

AUBURN RESEARCH


Spring 2021



**THE PARK
AT AUBURN**
A COMMUNITY OF

Bright Ideas





Spring is aflutter
on campus.

Photo by Jeff Etheridge



A quiet spring
evening on
Samford Lawn

Photo by Jeff Etheridge

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Credits
Dr. James Weyhenmeyer
Vice President for Research & Economic Development

Publication Team:
Jonathan Cullum
Editor

Megan Burmester
Copy Editor

Bridget Wyke
Creative Director

Jennie Carson Hill
Design and Production

Jeff Etheridge
Leslie Chapman
Jonah Enfinger
Philip Smith
University Photography

Contributors
Dr. Tannista Banerjee
Latha Bhavnani
Leslie Chapman
Matt Crouch
Mitch Emmons
Maria Gebhardt
Teri Greene
Jeremy Henderson
Paul Hollis
Jessica Holmes
Maggie Lawrence
George Littleton
Joe McAdory
Kitty Parker
Victoria Santos
Charlotte Tuggle

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Lucy LaMar*

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Inquiries, suggestions and news items concerning Auburn Research magazine should be directed to:
Jonathan Cullum
Auburn University
Research & Innovation Center
540 Devall Drive, Suite 200
Auburn, AL 36832
jonathan.cullum@auburn.edu

On the cover:
The collaborative research environment of The Park at Auburn yields bright ideas that benefit society and promote economic development.
Artwork by Jennie Hill.

Editor’s note: Some of the photos in this issue were taken before COVID-19-related face mask requirements went into effect.



Dr. Steven Brown



Dr. Jada Kohlmeier

Brown, Kohlmeier Receive Humanities Grant to Spotlight Notable Civil Rights Court Cases

by Vicky Santos

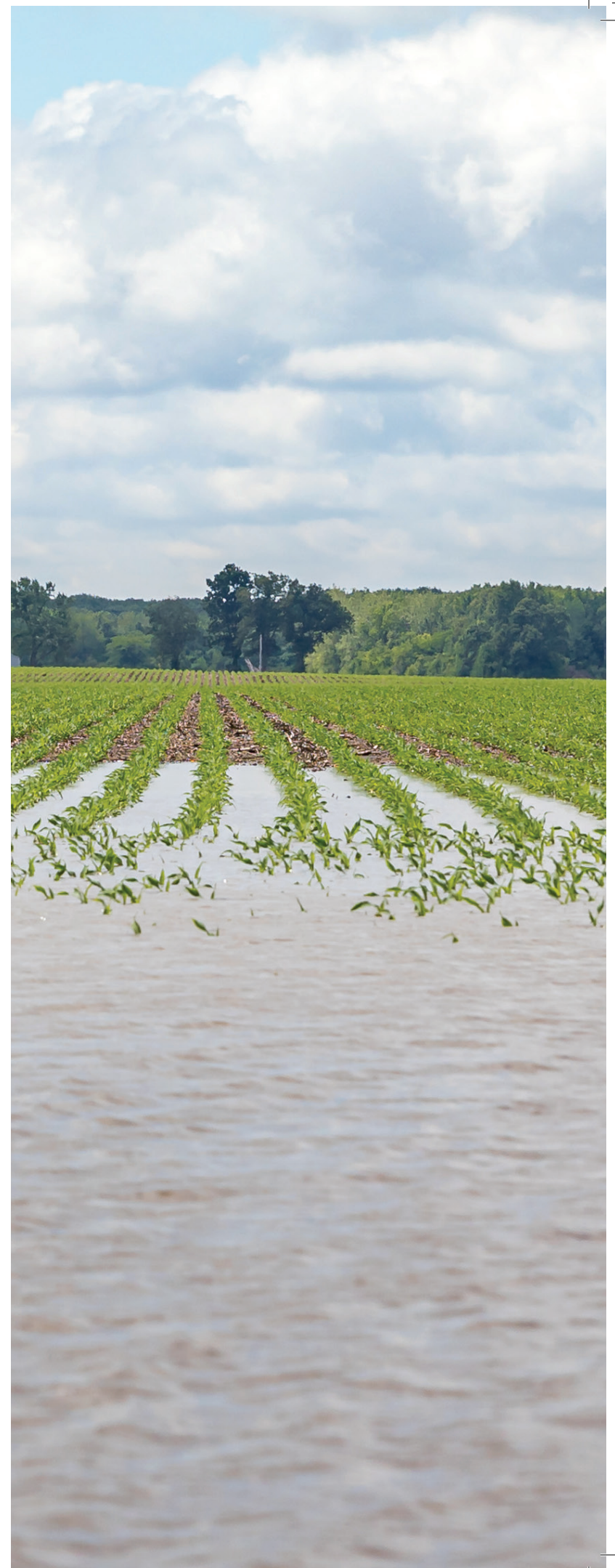
Dr. Steven Brown, professor of political science, and Dr. Jada Kohlmeier, professor of secondary social studies education, have been awarded a National Endowment for the Humanities (NEH) grant of \$175,000 for Citizens Fighting for Civil Rights: The Places, Faces, and Cases that Changed a Nation.

The award will fund a virtual, two-week institute this summer for 25 high school civics teachers. The institute will focus on civil rights and legal history and examine four landmark U.S. Supreme Court cases from Alabama that will address the following two questions: "What factors led to the Supreme Court's expansion of civil rights and liberties in these cases?" and "Why are these decisions still important to all Americans today?"

Citizens Fighting for Civil Rights is a product of a collaborative effort between Brown and Kohlmeier, and the institute is applying an interdisciplinary approach — political science and teacher education — to the study of place, people and events, which led to the momentous transformations in the American political and social landscape.

"These challenging times underscore how important the humanities are to making American culture and world history relatable across generations," said NEH Chairman Jon Parrish Peede. "NEH is proud to award hundreds of grants to keep our nation's scholars, students, teachers and citizens moving forward in pursuit of new knowledge and understanding."

The NEH announced \$30 million in grants for 238 humanities projects across the country. This round of funding, NEH's last for fiscal year 2020, will support vital research, education, preservation and public programs in the humanities. These peer-reviewed grants were awarded in addition to \$50 million in annual operating support provided to the national network of state and jurisdictional humanities councils.



WHERE THE SOIL AND THE CROWD MEET THE CLOUD

by Teri Greene

Auburn University faculty member and researcher Dr. Sanjiv Kumar of the School of Forestry and Wildlife Sciences is leading a team of researchers in connecting forecasts of soil moisture — a key influencer of climate change and a vital component in agriculture productivity and the prediction of flood and drought — through the combined use of big data, artificial intelligence and user interactions.

The study, “FACT: Interactive Deep Learning Platform and Multi-source Data Integration for Improved Soil Moisture Forecasting,” which began in September and will continue through August 2023, was funded by a nearly \$500,000 grant from the USDA National Institute of Food and Agriculture (NIFA). Kumar’s co-principal investigators are Dr. Wonilun Lee of Yeshiva University, who oversees the big data portion of the research, and Dr. Imtiaz Rangwala of the University of Colorado, Boulder.

This research is one of 12 projects funded by NIFA grants totaling over \$7 million that will initiate research on big data analytics, machine learning, artificial intelligence and other cyberinformatics — technology that is now considered necessary to keep the nation’s agriculture on the leading edge of food and agricultural production.

It is part of NIFA’s Food and Agriculture Cyberinformatics and Tools, or FACT, division, which aims to develop and provide data-driven solutions for complex agriculture problems.

Where the soil and the crowd meet the cloud

Kumar said an underlying concept of his team’s research is “let the climate model do its best, and let big data do the rest.”

The multidisciplinary approach will combine the expertise of earth system modeling, big-data technology and drought monitoring and forecasting. The objectives are to develop new algorithms for integrating soil moisture data from different sources, building a scalable big data infrastructure and deep learning analytics platform for real-time interactive soil moisture forecast applications and developing new or improved forecast attributes at the interface of human technology and data interactions.

There are multiple real-world implications, Kumar said.

“The project aims to provide an improved soil moisture forecast that is calibrated using user-provided soil moisture measurements and location information,” Kumar said. “At the front end, the user can access the forecast using a mobile app that is supported by cloud-based computer power and software-defined storage technologies.”

It will provide an increasingly useful tool for climate study by improving overall understanding of the soil-moisture process: using the crowd-sourced moisture data, the proposed system becomes smarter as the user provides new input, he added.

This AI/human/big data research will play an important role in climate study, Kumar said.

Dr. Janaki Alavalapati, dean of the School of Forestry and Wildlife Sciences, said Kumar and his team will likely reveal groundbreaking findings.

“The researchers’ implementation of multiple disciplines — from farmers’ observations to artificial intelligence to big data to study the measurement and forecasts of soil moisture could lead to breakthroughs in this vital area of study within the next few years,” Alavalapati said. “This ambitious project is one more example of Auburn researchers stepping to the forefront of innovations with worldwide implications.”

While the work that Kumar and his team have ahead of them benefits from its multidisciplinary approach to soil moisture science, it also delivers the most high-tech — but easily accessible — data to the people who need it most, when they need it most.

“This project combines fundamentals of climate science with big-data technologies and stakeholder interaction to bring up-to-the-minute science to farmers’ fingertips,” he said.





RESCUING COTTON PLANTS

Auburn research team tackles new cotton virus

by Paul Hollis

Since a potentially devastating cotton virus was first detected in Alabama fields in 2017, a group of Auburn University researchers and Alabama Extension specialists have been working tirelessly to learn everything they can about it so farmers can minimize their risks.

The team has worked so diligently, in fact, that Auburn has been designated as a USDA Center of Excellence for its focus on the virus — cotton leaf roll dwarf virus (CLRDV).

The virus was first detected through the work of Dr. Kathy Lawrence, professor in Auburn University's Department of Entomology and Plant Pathology, and crop consultant Drew Schrimsher, who collected field samples that were identified by Dr. Judith Brown, a virologist and University of Arizona Regents Professor.

The effort then took on a sense of urgency with a call in October of 2018 from Extension plant pathologist Dr. Austin Hagan, who had just seen extreme symptoms of the virus in a Baldwin County cotton field. First symptoms of the virus can be drooping leaves that eventually become crinkled.

"His exact words were, 'Holy cow!'" said Dr. Jenny Koebernick, assistant professor and cotton breeder in the College of Agriculture's Department of Crop, Soil and Environmental Science. "I called for a field day to be held the next week. The field in Loxley had nearly 100% incidence and yield loss, and it was the kind of thing where you had to see it to believe it."

Koebernick invited researchers from the University of Georgia, University of Florida, Louisiana State University, Mississippi State University, University of Tennessee, Cotton Inc., USDA and private seed company representatives to see first-hand the damage caused by CLRDV.

A meeting followed in November of 2018 with representatives from Cotton Inc., the Alabama Farmers Federation and various researchers, Koebernick said.

"All disciplines came together to discuss this complex issue and how to possibly approach it," she said. "We requested and received funds from the College of Agriculture that allowed us to collect cotton plants and confirm the presence of CLRDV in 13 counties."

Since that time, Auburn has been awarded various grants, with funds being used specifically for research to help farmers successfully battle CLRDV.

These include a Foundation for Food and Agricultural Research-Rapid Outcomes for Agricultural Research, \$150,000, and USDA-Crop Protection and Pest Management Program, \$325,000, with matching funds from Cotton Inc., and the College of Agriculture; Southern IPM Center, Critical and Emerging Issues, \$10,000; Cotton Inc., more than \$200,000 spread across the different disciplines; Southern IPM CLRDV Sentinel Plot Working Group, \$39,917; and Alabama Cotton Commission, \$80,000. The research team also is sharing in a \$5 million federal agricultural appropriation with the USDA Soil Dynamics Lab at Auburn.

