. Elijah is committed to excellence, as evidenced by his selection as one of only ten students nationwide to attend the AgGateway Annual Conference, all expenses paid, in fall of 2024. Outside of studies and work, Elijah enjoys the outdoors and spending time with family and friends. While he hasn't made a final decision yet, he intends to apply his engineering expertise in an industry setting where he can make a wide-ranging and lasting impact.

Khaoula Kamal, a BME senior from Tupelo, MS, is an MSU Presidential Scholar and student researcher in Dr. Priddy's lab, where she explores magnesium metal as a potential major advance in biodegradable orthopedic implants. Khaoula wants to improve rural healthcare, beyond simply a focus on medicine, so she served as a policy intern in Senator Wicker's office in Washington, D.C. Khaoula also chaired the Student Association Senate and was named Outstanding Shackouls Honors Student of the Year, Homecoming Maid, and Miss Mississippi State University. She is this year's recipient of MSU's Simrall Engineering Award and was the only Mississippian in 2021 recognized as a Horatio Alger Scholar. Khaoula was a 2025 inductee into the Bagley College of Engineering Student Hall of Fame. Next year, she plans to study medicine at University of Mississippi Medical Center and hopes to integrate applied engineering design to create emergency devices for critical care.

Anamica Khadgi is a senior in BME, hailing from Kathmandu, Nepal. While at MSU, she has been actively involved in research, student organizations, and service projects that have made her college experience particularly meaningful. Some of her favorite memories include her serving as President of the International Student Advisory Board and competing on the two-time national championship-winning MSU Debate Team. In ABE, she conducts research in Dr. Elder's lab, studying the effects of punicalagin in an osteoarthritic environment. As a sophomore, she participated in a summer research program at Emory University, studying immunosuppression in B-cell Acute Lymphoblastic Leukemia within an adipose microenvironment. This project sparked her interest in becoming a physician-scientist. After graduation, she plans to pursue a full-time research position to further develop her research interests. She is deeply grateful to ABE faculty and staff and the Bagley College of Engineering for supporting her throughout her MSU journey.

Annamarie Thompson, a BME senior from Trussville, AL, is an MSU Provost Scholar with a minor in mathematics. While at MSU, she has conducted research in the MSU Vet School's Department of Comparative Biomedical Sciences, studying diabetic wound healing and the pregnane x receptor. She also completed internships at the University of Texas M. D. Anderson Cancer Center and the University of Mississippi Medical Center. At MSU, Annamarie is a Bagley College of Engineering (BCoE) Ambassador, a student in the MBA Venture Pathway Program, a member of Tau Beta Pi, and a Shackouls Honors College Ambassador. In 2024, she was honored as both a Goldwater Scholar and an Astronaut Scholar, and in 2025 she was inducted into the BCoE Student Hall of Fame. After graduation, Annamarie will attend Duke University to pursue a Ph.D. in Molecular Cancer Biology. She plans to use her BME degree and research experience to study novel therapeutics for pediatric high-grade gliomas. Annamarie is grateful for the opportunities, mentorship, and support she has received as a member of the ABE family.

Graduate Student Spotlight

Jaydon Gibson, a BME M.S. student from Brandon, MS, is advancing bone tissue engineering by researching a perfusion-compression bioreactor system for enhancing osteogenesis of pre-osteoblast cells. He earned his B.S. degree in BME from MSU in 2023, and now his research focuses on culturing the cells on 3D-printed polymer scaffolds under controlled mechanical and nutrient flow conditions. Jaydon aims to increase cell seeding efficiency by implementing a custom oscillation flow device to seed the cells on the scaffolds. 3D printing of the scaffolds ensures uniform geometry and compressive loading. His system applies targeted compression cycles to the scaffolds, inducing strains like those bones experience in the body and promoting osteogenesis of the cells. Jaydon won first place in the engineering division of MSU's 2025 Spring Graduate Research Symposium for his oral presentation on this topic. He co-author on a manuscript, to be published in 2024, detailing the initial design of the bioreactor. He is also first author on a textbook chapter on biomaterial scaffolds for orthopedic applications. The book is in press and will be published this spring.

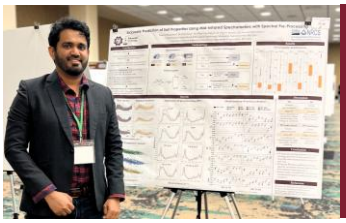
Kaitlyn Gordon is an AETB graduate student from Dora, Alabama. She earned her B.S. in AETB, with concentrations in Precision Agriculture and Surveying in May 2023. She plans to complete her M.S. in August 2025, with a minor in Agricultural and Extension Education. Under Dr. Tagert's guidance, her thesis research is part of a USDA-NIFA funded project looking at biomass combined heat and power energy systems to increase energy resiliency in rural communities. As a component of this work, she is developing an Extension program to increase awareness and understanding of renewable energy options in Mississippi. During her time as a student, Kaitlyn has been actively involved in MSU's ASABE student chapter. She was awarded first place for her poster in the educational/outreach session at the 2024 ASABE Annual International Meeting in Anaheim, CA. Originally drawn to Mississippi State by the small-town atmosphere and welcoming campus, she's found that same supportive environment within ABE. Beyond academics, Kaitlyn values the lasting friendships she has formed and the close-knit community that has made her time at MSU so meaningful.

Mohsen Nekooei is a Ph.D. candidate in BSE, having joined ABE in summer 2022. He earned his B.Sc. in Water Engineering in 2007 and his M.Sc. in Irrigation and Drainage in 2011 from Isfahan University of Technology (IUT) in Iran. Mohsen's current research focuses on groundwater modeling of the Mississippi River Valley Alluvial Aquifer (MRVAA) in the Mississippi Delta, incorporating the impacts of changes in land use and climate. Mohsen has over 10 years of experience in the water-related industry in his home country, spanning design, supervision, consulting, and project implementation. Now, his primary goal is to leverage his practical experience and new knowledge into a position at an academic or research institution, where he can contribute to advancing research in water systems and sound ecological practices. He is set to defend his doctoral dissertation in the upcoming weeks and graduate in summer 2025.

Our Students are winning!

Thevathayarajh "Theva" Thayananthan, Ph.D. student in BSE, was selected as the lone Bagley College of Engineering 2025 inductee into MSU's Graduate School Hall of Fame. This is a huge honor, recognizing Theva's research dedication and academic excellence. Congrat's, Theva!

Spencer Lile is one of two MSU recipients of the 2025 Barry Goldwater Scholarship, one of the nation's premier undergraduate scholarships. Spencer is from Benton, Arkansas, and is double majoring in biomedical engineering (pre-med emphasis) and physics. He plans to enroll in a combined M.D. and Ph.D. program to study computational modeling of the heart, and he hopes to someday work in a lab designing patient-specific heart-disease treatments for rare heart disorders. Keep flying high, Spencer!



Yasas Gamagedara, Ph.D. student in BSE, won Third Place in the Graduate Poster Award category (Agriculture and Plant Sciences Division) at the 89th Annual Meeting of the Mississippi Academy of Sciences, Biloxi, MS, March 19-21, 2025. Way to go, Yasas!

AG & BIO ENGINEERING
Mississippi State University

Traveling with ABE

Mid-South Farm & Gin Show 2025 February 28 - March 1
Memphis, TN

2025 Beltwide Cotton Conferences
January 14 – 16 - New Orleans, LA

4th annual AI in Agriculture conference
March 31-April 2, 2025 - Starkville, MS

2025 ASABE Southeast Regional Rally March 27-30, 2025
College Station, Texas

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