The Center of Excellence (COE) designation is awarded through the USDA-National Institute of Food and Agriculture (NIFA), Crop Production and Pest Management grant program. This designation helps researchers gain recognition and receive special consideration to achieve additional status as a group leading efforts to address CLRDV. It also gives priority for competitive funding offered through NIFA.

Bringing expertise together

"We proposed a COE that brings together expertise at Auburn University and the University of Georgia that integrates insect population ecology, virology, vector-virus-plant interactions, integrated pest management and agronomic expertise to better understand the epidemiology of aphid-transmitted viruses and investigate virus disease management in cotton agroecosystems," said Dr. Alana Jacobson, associate professor in the Department of Entomology and Plant Pathology and a leader on the research team.

"This represents a novel approach that will creatively address critical challenges posed by

insect-transmitted plant viruses associated with invasive viral diseases that threaten agricultural production at local, state, regional and national levels," Jacobson said.

The proposal, she said, works toward developing an integrated pest management program for an emerging disease that preserves the economic viability of U.S. cotton production.



"A major component of this project will be minimizing the chemical footprint of insect-management practices in a production system that has become wholly dependent on prophylactic pesticide use that has cascading impacts on pests, beneficial organisms and the environment," Jacobson said.

"This multidisciplinary and transdisciplinary Auburn-University of Georgia cotton team is comprised of faculty at all career stages and is uniquely positioned to lead CLRDV research and extension efforts in the U.S. due to their complementary skill sets and knowledge."

The Auburn team has forged collaborations with Extension and research entomologists, plant pathologists and agronomists in Virginia, North Carolina, South Carolina, Georgia, Florida, Tennessee, Mississippi, Arkansas, Louisiana and Texas, along with leading experts in virology and vector biology at the University of Arizona and Boyce Thompson Research Center.

What is known about CLRDV

What the team knows about the virus is that it has been reported in Africa, India, Timor Leste and Brazil and Argentina in South America. The isolates found in Alabama fields are most related to the ones in South America.

In 2018, the virus was found in approximately 40 counties. In addition, Extension plant pathologist Dr. Kassie Conner helped to detect the virus in approximately 14 states.

It's difficult at this time, Jacobson said, to quantify exact yield losses due to the virus because they can only be separated from other abiotic and biotic factors under controlled conditions. Only extreme cases can be easily quantified in the field, making it impossible to make good estimates and to understand the range of yield loss that may be caused by the virus.

"Diagnostic methods are still cost prohibitive, so many people have made assessments based on symptoms that are poorly classified and highly variable," she said. "Incidence can be 100% even in areas where symptoms are not apparent — this has been observed in research trials. It is safe to say it is widespread."

The virus is transmitted by a tiny insect named the cotton aphid, but replicated trials at Auburn and Georgia showed that foliar applications of insecticides did not reduce the incidence of the virus.

"There are no other control methods that are supported by scientific data for reducing virus incidence or disease," Jacobson said. "Field research for management of this virus began in 2019 when we learned that aphid management was not going to reduce virus transmission to the crop."

There are, however, several ongoing studies investigating the virus, including sentinel plots that will help researchers better understand the interactions between cotton variety and plant date on aphid populations, symptom severity and yield loss.

Another study using aphid-exclusion cages to control the timing of infection will determine how crop age at the time of infection influences



symptom severity and yield loss. Also, breeders are plant phenotyping for CLRDV infection and symptoms. Koebernick is currently screening nearly 1,500 cotton varieties at research sites in Tallassee and Fairhope, looking for resistance to the virus.

"We are also conducting lab studies on the vector in an attempt to discover how long it takes to acquire and transmit the virus," Jacobson said. "Field studies are focusing on overwintering/reservoir hosts in our cropping systems, including cover crops, weeds and regrowth on cotton stalks. This year, studies will try to address the impact of vegetation management on reducing CLRDV incidence."

Current Auburn research team members, in addition to Koebernick, Jacobson, Lawrence and Hagan, include Conner, director of the Plant Diagnostic Lab; Dr. Kira Bowen, research epidemiologist; Dr. Ed Sikora, Extension pathologist; Dr. Kathleen Martin, research vector biologist; Dr. Steve Brown, Extension cotton specialist; and Dr. Amanda Schrerer, Extension pathologist.



Auburn University College of Agriculture researchers Dr. Jenny Koebernick, left, and Dr. Alana Jacobson, are leading a nationally recognized team that is working to battle a new cotton virus.

"This group of Auburn professors is working with research and Extension scientists in more than 10 states to address this problem from a range of disciplines," Koebernick said. "We are dedicated to understanding and solving this very complex problem. It is important to focus not only on long-term solutions such as breeding for resistance, but also on developing management strategies for minimizing grower risk."

DIET & DOLLARS: Interdisciplinary Research Team Studies How Fiscal Incentives Can Promote Healthy Eating

by Dr. Tannista Banerjee

Healthy eating benefits everyone, and food choices can be an important part of that equation. But can consumers be financially incentivized to make healthier food purchases?

An Auburn University interdisciplinary research group, overseen by Dr. Tannista Banerjee, collaborated with the Radio Frequency Identification (RFID) lab to conduct experimental economics and neurobehavioral analysis to find out.

The researchers investigated how fiscal interventions in the form of lower sales taxes and store discounts on healthy food items impact the purchase of both healthy and unhealthy food items among low socioeconomic status parents. Banerjee worked with Dr. Veena Chattaraman of the Department of Consumer and Design Sciences, College of Human Sciences, the MRI Research Center and Dr. Gopikrishna Deshpande of the Department of Electrical and Computer Engineering.

“Given the rising health care costs associated with obesity, governments have tried different policy interventions, but the efficacy of such fiscal policies is currently being debated,” said Banerjee, an associate professor in the Department of Economics in the College of Liberal Arts.

Based on these findings, their research was accepted and published in *Nature, Scientific Reports*. The full paper is available at <https://rdcu.be/b7x3l>.

“Our study is the first study to measure choice behavior in a semi-realistic shopping environment, employing neural correlates with both electroencephalography (EEG) and functional magnetic resonance imaging (fMRI). This paper is important as it solves a long-standing debate in experimental and health economics and has important health policy implications.

The brain processes underlying the effectiveness of public policy interventions employing sales taxes and discounts [were] unexplored, and we investigated this,” Banerjee said.

Banerjee created a grocery store environment in the RFID lab to facilitate the shopping experiment for low-income parents. Researchers collected behavioral and EEG data in the RFID lab while participants completed their grocery shopping. Later, Deshpande collected brain activity data of participants through non-invasive neuroimaging at the MRI Research Center.

Auburn's intramural grants program, the College of Liberal Arts, the Department of Economics, the College of Human Sciences, the Department of Consumer and Design Sciences, and the MRI Research Center provided the financial support for this research. The RFID lab provided material support.

The results show that with lower taxes and greater store discounts, participants bought more healthy food and less unhealthy food. The study demonstrates that both fiscal interventions improve dietary choices by significantly reducing the purchase of calories, sugar, added sugar, saturated fat and sodium, while significantly increasing dietary fiber purchased. These results provide preliminary evidence that fiscal interventions tested in this study have the potential to promote healthy food choices among low socioeconomic status households and reduce obesity. This study also shows the important role that lower food taxes and greater store discounts (on healthy food) can play in encouraging parents to choose healthier foods for their family.

“Given the rising health care costs associated with obesity, governments have tried different policy interventions, but the efficacy of such fiscal policies is currently being debated.”

— Dr. Tannista Banerjee



Dr. Tannista Banerjee



THE FUTURE OF HEALTH CARE – TELEMEDICINE

by Joe McAdory

Whereas COVID-19 has dealt a mighty blow to economies, lives and the capacity of health care systems, it has also changed the way we offer and consume medical services. Telemedicine — where physicians serve patients remotely — has firmly planted its flag on the U.S. health care landscape.

Why? It's convenient. It's cost-effective. It offers an opportunity to improve service capacity of hospitals.

at local clinics and forwarded to physicians, with time allotted for phone consultation. But was it utilized enough? No ... but it's growing.

"When analyzing the trends of utilization of telemedicine, we see a significant positive shift," Raja said. "In the month of December 2019, only 821 telemedicine related claims were filed in Alabama. Fast forward to May 2020 ... we had 109,888 claims for more than 64,000 unique patients. Even



109,888
CLAIMS FOR MORE THAN
64,000
UNIQUE PATIENTS IN MAY 2020

"People can now call their doctor and receive a consultation, or talk to a nurse, and most health insurances will cover the charges" said Dr. Uzma Raja, systems and technology department chair and Gayle Parks Professor in the Harbert College of Business, who has long researched telemedicine's trends, popularity and capabilities. "In the past, policies and regulations were a barrier to the adoption of telemedicine. I believe that the new policies in light of COVID-19 might help us move faster towards the adoption of telemedicine."

Telemedicine is best suited for residents in rural areas, eliminating long drives to urban health care centers. Basic information and tests are recorded

with the relaxation in the in-person clinic assistance, we see a continued usage of telemedicine with more than 72,000 claims from 45,000 patients processed through Medicaid in August (2020)."

Raja said that one of the past critical challenges to telemedicine adoption has been patient acceptance of this method of service delivery. "Some rural patients were making longer drives to visit their doctor in-person rather than use telemedicine," Raja said. "Warming up to the use of new technology takes time. However, it seems like COVID-19 might have involuntarily forced patients to use telemedicine, and patients are now discovering the

benefits of consuming technology-based health services. This trend could fundamentally change the deployment of health care, especially to the rural communities.”

Dr. Rafay Ishfaq, the W. Allen Reed Associate Professor in supply chain management at the Harbert College of Business, said whereas telemedicine plays a large role in bridging the logistics gap within the health care supply chain, it’s also helping already overburdened hospitals increase their capacity to provide health care.

“What COVID-19 has done is expose the operational limitations within the health care system,” Ishfaq said. “With an aging population disproportionately impacted by COVID-19, there has been a substantial additional burden on available capacity. At one end of the spectrum, we have the option to invest a lot of money in building more hospitals, increasing the size of waiting rooms or increasing the number of hospital beds. Or ... maybe we can invest in an alternate method of delivering health care where capacity can be enhanced without extensive investments in the physical infrastructure.

“If we invest in access to broadband in rural communities, the enhanced infrastructure could support the integration of technology-based health care delivery systems. Even in the areas with a dense urban population, we would be able to extend the capacity of health care systems without excessive and prohibitive financial investments.”

The impacts of COVID-19 on local hospitals’ health care capacities reveals that something must be done. Can telemedicine hold the key?

“Yes, because physicians can reach out to customers, or patients, that are far beyond the reach of their hospitals,” Ishfaq added. “I think COVID-19 has become like a pseudo-social experiment for telemedicine. There’s an entire population that needs routine health care services, and there’s not enough capacity in the hospitals to be able to accommodate this growing need.”

As the acceptance — and need — for telemedicine grows, so will its capabilities, Raja said. “I see a bright future for telemedicine as long as the policies and technologies can keep up with the demand,” she said. “We continually expect faster, more reliable and easily accessible technology which can become available to health care patients through smart and wearable technology. As this technology proliferates, it could result in telemedicine becoming embedded into our daily lives.”

Raja and Ishfaq’s research on telemedicine, “Bridging the Healthcare Access Divide: A Strategic Planning Model for Rural Telemedicine Network,” was published by Decision Sciences.





A DOG COULD BE A CHILD'S BEST FRIEND

by Latha Bhavnani

Researchers have established a link between health and education indicating that students who may have mental and physical health concerns are at risk for poorer school performances. Once the mental, physical and social-emotional needs are met, students are better able to focus on their academic needs and school performance. In the K-12 setting, the school counselor and school nurse collaborate to ensure the social and emotional needs of students are being met. Both professionals pool their expertise to provide students tools to cope not just with academics but also with underlying social and psychological stress that could hinder their progress.

According to Dr. Morgan Yordy, assistant professor in the Auburn University School of Nursing (AUSON), due to the increase in childhood trauma and other factors impacting students in K-12 school settings, a collaborative intervention through an integrated care approach may be needed to address the students' academic, physical and social-emotional health.

An innovative community outreach project among AUSON's Yordy, Associate Professor Dr. Malti Tuttle and Associate Professor Dr. Jill Meyer from the Department of Special Education, Rehabilitation and Counseling within the College of Education explores alternative methods to enhance communication and collaboration between school counselors and school nurses in the K-12 setting. The project proposes to use canines as the vehicle to enhance the relationship between nurses and counselors and, in turn, improve health outcomes for the students served. This project builds on a previous collaboration model developed and published by faculty, as well as pilot data regarding school nurse and counselor perceived benefits and/or hazards associated with animal-assisted therapy (AAT), specifically canine therapy, in the school system.

Tuttle, a school counselor by training, believes that school nursing and school counseling are both part of the helping profession, which lends itself to a vital platform for collaborating to best serve all students.



AAT has gained a lot of popularity lately as a therapeutic intervention that incorporates animals into the treatment plan for individuals or groups. It has been used to enhance and complement the benefits of traditional therapy. Researchers believe the potential social benefits of AAT in the classroom strengthens the classroom environment, while allowing students to experience the physiological and psychological benefits of animal-assisted interaction (AAI). Animals in counseling sessions and the classroom have been known to facilitate an atmosphere of trust, nurturance and relationship building. The therapy animal is a nonjudgmental companion in the process of learning and development. In physiological well-being, animal-human interaction demonstrates positive results, with an increase in oxytocin levels and decreases in cortisol levels and blood pressure.

“This study has important practical and research implications and has the potential to attract major research or outreach funding.”

– Dr. Pao-Feng Tsai

Yordy admits that although AAT has gained popularity within K-12 schools for the emotional-social support, academic support and sense of belonging animals provide, concerns still arise despite documented potential benefits.

“This exploratory, cross-sectional, quantitative study examined the knowledge, attitudes and experiences of school counselors and school nurses with AAT to determine potential risks and benefits of AAT in schools, as very little empirical information exists in this area of research,” Yordy said.

This study was based on a survey from a previous study by Yordy and associates. The survey, sent to school nurses and counselors nationwide,

explored their perceptions of the potential benefits and concerns associated with establishing AAT programs in K-12 school settings. Results indicated canine ownership, roles within schools and region affected participants' responses. It also revealed that school counselors and individuals who previously owned that canine were more likely to endorse the positive impact of AAT than school nurses and individuals who had never owned a canine.

"Additionally, we found that the survey seemed to suggest the region of the United States in which school nurses and school counselors were employed impacted their endorsement of AAT, with professionals in the western United States being more likely to report a lower positive impact and a higher negative towards AAT. These results were thoroughly examined, and it was determined that those who reside in the West also reported less experience with AAT in school systems.

"We took information from the survey recognizing the importance of the school nurse and school counselor collaborating for trauma and developed a continuing education program to enhance collaboration and integrate animals in schools," Yordy said.

"I think canine ownership and region were important findings. Counselors endorsed the utilization of canines in school more so than the school nurse. They were more open. I think that realization made our research team regroup to see how we can get these two disciplines talking.

"As school counselors and school nurses continue to integrate AAT programs into their K-12 school settings, additional professional development opportunities must be established to address best practices and considerations when using AAI and ensure the welfare of students and the therapy dog. Future research and advocacy efforts within the fields of school counseling and school nursing may possibly seek to focus on establishing guidelines, policies and professional development trainings for the ethical implementation of AAT in K-12 school settings," Yordy added.

According to Dr. Pao-Feng Tsai, associate dean for research at AUSON, Yordy's research study is innovative and considers the unique contribution of ownership, location and roles on AAI and operating an effective AAT in schools. "This study has important practical and research implications and has the potential to attract major research or outreach funding," Tsai said.

While the role of animals in humans' lives continues to evolve, one aspect remains the same — animals have a natural ability to provide humans with a sense of comfort and support. With the increase in canine intervention in medical and therapeutic settings, researchers have gained a deeper understanding of the potential benefits of human-animal interactions, such as mood elevation and decreased levels of depression, anxiety and pain.

The vision of the National Association of School Nurses (NASN) demonstrates the important role of the school nurse to affect the academic, health and emotional outcomes of children and adolescents served with the goal being "all students will be healthy, safe and ready to learn." The NASN (2018) Framework for 21st Century School Nursing Practice emphasizes the need for evidence-based practice to support student health and academic



success within the school environment. One promising program involves AAT in the school systems; however, limited research exists regarding AAT from the school nurse perspective.

"I believe the potential impact of the program is not only significant for AUSON, but the collaborative relationship between the K-12 school settings and future community outreach is just as essential," said Dr. Gregg Newschwander, dean of the School of Nursing.

In that regard, one local school official seems to agree. "I wanted to share with you how much I learned from the program, Recognizing Trauma: Training for School Nurses and Counselors," said Brenda Lindahl, the Auburn City Schools (ACS) nurse administrator, after ACS used the Module of Facility Service Dogs for their professional development day. "Our participants were deeply moved by the program and want to consider presenting trauma training at the Alabama Association of School Nurses' Annual Conference next year. Who knows? We may have a school with an AAT program in the near future!"

AN OVATION FOR INNOVATION

*Plant disease and cattle production researchers
honored with New Innovator awards*

by Paul Hollis

Two Auburn University College of Agriculture researchers have been named recipients of the Foundation for Food and Agriculture Research (FFAR) 2019 New Innovator in Food and Agriculture Research, based on their prior research accomplishments during the 2019 calendar year. The award is granted to early career scientists supporting research in one of the foundation's six challenge areas.

Dr. Paul Dyce, associate professor in the Department of Animal Sciences, and Dr. Neha Potnis, assistant professor in the Department of Entomology and Plant Pathology, were two out of only seven U.S. researchers to receive the prestigious FFAR New Innovator Award for 2019.

The recipients will receive a total of \$1,744,803 over three years, with matching funds from the recipients' respective institutions to double FFAR's investment for a total of \$3,494,132.

The New Innovator in Food and Agriculture Research Award provides early career scientists with funding to conduct audacious food and agriculture research. Investing in these scientists in the early years of their careers allows them to pursue innovative and transformational ideas uninhibited by the pressure of identifying their next grant.

"Preparing for the next frontier of agricultural innovation starts with investing in today's scientific workforce," said FFAR's executive director, Dr. Sally Rockey. "We are thrilled to support emerging superstars in food and agriculture research as they develop cutting-edge strategies to revolutionize food production, processing and distribution."

"The College of Agriculture is truly honored to receive two of the eight New Innovator in Food and Agriculture Research awards," said Dr. Henry Fadamiro, associate dean for research and associate director of the Alabama Agricultural Experiment Station.

"To receive two awards in one year speaks to the quality and creativity of our faculty," Fadamiro said. "In total, five faculty members in the college have received grants from FFAR in recent years. These awards are partly the result of increased engagement with FFAR and reflect the growing reputation of the college in cutting-edge research and innovations."

Potnis said the award will provide her an opportunity to leverage basic scientific findings to devise immediate and long-term solutions to tackle endemic plant diseases.

"I am especially excited about multidisciplinary collaborations with Extension plant pathologist Dr. Ed Sikora, agro-climatologist Dr. Di Tian, agricultural economist Dr. Ruiqing Miao and epidemiologist Dr. Karen Garrett.

"This multidisciplinary collaborative project will provide an excellent opportunity for my graduate students to receive training in a wide range of research topics ranging, from field surveys, molecular methods, microbiome study, modeling, seed pathology, genomics/metagenomics and, most importantly, communication with growers," she said.



Dr. Paul Dyce, assistant professor in the College of Agriculture's Department of Animal Sciences, and Dr. Neha Potnis, assistant professor in the Department of Entomology and Plant Pathology, were two out of only seven U.S. researchers to receive the prestigious FFAR New Innovator award, based on their prior research accomplishments in 2019.

With matching funds from Auburn University and the University of Florida, Potnis's total grant amount is \$581,992.

Dyce said the FFAR award gives him the funds that are needed to facilitate moving his research project forward for the cow-calf industry.

"It provides the opportunity to train undergraduate and graduate students in the area of improving reproductive efficiency within the cow-calf sector," Dyce said.

Dyce's research project involves identifying molecular markers in the blood of heifers that are able to inform their reproductive potential.

"Currently, significant input costs are associated with developing heifers that ultimately prove disappointing when it comes to their ability to reproduce," he said. "Our efforts are to ultimately develop a set of tools that provide cattle producers with the ability to remove those heifers prior to investing in their development. This has the potential to improve the efficiency of cattle production and ultimately benefit cattle producers' profitability."

The project is in collaboration with Dr. Soren Rodning, associate professor in the Department of Animal Sciences, and involves several Alabama Agriculture Experiment Station Research & Extension Centers.

With matching funds from the Alabama Agricultural Experiment Station and the Alabama Cattlemen's Association, Dyce's total grant is \$599,309.

SENSORS SAVING LIVES

by Maria Gebhardt

Millions of people suffer from cardiovascular, inflammatory and neurological disorders. Oxidative stress is a direct symptom based on imbalances in the human body that are linked to these diseases.

Dr. Christian Goldsmith, a professor in the Department of Chemistry and Biochemistry whose research focuses on inorganic chemistry, is leading an interdisciplinary team at Auburn University to develop innovative molecular sensors to detect the overproduction of Reactive Oxygen Species (ROS), also known as free radicals, which are unstable molecules that normally play important roles in cellular signaling.

However, an overproduction of ROS in the body can lead to damage resulting in lifelong and even terminal diseases. The human body naturally has defense mechanisms to detoxify ROS and eliminate overproduction. If the human body cannot successfully eliminate the increased levels of ROS, it can lead to cell dysfunction and risk of disease.

“We are creating sensors in our lab that could help us pinpoint the steady-state concentrations [of ROS] in a specific area,” Goldsmith said. “These sensors could detect problems in the heart and brain through non-invasive procedures, saving lives.”

Goldsmith is the recipient of a \$420,000 award from the National Science Foundation, Division of Chemistry.

He and his team developed the model and sensing strategy at Auburn.

“Currently, there is a significant lack of reliable imaging techniques to understand the role of ROS in disease,” he said. “These small molecule sensors will create two distinct Magnetic Resonance Imaging (MRI) signals before and after their interaction with ROS.” Comparing the signal intensities can allow researchers to determine how much ROS is in a particular part of the body, providing critical information for doctors.

“Improved diagnostic techniques could help medical professionals identify these specific conditions before irreversible long-term damage to the tissue occurs, making treatment more effective,” he added.

The interdisciplinary team includes collaborations with the Auburn University MRI Research Center and Auburn University College of Veterinary Medicine.

“Patients who develop severe symptoms from COVID-19 often have high levels of oxidative stress in their bodies. My research has the potential to help these patients.”

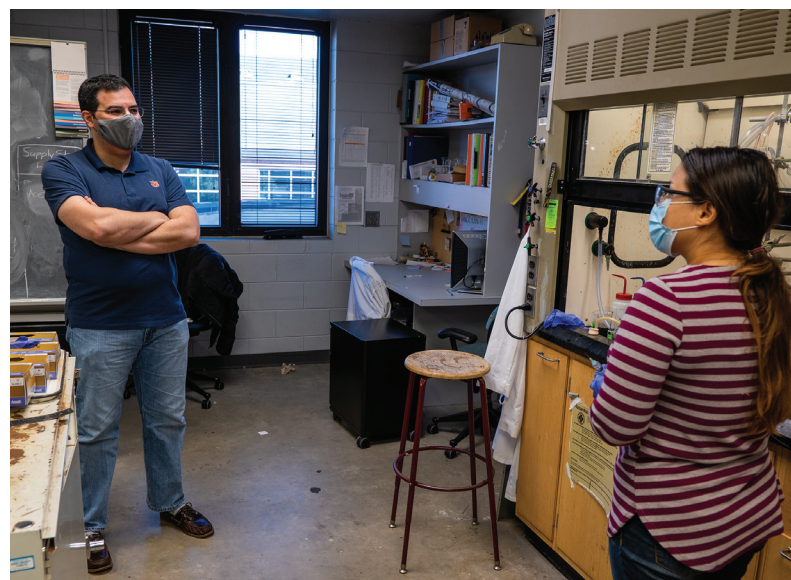
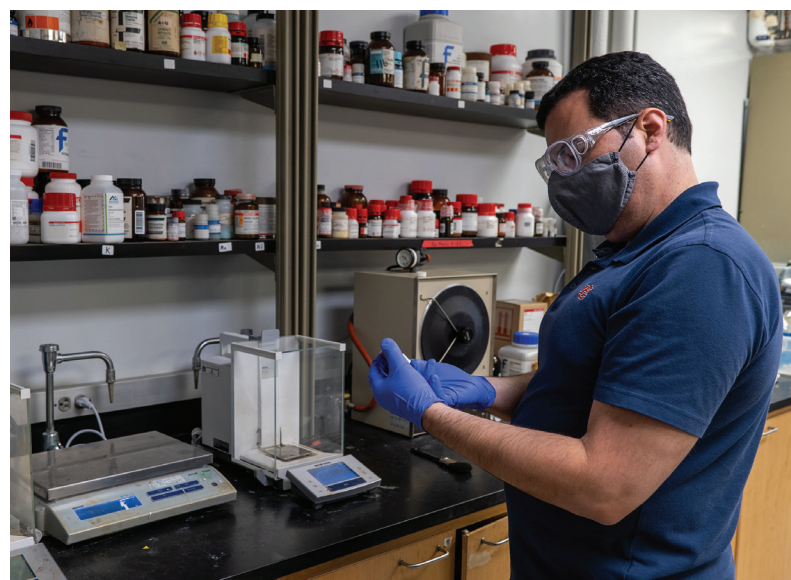
— Dr. Christian Goldsmith

Additionally, Dr. Adil Bashir from the Samuel Ginn College of Engineering and Dr. Ivana Ivanović-Burmazović’s team at the Ludwig Maximilian University of Munich will be working on the project.

“These sensors are essential tools that will help other researchers advance procedures to help reduce the effects of ROS,” Goldsmith explained.

Goldsmith’s research also has an impact on COVID-19.

“Patients who develop severe symptoms from COVID-19 often have high levels of oxidative stress in their bodies,” he said. “My research has the potential to help these patients.”



ALABAMA EXTENSION SCIENTISTS GUIDE SMART IRRIGATION EXPANSION

by Maggie Lawrence

Alabama farmers plant more than 1.3 million acres of row crops annually, but their use of irrigation to support those crops is one of the lowest in the Southeast. Thanks to scientists with the Alabama Cooperative Extension System at Auburn University and their partners, Alabama farmers can implement sustainable irrigation systems to boost production and minimize year-to-year variability.

Watershed plans developed by Dr. Eve Brantley and the Alabama Extension Water Program provide farmers with critical information on how to implement irrigation without adversely impacting groundwater and surface supplies.

“These plans allow farmers to expand irrigation while minimizing the impacts on the environment, neighbors and nearby communities,” Brantley said. Brantley and her team work closely with USDA’s Natural Resource Conservation Service (NRCS), the Alabama Soil and Water Conservation Committee (AL SWCC) and the State Climatologist Office at the University of Alabama in Huntsville in the Alabama Irrigation Initiative.

Farmers are already using the Middle Tennessee River watershed plan to add new irrigation systems. Brantley said that federal funding up to \$200,000 per farmer is available to selected farmers in that watershed. Farmers first apply to the AL SWCC for ranking and then NRCS conducts follow up farm visits as part of the final approval for the financial assistance.

U.S. Sen. Richard Shelby and Congressman Robert Aderholt led the effort to secure the funding.

“Agriculture anchors the Alabama economy. Expanding irrigation technology will help our farmers enhance their bottom line in a sustainable way, bringing economic benefits for the whole state. That’s why I have been proud to champion this initiative in Congress,” Aderholt said.

Dr. William Puckett, executive director of the AL SWCC, echoes the importance of the effort.

“We really are blazing new ground,” Puckett said. “We are using federal funds normally designated for large scale projects to fund new irrigation systems at the farm level.”

Puckett said the initiative will leverage \$30 million in federal funds through a cost-share contract with farmers. Underserved farmers will pay 35% themselves while getting 65% of the needed funds through the initiative; other farmers will get a 50/50 cost share.

Brantley, who is also the director of the Auburn University Water Resources Center, said two more watershed plans are planned as part of the irrigation expansion program.

“The Choctawhatchee Pea watershed plan is in review and approval is anticipated in 2021,” she said. “The Middle Alabama watershed is the next watershed in the irrigation expansion program.”

These watershed plans draw heavily on the research and on-farm demonstrations led by Dr. Brenda Ortiz, Alabama Extension’s precision agriculture specialist.

“The application of the right rate of water at the right location and at the right time and with the most efficient system is crucial to the sustainable expansion of irrigation in the state,” Ortiz said.

Over the last four years, Ortiz and her undergraduate and graduate students established a network of on-farm irrigation demonstration sites across the state.

“We use these sites to engage farmers and demonstrate the technology to implement the four Rs of water management: right rate, right time, right place and right irrigation system,” Ortiz said. “Cutting-edge soil water, crop and weather monitoring technologies at each site remotely indicate changes in soil moisture, weather and crop water stress and growth.”

Additionally, several center pivot irrigation systems have been retrofitted with variable rate technologies so they can apply different irrigation rates over a field instead of the traditional uniform rate application.

“Variable rate irrigation technology will help farmers addressing the over or under-application of water on some parts of crop fields that uniform rate irrigation can’t do,” Ortiz said.

In the summer of 2020 on a Lawrence County field, research results showed yield variability was reduced through the application of the 4Rs concept. For the first time in 10 years, the farmer had uniform yields across the demonstration area and that was the result of the use of soil sensors and variable rate irrigation.

Brantley and Ortiz agree that the combination of new irrigation technologies combined with regional watershed planning improve farmers’ crop production while safeguarding Alabama’s water supplies.

"Agriculture anchors the Alabama economy. Expanding irrigation technology will help our farmers enhance their bottom line in a sustainable way, bringing economic benefits for the whole state. That's why I have been proud to champion this initiative in Congress."

– Congressman Robert Aderholt



Center pivot irrigation system in a corn field



From left to right: Sabra Sutton, Alabama Association of Conservation Districts; Dr. William Puckett, Alabama Soil and Water Conservation Committee; Dr. Maury Estes, University of Alabama in Huntsville; Cameron Handyside, UAH; Dr. Kevin Doty, UAH; Dr. John Christy, state climatologist, UAH; Congressman Aderholt; Dr. Richard McNider, UAH; Dr. Eve Brantley, Alabama Cooperative Extension System at Auburn University; Jessica Curl, ACES at Auburn; Sara Bolds, ACES at Auburn



Dr. Eve Brantley, Alabama Extension water program leader



Lamont Bridgeforth, a Limestone County farmer, discusses irrigation technology with Dr. Brenda Ortiz, Alabama Extension Precision agriculture specialist.



SUPER STRUCTURE

by Jeremy Henderson



America has an infrastructure problem. Auburn now has a \$22 million solution. It's at the corner of West Samford Avenue and Shug Jordan Parkway, it's nearly 42,000 square feet and it's spectacular.

"The U.S. is dealing with significant issues related to aging infrastructure, such as roads, bridges, railways, airports, waterways and water and wastewater facilities," said Dr. Steve Taylor, associate dean for research in the Samuel Ginn College of Engineering. "It's a safety issue, but also an economic development issue. Without safe and functional transportation networks, our economy fails. Without safe and functional water and wastewater systems, our economy fails. Auburn researchers in the Department of Civil and Environmental Engineering will now be able to better contribute to designing newer, cost effective infrastructure solutions for years to come thanks to the new Advanced Structural Engineering Laboratory (ASEL)."

"Advanced" is almost an understatement. The ASEL, one of the largest structural engineering labs in the world, is a technological marvel.

The facility, which opened in mid-November, includes a high bay laboratory with a strong wall and strong floor specially engineered to handle extreme structural testing loads; a geotechnical chamber within the strong floor; a concrete materials research and testing laboratory; wind testing capabilities that can replicate hurricane-level loads; and faculty and graduate student spaces.

"The new technology and functionality obviously excited our faculty when we first discussed building the ASEL, but another huge plus was that there would be so many things close together on one research campus," Taylor said. "For years, we'd had an excellent structural testing lab that's part of the Harbert Engineering Center, but we had outgrown it. We'd come to the point that we needed to replace it, due in part to its surroundings."

Indeed, one of the most attractive aspects of the lab, is the ease of access. Due to its location on the engineering campus, the previous structural testing lab, which was built in 1988, could only accommodate elements up to 40 feet in length.

"And even that took a lot of work," said Dr. Robbie Barnes, associate professor of civil and environmental engineering.



“Let’s just say that a few signs may or may not have been bent. But with the new facility, we can bring in elements like full-scale bridge girders that are 140 feet long. A lot of care was put into the design to ensure that a long vehicle, be it a truck or trailer, can basically just back right up to the building.”

Plenty of care was also put into providing peace of mind once that vehicle’s cargo is inside. The ASEL’s strong floor is twice as large, and features anchor points that hold 10 times the load, as the floor in the previous lab, which will be repurposed for other academic and research use.

But the ASEL’s most unique feature may be the 4,700-cubic-foot geotechnical test chamber within the strong floor footprint — the only test chamber in the nation in a university laboratory contained in the high-bay strong floor footprint — that will allow the department’s geotechnical researchers to conduct testing on foundations, anchorages and towers previously only possible in the field.

“After a devastating season of hurricanes in the Southeast, we are reminded of the fragile nature of some aspects of our critical infrastructure,” said Dr. Justin Marshall, associate professor of civil and environmental engineering and the director of the ASEL. “The unique capabilities of the ASEL will allow for full-scale, controlled testing, including the soil, the foundation and

the structural system to develop and evaluate innovative, high-performing, resilient and cost-effective infrastructure that will endure and perform well into the future.”

Marshall calls the ASEL “game changing.” Dr. Andy Nowak, chair of the Department of Civil and Environmental Engineering, goes a step further.

“It really is a revolution in structural engineering,” Nowak said. “It creates completely new opportunities. It changes the way we think about solving structural and material engineering problems. What was impossible is now possible.”

And Nowak is excited about who will be doing it.

“In addition to helping us secure research grants and projects, the ASEL will help us to recruit the best faculty and the best students,” he said.

Taylor agrees.

“We now offer one of the best laboratories in the country — if not the best,” Taylor said. “If I’m a student who wants to be a structural engineer, this is the best place to go to school in the nation.”

But the ASEL isn’t just a recruiting tool for the university, but for the state.





“Auburn University continues to serve a pivotal role in the development of our state’s second-to-none workforce,” said Gov. Kay Ivey, a 1967 Auburn alumna when the facility opened last fall. “I am proud to celebrate the Samuel Ginn College of Engineering’s new Advanced Structural Engineering Laboratory and the fact that this is not only a giant step for Auburn, but a giant step for Alabama. When you have what is arguably the best lab of its kind, you are signaling to the world that Alabama is the place to do business.”

The unprecedented investment in Auburn’s structural and geotechnical engineering expertise not only coincides, but pairs perfectly with the college’s continued efforts to elevate its transportation engineering initiatives; many of the full-scale structures and components that the ASEL can test, such as guardrails, long-span bridge girders and other bridge foundation systems, are integral to transportation infrastructure.

“As it is in many other areas of research, I’m proud to say that Auburn is now one of the top destinations in the world for structural engineering,” said Dr. Christopher B. Roberts, dean of engineering. “Whether it’s developing new innovations or finding ways to significantly lengthen the life of our existing infrastructure while decreasing costs to taxpayers, the ASEL allows our faculty in the Samuel Ginn College of Engineering to take the lead in solving some of our nation’s most pressing problems. That’s what industry experts have come to expect from Auburn engineering.”

4,700

CUBIC-FOOT

geotechnical test chamber

RE-ENVISIONING PUBLIC INFRASTRUCTURE

Engineering with Nature® and landscape architecture

by Jessica Holmes

Dr. Rob Holmes, associate professor of landscape architecture in the College of Architecture, Design and Construction, has received a grant from the U.S. Army Corps of Engineers (USACE) to support reimagining public infrastructure in a series of sites across the country. The USACE's Engineering With Nature® (EWN®) initiative uses combined natural and engineering processes to provide economic, social and environmental benefits to the public. Holmes will apply landscape architecture approaches to USACE infrastructure projects to help ensure they are beneficial to local communities not only in terms of their primary engineered functions, but also in terms of ecology, recreation and aesthetics. The project team includes faculty partners at the University of Virginia and University of Pennsylvania, along with members of the Dredge Research Collaborative.

Many infrastructure projects built by the USACE were originally designed to focus primarily on functions like flood control, stormwater conveyance or sediment management. Many of these projects are now reaching a point in their lifecycles where they require repair or replacement, which presents an opportunity to re-imagine these infrastructures in new way. A canal, for instance, might not only serve to carry floodwater away from vulnerable communities, but also provide habitat for riparian species and recreational opportunities to those same communities. Such a canal might only be needed for stormwater conveyance once or twice a year, but could provide recreational, aesthetic and ecological benefits every day of the year, greatly enhancing the public value of the infrastructure as a usable landscape.

Holmes said, "The work that EWN® is doing is really essential. The way that most of our nation's infrastructure was designed and conceived dates to the early 20th century. Since then, we have learned a lot about how ecosystems work and how infrastructure affects social life both positively and negatively and EWN® is trying to bring that knowledge to bear. At the same time, this — thinking about how infrastructure can serve multiple purposes and contribute socially and aesthetically — is something that landscape architecture has long worked on, so it is a good alignment between the goals of landscape architecture and the Army Corps."

USACE staff and the project team will identify two sites to focus on during each year of the project. In a former USACE grant, the project team addressed sites across the country, including locations in Maryland, Florida, Louisiana and Texas. In one such project, the team worked with the

Baltimore district in Maryland to investigate the possibilities for a set of aging jetties that are in need of repair or replacement. The team analyzed how they might be redesigned to perform their original engineering functions, but offer ecological and social benefits as well.

The initiative will be funded at approximately \$100,000 a year for up to five years. Through this series of projects, the team has an opportunity to make a significant impact on public infrastructure that will make it more valuable, attractive and sustainable.

For more information about the USACE's Engineering With Nature® initiative, please visit: engineeringwithnature.org.



Rob Holmes



Rendering of the Baltimore district proposal by Holmes and Auburn landscape architecture student Romina Delgado Tobar

Mapping Out a Solution to Rural Health Disparities

by Matt Crouch

Those living in rural parts of the country, particularly in Alabama, can face challenges when it comes to health care access. Dr. Natalie Hohmann, an assistant professor with the Auburn University Harrison School of Pharmacy, is investigating ways to address these health disparities.

Recognizing her work, Hohmann was selected for a KL2 Mentored Career Development Award from the Center for Clinical and Translational Sciences, or CCTS, at the University of Alabama at Birmingham. The program prepares early career faculty who have recently finished a research or health professional doctorate for a career in translational research.

The goal of the program is to impart the knowledge, experience and perspective required to develop a network of independent investigators, with an emphasis on research that addresses diseases and health disparities that disproportionately affect the Deep South.

Dr. Hohmann's KL2 award reflects the outstanding research being conducted by our junior faculty, particularly research designed to find solutions that close health disparities gaps across the Southeast," said Dr. Tim Moore, Harrison School of Pharmacy associate dean for research. "Natalie is also the first KL2 scholar to come from Auburn since this CCTS program was established in 2014, further signifying the rapid growth of translational research projects at HSOP.

Hohmann's project is titled, "Disparities in Access to Dementia Care in Rural Alabama: Bridging the Gap through Community Resource Mapping." She will identify and map locations of existing dementia services in Alabama and investigate dementia caregivers' needs, barriers to access and current utilization of dementia services in the Deep South, and how these vary across rural/urban setting and racial minority group.

"Alzheimer's dementia and related dementias are a significant issue, and the prevalence of dementia in the United States is highest in the Southeast," said Hohmann, a 2019

graduate from the Harrison School of Pharmacy's Ph.D. program. "People living with dementia and the family and friends who help care for them are often not aware of the services available in their communities to help them overcome the challenges of living with dementia. They may also not have easy access to these services or live in communities that do not offer these services to begin with."

Alabama ranks among the top in the country in dementia prevalence. Additionally, Hohmann said it is not clear what services are available, particularly when you compare rural vs. urban and Caucasian vs. African American. To better address the problem, understanding these principal differences is key to creating tailored solutions to help provide the types and numbers of services needed and working towards eliminating inequities.

"We also know that people living in rural regions have an increased risk of dementia and less availability of community-based dementia services compared to urban regions," Hohmann said. "There is also evidence that African American family caregivers of people living with dementia use fewer community resources, such as dementia services like respite programs and adult day care, in the rural Deep South compared to white caregivers, but spend large amounts of time each week on caregiving responsibilities."

This toll on family members and caregivers is especially important with a condition like dementia as the patient may not be able to do their own research or care for themselves in a lot of ways. For that reason, it is important for those taking care of a dementia patient to have easy access to information and resources.

"Family members and friends who help take care of people living with advanced dementia may need to spend more time at home to take care of their loved one, meaning less time spent at work, relaxing or taking care of other personal and family needs," Hohmann said. "This



Dr. Natalie Hohmann

can take an emotional, physical and financial toll on these caregivers. Local communities can help support family and friends who care for people living with dementia by providing resources and services like adult day care programs, home helpers, support groups, memory clinics and educational sessions."

With her research into the problem, Hohmann plans to develop an interactive map illustrating dementia services in Alabama. Not only will the map act as a resource for those looking for assistance, but the data will also show areas of need within the state.

"Natalie has definitely hit the ground running with what she has accomplished in the relatively short time she has been here," said Dr. Scott Penzak, head of the Department of Pharmacy Practice.

Guiding Hohmann through the project is Dr. Salisa Westrick, Sterling Professor and department head in the Harrison School of Pharmacy's Department of Health Outcomes Research and Policy. Additional mentors on the KL2 project include Dr. Andrea Cherrington, UAB Department of Medicine; Dr. Olivio Clay, UAB Department of Psychology; and Dr. Carolyn Pickering, UAB School of Nursing.





GREEN MEANS GO, RED MEANS REWARD

Decreasing risky decisions for adolescent drivers

by Charlotte Tuggle

An Auburn University researcher has found that rewards can reduce risky decision-making behind the wheel, especially for adolescents who drive dangerously.

Dr. Ben Hinnant, associate professor in the Department of Human Development and Family Science in the College of Human Sciences, reported these new findings in the field of research dedicated to understanding the leading cause of adolescent mortality.

Hinnant's study found that rewards significantly increased the number of safer driving decisions for adolescents who reported their driving style as high in risk-taking (fast, angry or distracted driving behaviors).

"There is a lot of developmental research suggesting that increases in risk-taking behavior during adolescence are, at least, partly due to heightened sensation seeking and reward sensitivity," Hinnant said. "Incentivizing safe driving behavior could be a way to leverage or refocus that heightened reward sensitivity."

Twenty-four adolescents, ages 15 to 17, self-reported their driving styles using a modified version of the Multidimensional Driving Style Inventory, or MDSI. The MDSI surveys participants' driving attitudes, motivations and behavior.

Each of the participants played a driving game that simulated approaching stoplights, during which they had to choose whether to stop at a yellow light or risk advancing through an intersection when the traffic light was about to turn red. The experiment was designed so all adolescents played the game under different conditions: A peer condition where they were told another teenager they just met was observing their choices and a reward condition that was set up so that safer decision-making would yield more monetary rewards. During the control condition, teens were told they were under no peer observation and were offered no extra rewards.

The main takeaways are that rewards were generally effective in reducing risky driving decisions, but this was especially true for teens

who engage in dangerous driving behaviors that put them at risk of being involved in a crash. In general, these findings applied whether a peer was observing the teens' driving decisions or not. These findings suggest that rewards may be an effective way to decrease risky driving during adolescence.

Hinnant's study evaluates a more complex picture of risky teenage driving by considering individual driving styles and how they are affected under peer-observed and reward-driven circumstances.

"It's interesting and promising that rewards were most effective in changing decision-making for teens who seem to be most at risk for being involved in a crash. There are still some big

"It's interesting and promising that rewards were most effective in changing decision making for teens who seem to be most at risk for being involved in a crash."

— Dr. Ben Hinnant

questions to address," Hinnant said. "Would incentivizing safe driving practices translate over to real-world driving behavior, as compared to our results from a lab setting? If so, what is the best way to make a reward-focused approach to improve adolescent driver safety practical and broadly applicable? Answering these questions will be key to reducing the number of teen motor vehicle crashes, over and above the effects of existing programs like graduated driver licensing."

Hinnant's research was internally funded through an Auburn University intramural grant and the Alabama Agricultural Experimental Station SEED Program Award. He hopes to expand on this research through grant funding. Moving forward, Hinnant hopes to improve the research by increasing the participant sample and further exploring the relationship among age, adolescent development and reward sensitivity.

Because the study showed a strong correlation between rewards and safe driving decisions, the research findings have serious implications for crash prevention efforts. Hinnant's results could support initiatives such as a reward system for safe teen drivers which would operate like an insurance premium discount. With additional research, public health authorities and private sector officials will be better equipped to incentivize safer adolescent driving to help prevent unnecessary vehicular injury or death.

Dr. Jennifer Kerpelman, professor and associate dean for research and graduate studies in the College of Human Sciences, leads the charge for more practice-oriented research in the college.



She said this experiment is one of many that translate research from the lab to practical action.

"It is important that universities, especially land-grant institutions like Auburn, are contributing to solutions that make a real impact on people's lives," Kerpelman said. "Human scientists are integral to understanding and affecting daily decisions people make. In the case of Ben Hinnant's research, that could be a matter of life or death."

FACULTY ACHIEVEMENT HIGHLIGHTS



ADANUR

Dr. Sabit Adanur, professor in the Department of Mechanical Engineering in the Samuel Ginn College of Engineering, was awarded \$75,374 to conduct research relating to the design, fabrication and testing of novel medical face masks to prevent the spread of COVID-19 or future contagious viruses.



DITCHKOFF

Dr. Steve Ditchkoff, the William R. and Fay Ireland Distinguished Professor in the School of Forestry and Wildlife Sciences, along with his co-editors, won The Wildlife Society's 2020 Wildlife Publication Award in the "edited book" category for the book, *Invasive Wild Pigs in North America: Ecology, Impacts, and Management*, published in 2020 by CRC Press.



CHARLES

Dr. Julia S. Charles, associate professor in the Department of English in the College of Liberal Arts, has published a new book, *That Middle World: Race, Performance, and the Politics of Passing*, by University of North Carolina Press. In this study of racial passing literature, Charles examines how mixed-race subjects invent cultural spaces for themselves and articulate their sense of selfhood and communal belonging. Her teaching and research interests include racial crossing/ passing literature, 19th- and 20th-century Black women writers, African American literary movements and depictions of mixed-race characters in American fiction.



VIA AND
ERRAMUSPE

Dr. Brian Via and Dr. Beatriz Erramuspe, director and research fellow, respectively, of the Forest Products Development Center in the School of Forestry and Wildlife Sciences, were awarded \$247,142 to research development of a paper-based device for a cost-effective method to detect dangerous formaldehyde emissions in wood panels. The award are part of a \$2.57 million award by the Alabama governor's office to five of the state's research institutions, Gov. Kay Ivey announced.



MAO

Dr. Shiwen Mao, the Earle C. Williams Scholar Chair in the Department of Electrical and Computer Engineering in the Samuel Ginn College of Engineering and director of the Wireless Engineering Research and Education Center, along with his former students received the IEEE Vehicular Technology Society's 2020 Jack Neubauer Memorial Award for their paper published in the IEEE Transactions on Vehicular Technology. The award is presented to the team with the best systems paper published in the past five years. The team of authors — Mao, Drs. Xuyu Wang, Lingjun Gao and Santosh Pandey — received the award for their paper, "CSI-Based Fingerprinting for Indoor Localization: A Deep Learning Approach."



MITTAL

Dr. Jay Mittal, associate professor in the Master of Community Planning program in the Department of Political Science in the College of Liberal Arts, was awarded the 2020 Kenneth J. Groves Jr. Distinguished Leadership Award for a Professional Planner at the annual conference of the Alabama Chapter of the American Planning Association. This award is given to an accomplished planner for significant and sustained contributions to the planning profession.



THOMAS

Dr. Jakita Thomas was included in Cell Mentor's list of 1,000 inspiring Black scientists in America. Thomas is the Philpott-WestPoint Stevens Associate Professor in the Department of Computer Science and Software Engineering in the Samuel Ginn College of Engineering and director of the CULTuRally & Socially Relevant (CURSOR) Computing Lab. Her research interests include exploring the development of computational algorithmic thinking, promoting access to health care information and services for underserved populations, improving reasoning using expert cases, scientific reasoning, complex cognitive skills learning and computer-supported collaborative learning.

Thomas helped launch the inaugural Black Women in Computing Conference, which has since morphed into a computer science education and workforce development organization called blackcomputeHER.

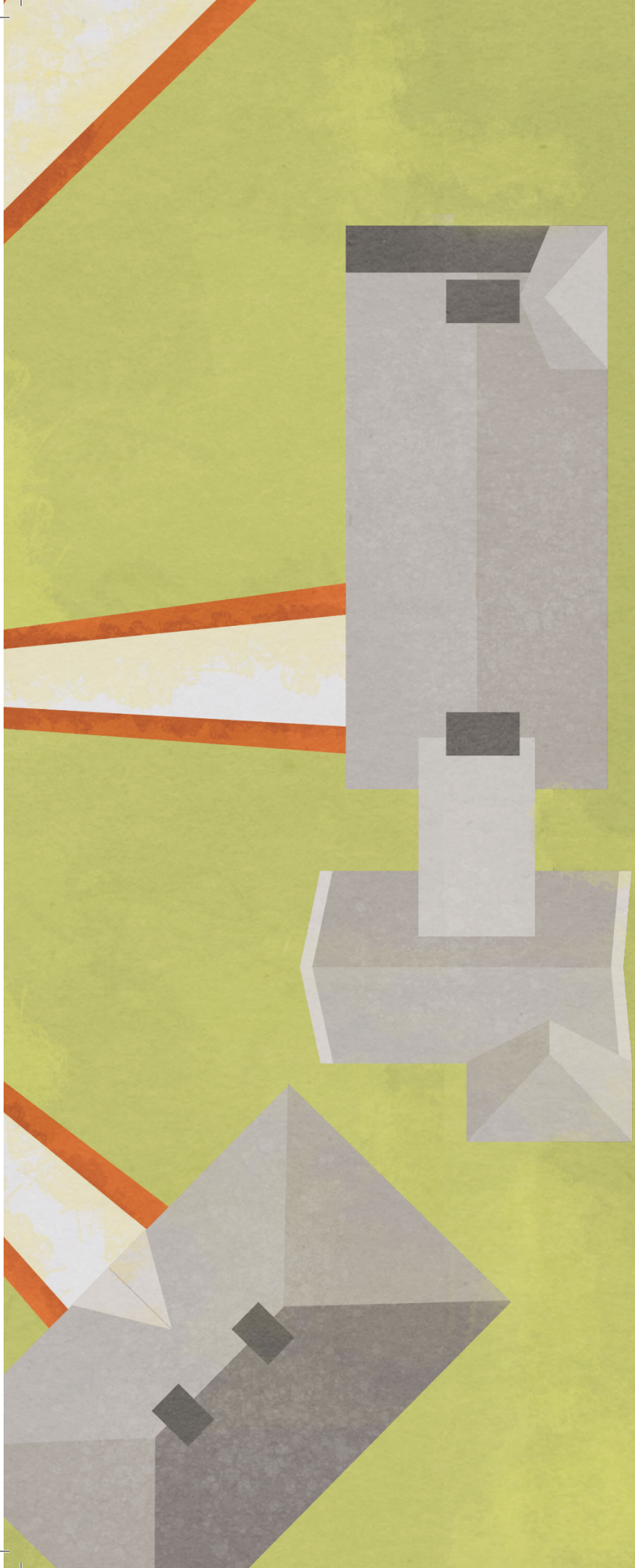




THE PARK AT AUBURN

A COMMUNITY OF

Bright Ideas



The Park at Auburn, a collaborative research ecosystem, is bringing together the brightest minds and most groundbreaking research to change our state, nation and world. With its own community of innovators working jointly to make a difference, Auburn is finding real-world solutions to some of society's toughest challenges.

by Teri Greene

Just a little over a decade ago, if you had zoomed in on an aerial map of what is now Devall Drive, just south of the Auburn University campus, you would have seen...nothing.

Jump to the present: You are seeing The Park at Auburn, a collection of multi-level buildings with square footage in the tens of thousands, sprawling across 171 acres. The latest addition: a 105,000-square-foot Research and Innovation Center, which opened in September.

People are often intrigued as they drive past, but wonder what exactly goes on inside.

Collaboration, innovation, knowledge, synergy, expertise, support — those are some the keywords you'll hear when people talk about the park, which was established in 2007. But those who hear about it may wonder — what's the context?

Soon, people will know. They will hear about The Park at Auburn as new strategies are put in play to further expand, diversify and rebrand. To outsiders, it will represent more than a group of impressive buildings.

Now, The Park, as it has rebranded itself, is truly in the game.

"We're turning the next page in our development history," said Bill Dean, who came on board in April 2020 as executive director of the Auburn Research and Technology Foundation, Foundation (ARTF). "We want to streamline the park's relationships and partnerships, as there are so many technologies here to be developed. Auburn University has recognized expertise in engineering, agriculture, veterinary medicine, forestry, animal science, aquaculture, chemistry, physics, biology and pharmaceuticals, along with a business school training entrepreneurs. We want to build an immensely collaborative research park where people from industry, academia, the private sector and government can work together through our technology resources and collaborate on solutions that will benefit the public."

From the start, the park aimed to build a thriving entrepreneurial ecosystem, merging research — with cutting-edge facilities and equipment and leading experts that put them to use — with businesses of all sizes to leverage collaborative research into real-world progress. The park continues to protect, commercialize and distribute what emerges from the Auburn

knowledge base, making it accessible and meaningful.

“We’re going to be improving the internal technology process with our great faculty and students, so we are able to do more research and do it better,” Dean said. “We want to build a program to accelerate development into the market space.

“A big part of the process is collaborating with deans, associate deans and faculty across Auburn’s campus. The park’s staff will be learning from them to fill in any gaps to make the park more productive. One reason The Park flies under the radar is that people outside Auburn do not see or have not experienced the behind-the-scenes mechanisms.”

Those inner workings can elevate discovery. In the labs of the MRI Research Center, for example, experts in veterinary medicine, psychology, kinesiology, pharmacy, biological sciences and engineering regularly pool their resources and share research findings with one another.

It’s difficult for faculty or other investigators to conduct this level of research in silos — or in an individual college or department on the Auburn campus when trying to align with business needs, Dean said.

“Collaborations and partnerships are a better way to distinguish our technology resources. Collaborations don’t have to be so hard. Eliminate the pain points, communicate, articulate research strengths and use tailored services to help manage the process,” he added. “It just makes our technology development stronger, makes it more competitive and it ramps up market opportunities when there are more people making it happen.”

Joint research, astounding results

In April, as COVID-19 surged, Auburn molecular biologist Dr. Joanna Szluba-Solinska focused her research on SARS CoV-2, the virus that causes COVID-19. She teamed with researchers from the Samuel Ginn College of Engineering on COVID-related projects. One involved determining whether different types of coronaviruses could be visually detected by observing changes in their spectra.

She discovered that a hyperspectral microscope that had been on the market since 2004 had just the right high-resolution capabilities she needed. That microscope technology was developed by Dr. Vitaly Vodyanoy, an Auburn veterinary medicine professor, and then further developed and patented by CytoVita, Inc., a subsidiary company of Aetos Technologies, Inc., which is based in The Park.

CytoVita imaging technology has been installed in research laboratories around the world. Now, it could be a new tool in the battle against COVID-19.

It’s a story that began in The Park and came back around, this time for a new purpose.

The park is blazing a trail of even more innovation in the realm of health.

“Advancing innovation through collaborations and partnerships at Auburn University will improve the quality of life of citizens not only in Alabama, but worldwide.”

– Bill Dean

From top, left to right: The Park’s newly opened Research and Innovation Center—a mixed-use, entrepreneurial ecosystem

Modern meeting spaces in the new event center, 540 at The Park, and in the New Venture Accelerator





Health breakthroughs: Forging ahead

Health care organizations such as East Alabama Medical Center (EAMC) are expanding their presence in the park. EAMC's partnership has grown from contracting for the use of scanners in the MRI Research Center to the planned summer opening of a freestanding emergency department and an ambulatory surgery center in an 80,000-square-foot health sciences facility. The Auburn Medical Pavilion operated by East Alabama Health will create opportunities for collaboration with Auburn and with the Edward Via College of Osteopathic Medicine, also located in the park.

Health research and health care for human and animal populations converge in the park. During the day, human patients undergo diagnostic imaging at the MRI Research Center or visit the new offices of a local medical practice, Auburn Pediatric and Adult Medicine. In the evenings, Auburn researchers conduct important work at the center. For example, psychology professor Dr. Jeffrey Katz uses MRI to understand cognition in Auburn's Vapor Wake detection dogs — aiding his own research, but also advancing the work of scientists in the College of Veterinary Medicine.

Ready for action

At the park, new growth brings new priorities.

For example, assuring that there is adequate wet lab space for research. These specially designed labs are key to stepping up the park's research game and paving the way for collaboration with the private sector and non-business creations.

Another goal — on the dry side of research — is providing advanced makers' spaces, where specialized equipment accommodates the work of experts in areas like additive manufacturing, or 3-D printing, as well as software development and other technologies that are reaching advanced stages of growth.

The grander goal: spread the word about the park far and wide. The emphasis: "Auburn is not only an R1 university — one of 131 in the U.S. listed for high levels of research — but also a public land-grant university whose mission is improving the lives of people," Dean said.

"Advancing innovation through collaborations and partnerships at Auburn University will improve the quality of life of citizens not only in Alabama, but worldwide."

Top left, Auburn Provost Dr. Bill Hardgrave tours the New Venture Accelerator.

Middle left, the Auburn Medical Pavilion and new park entrance off Shug Jordan Parkway.

Bottom left, Students refining start-up businesses in the New Venture accelerator.



Fast Facts

- 921 full-time employees
- First building completed in 2008
- The park consists of 8 buildings (*East Alabama Medical Center & Health Sciences Center under construction currently*)
- Research and Innovation Center includes class-A office space available for lease
- Site of a second location for local favorite Amsterdam Café
- 540 at the park is a state-of-the-art event space with ballroom and boardroom
- Auburn Research Park encompasses more than 170 acres

Buildings

- The Center For Advanced Science, Innovation and Commerce (CASIC)
- Via College of Osteopathic Medicine
- AU Forest Products Lab
- US Forestry Department – Forest Operations Research
- Research and Innovation Center
- MRI Research Center
- ARTF Building
- Big Blue Marble Academy (*Childcare Center*)
- Auburn Medical Pavilion operated by East Alabama Health (*opening summer 2021*)

RECOGNIZING FACULTY EXCELLENCE

by Mitch Emmons

Winners of Auburn University's 2020 Faculty Awards were recognized at a ceremony in the fall. Among the distinguished recipients were winners of two of the university's most prestigious research-related awards: the Provost Award for Faculty Excellence in Undergraduate Research Mentoring and the Creative Research and Scholarship Award.

Dr. Angela Calderón, an associate professor in the Department of Drug Discovery and Development in the Harrison School of Pharmacy was the winner of the Provost Award for Faculty Excellence in Undergraduate Research Mentoring. Dr. Bruce Gladden, the Humana-Germany-Sherman Distinguished Professor in the School of Kinesiology in the College of Education, and Dr. Kenneth W. Noe, the Draughon Professor of Southern History in the Department of History in the College of Liberal Arts, received the Creative Research and Scholarship Award.

Gladden is the recipient in the sciences, medical sciences, engineering and agriculture category. Noe is the recipient in the fine arts, liberal arts, architecture and design, business, social and human sciences category.



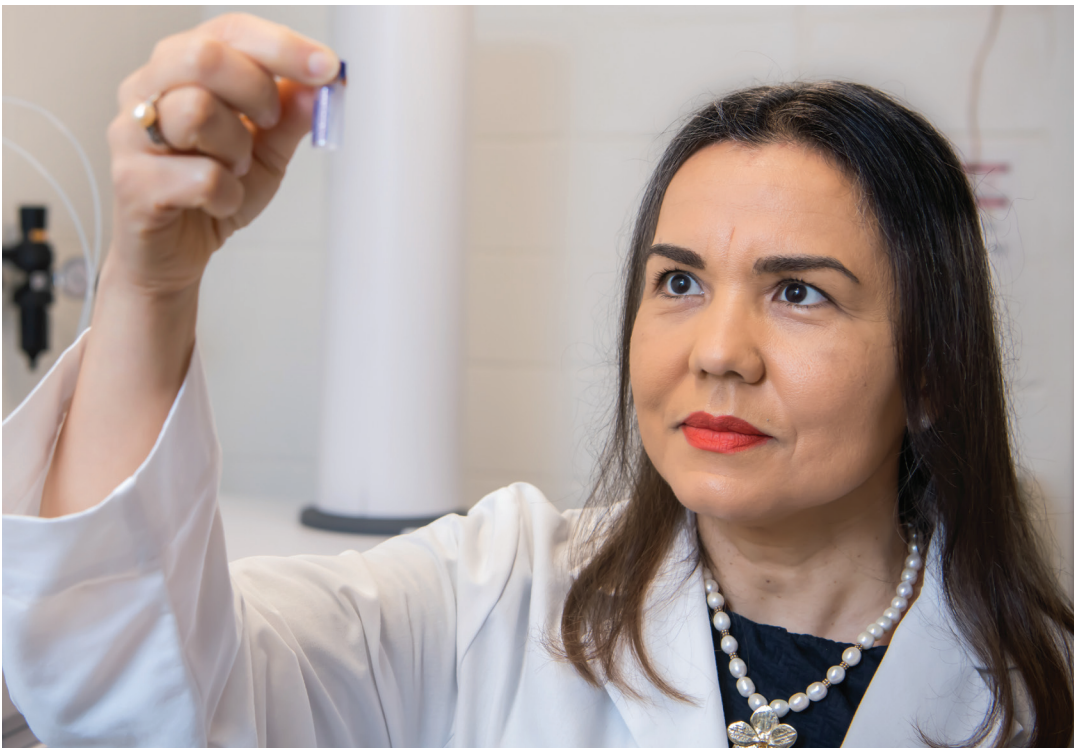
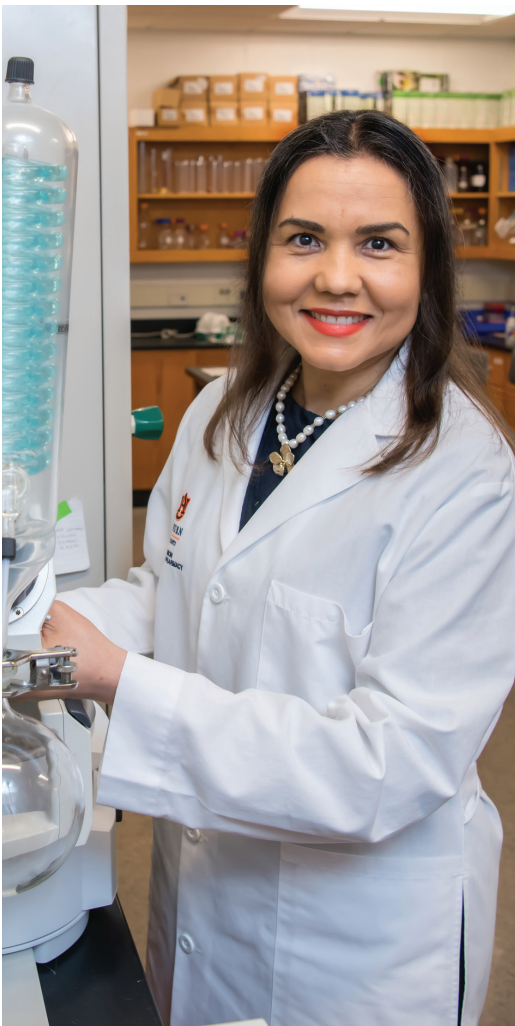
**Provost Award for Faculty
Excellence in Undergraduate
Research Mentoring**

Established in 2012, this award recognizes faculty members who demonstrate a strong commitment to undergraduate research and outstanding services to students and whose efforts support Auburn students interested in careers in research and creative work.

Dr. Angela Calderón received her Bachelor of Science in pharmacy from the University of Panama, Panama City, Republic of Panama; a Master of Science in pharmacognosy from the University of Illinois at Chicago; and doctorate Ph.D. degree in pharmacognosy from the University of Lausanne, Lausanne, Switzerland. She joined the Auburn faculty in 2008.

Calderón specializes in natural drug products research, specifically applications of mass spectrometry to natural products drug discovery for tuberculosis and malaria and quality and safety assessment of botanical dietary supplements. She is the first researcher to develop a mass spectrometry based assay to discover antimalarial and antitubercular compounds. Over the past nine years, she has authored 32 publications, received one U.S patent and authored two book chapters. In the classroom, she teaches graduate courses in separation science and mass spectrometry.

“Undergraduate research mentoring is an integral part of the success of my research program,” Calderón said. “My laboratory focuses on searching for antimicrobial compounds from a bacterial soil metagenomics library and plants and the quality and safety of botanical dietary supplements. Auburn's Provost Award for Faculty Excellence in Undergraduate Research Mentoring recognizes my contribution to educating the next generation of natural products researchers with unique skills in mass spectrometry.”



COLLEGE/SCHOOL

Harrison School of Pharmacy

YEARS WITH AUBURN

13 years

RESEARCH AREA

Natural drug discovery and development

**Creative Research and
Scholarship Award**

The Creative Research and Scholarship Award recognizes faculty members who have distinguished themselves through research, scholarly works and creative contributions. This award recognizes two categories: sciences, medical sciences, engineering and agriculture; and fine arts, liberal arts, architecture and design, business and social and human sciences.

Dr. Bruce Gladden is the director of the Muscle Physiology Laboratory in the School of Kinesiology. His research interests include two major tracks of investigation within the overall area of bioenergetics and regulation of metabolism during exercise: 1) the role of lactate in metabolism, and 2) how the energy systems make the transition from resting to exercise conditions.

The lab has a 25-year history in the school at Auburn. Its overall emphasis is the regulation of metabolism during exercise. Studies are typically interpreted in the context of human physiology and biochemistry. Gladden teaches in the areas of exercise physiology and biochemistry of exercise. His academic history includes: Post doctoral fellow in physiology, University of Florida; Ph.D. in zoology, University of Tennessee; Bachelor of Science, in zoology, University of Tennessee, Knoxville.

“I was very surprised and excited to receive this award,” Gladden said. “It always provides great encouragement when you receive this type of recognition from your peers. Certainly in my case, this award is the result of wonderful collaborations with my doctoral students and faculty colleagues at Auburn, as well as those at other universities in the United States and around the world. I owe all of them a great debt of gratitude.”



COLLEGE/SCHOOL

College of Education,
School of Kinesiology

YEARS WITH AUBURN

32 years

RESEARCH AREA

Bioenergetics and
metabolism during exercise

Dr. Kenneth Noe is a native of Virginia and an expert in American Civil War history. Noe received his bachelor's from Emory & Henry College; a Master of Arts degree from Virginia Tech University; an MSLS from the University of Kentucky and his Ph.D. from the University of Illinois. He then taught at West Georgia College for 10 years before coming to Auburn in 2000. His major teaching and research areas are the American Civil War and Appalachian history.

Noe is a frequent speaker on the Civil War Round Table circuit and is the author or editor of eight books on the subject. He was the 2008-09 president of the Alabama Historical Association. He also served as a consultant to the NBC/TLC series, *Who Do You Think You Are?*. He teaches classes in honors world history II; Appalachian history; Civil War and reconstruction; and conducts a graduate seminar in Civil War and Reconstruction.

“I’m really grateful to the Creative Research and Scholarship Award committee for recognizing my contributions to scholarship at Auburn over the last two decades,” Noe said. “The award will help me build upon research about the American coast that I was unable to use in my latest book. I look forward to continuing my research and writing about the environmental history of the American Civil War during my upcoming retirement.”



COLLEGE/SCHOOL

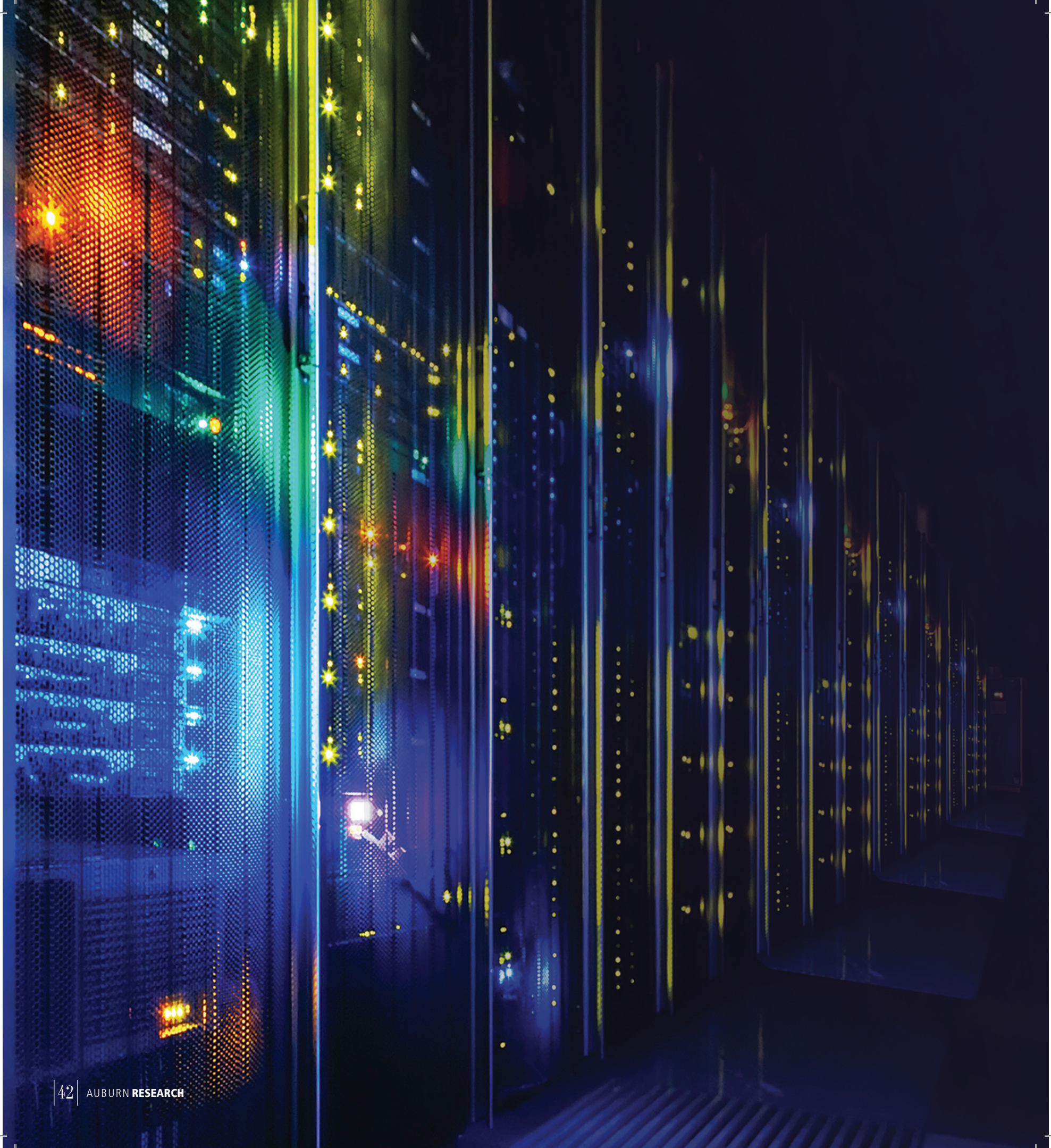
College of Liberal Arts

YEARS WITH AUBURN

21 years

RESEARCH AREA

American Civil War and
Appalachian history



SUPER COMPUTING

Auburn's latest high-performance computer named in honor of pioneering NASA mathematician

by Kittye Parker

In a year of unprecedented changes, the need for strong and powerful computing services, especially those that are accessible remotely, has proven immeasurable. And the ever-growing popularity of these devices now perfectly aligns with the installation of Auburn University's third-generation supercomputer, Easley.

The first supercomputer on Auburn's campus, CASIC, was established in 2013 and named after the building in which it resided. When the research efforts across campus established a greater demand for high-performance computing (HPC), a second supercomputer was acquired in 2016 and named Hopper, after the late Rear Adm. Grace Hopper, who was a pioneer of computing technology. This newest addition continues to build on the tradition of meaningful names after Dr. Nick Giordano, dean of the College of Sciences and Mathematics, led the task to find something the community could rally behind and embody. The resulting name, Easley, is in honor of the late Annie Easley, an Alabama native and NASA computer scientist.

Annie Easley was a great believer in education and in following her mother's admonition, "You can be anything you want to be, but you have to work at it." Her original plans to become a pharmacist were thwarted after the only program local to her closed, but another door quickly opened. In 1955, after reading an article about twin sisters working as "human computers" for the National Advisory Committee for Aeronautics, Easley applied for a job at the Aircraft Engine Research Laboratory in Cleveland, Ohio (later renamed the NASA Glenn Research Center). Two weeks later, she started her 34-year career as a mathematician and computer engineer. As technology evolved, so did Easley's job and contributions. Instead of solving the mathematical equations herself, she began developing and implementing computer codes.

In addition to playing a major role with the Centaur Upper-Stage Rocket and other shuttle launches, her work was integral in solving energy problems and was invaluable in the improvement of commercially available energy solutions and other technologies.

When asked about the discrimination she faced, Easley stated that she wasn't trying to pioneer change, but rather just trying to do her job.

"I just have my own attitude. I'm here to get the job done," she said in a 2001 interview for a NASA Oral History. "My head is not in the sand. But my thing is, if I can't work with you, I will work around you." In spite of being denied certain benefits and even being cropped from promotional photos, Easley persisted. She ultimately added the role of equal employment opportunity counselor to help others address issues like those she faced. Easley never claimed to be a role model or trailblazer, but in striving to do her best and find answers, she had a tremendous impact on those around her, as well as NASA and computer technology as a whole.

The Annie Easley story is one centered around breaking barriers and pioneering into new eras. The Office of Information Technology hopes to follow her example by introducing the significant computing power held within the Easley supercomputer. The steps to bring this system to life started well before the initial core build in the summer of 2020, and the subsequent installation, configuration and testing that lasted through November 2020. But this new system, officially online as of late November, has 180 individual computing nodes that work together to provide over 500 trillion FLOPs, or floating operation points, per second. That is nearly triple the computational capacity of the Hopper, which was already solving more equations in one second than a human could solve in millions of years. And to store and process this data,



Annie Easley

Easley has four petabytes of storage and an immense amount of graphics processing power to make sure the system can keep up with all the compelling research coming out of Auburn.

If you're wondering what could drive the university to invest in such an extensive high performance computing system, it's important to note that there are over 500 registered users across 34 lab groups currently utilizing these supercomputing processes. These groups span across eight of the 12 academic colleges and schools at the university. Some of the research topics include climate science, bioinformatics, genomics, fluid dynamics, computational chemistry and big data analytics. Together, those teams and projects kept our HPC utilization at approximately 72% throughout 2019, and these research endeavors continued even through the unprecedented trials set forth throughout 2020. As Auburn continues to grow, so will its need for research capacity. The Easley supercomputer establishes that computing power and sets a tone for trailblazing and growth for the years to come.

If you are interested in learning more about high-performance computing at Auburn University, please visit hpc.auburn.edu or email hpcadmin@auburn.edu.



FIRED UP

Researchers studying how controlled burns could help mitigate the effects of wildfires

by Mitch Emmons

The news is often filled with stories about wildfires and the widespread damage caused when they burn out of control. A combustion expert in Auburn University's Department of Aerospace Engineering in the Samuel Ginn College of Engineering, along with forestry scientists, is studying how the absence of managed control burns could be a significant contributor to this problem.

Assistant Professor Dr. David Scarborough and his graduate research assistant, Daniel Stubbs, are conducting studies on the characteristics of wildfire burning and the ways that naturally occurring fuels — largely ground litter vegetation — interact. Their objectives include, among other things, collecting data to support the use of prescribed — or controlled — burning as a means for mitigating the devastation caused by wildland fires.

"We are seeking to learn more about how wildfires and the fuels that feed them interact," Scarborough said. "Forestry researchers are not usually focused on combustion research, so we joined with forestry in this study. We are trying to use our expertise in combustion and fluid

dynamics to serve and contribute to a large, important state and regional industry. This project gives us a platform to conduct relevant research and compile valuable data."

Using their laboratory apparatus — dubbed the Wildland Fire Integrated Research Experiment (WildFIRE) — Scarborough and his team simulate wildland fires under a variety of conditions and fuel compositions. WildFIRE is a laboratory-scale experiment that incorporates high-speed, high-resolution optical diagnostics along with more traditional diagnostics, such as fuel mass consumption, temperature and emissions measurements, to investigate the effects of fuel composition and moisture content, terrain slope and wind speed on the combustion of wildland fuels. WildFIRE is used to obtain important data on such factors as flame height, flame propagation speed, fuel consumption rate, harmful emissions and residual fuel mass to compare with and improve modeling tools that are used to simulate wildfires.

"Our primary focus is on combustion of loblolly pine needles, because this is widespread in Southeastern forests," Scarborough said. "We

are trying to better understand how pine needles burn under a variety of natural conditions."

Their study began around the time of the huge Great Smoky Mountains wildfire in the Gatlinburg, Tennessee, area in 2016. More recent wildfires in the western United States have spawned further interest within the forestry and fire safety communities, according to Scarborough.

Scarborough noted the economic impact of the forestry industry as the catalyst behind this research: "Forestry is a major part of the Alabama, United States and world economies." According to the Alabama Forestry Commission, Alabama forests generate more than \$21 billion in revenue annually and provide 122,000 jobs. There are 23 million acres of timberland in Alabama, accounting for 69% of the total land area in the state. Alabama has the third-most timberland acreage in the 48 contiguous states, behind only Georgia and Oregon.

"Wildfire was once a common, frequently occurring, natural disturbance initiated most commonly by lightning in numerous ecologically important ecosystems," Scarborough adds.

“However, across much of the modern landscape the fire process has been significantly altered and sometimes eliminated through human intervention. In the absence of fire, leaves, evergreen needles and small sticks accumulate on the forest floor over the period of many years. Furthermore, many invasive woody species such as wax myrtle and yaupon holly, grow uncontrolled under the tree canopy. Therefore, fire, when it does finally occur, as it most assuredly will, often rages out of control, propagating rapidly with high heat intensity and long flames as it consumes many years’ worth of accumulated fuel and woody plants.”

**Alabama Forests
Generate Over
\$21
BILLION
IN ANNUAL REVENUE**

Foresters have long known that a practice known as prescribed burning is a valuable and effective fire control application, according to Scarborough, but this practice is not applied as frequently for a number of reasons.

“Prescribed, or controlled, burning is a type of intervention that seeks to provide the benefits of natural wildland fires while minimizing the potential threats to property and other anthropogenic concerns,” Scarborough says. “These prescribed burns, when repeated at frequent intervals, serve to consume the fuel materials on the forest floor while managing invasive species. This, in turn, reduces the amount of potential fuels accumulated on the forest floor.”

Although prescribed fire reduces the risk of damaging wildfire and promotes forest restoration and wildlife habitat, significant regulatory restrictions and public perception pose hurdles to the use of prescribed fire. But better

data could help change that.

“The primary reason is that data on wildfire and prescribed burns are difficult to obtain due to the cost and risks posed from fire on the scale at which wildland fires occur,” Scarborough said. “On the opposite end of this spectrum, small-scale laboratory studies fail to include many relevant factors.”

This is where Scarborough and his team’s work is making a valuable contribution. The Wildland Fire Integrated Research Experiment is a wildland fire combustion research facility capable of simulating burn areas up to several square meters, located at Auburn University’s Combustion Physics Laboratory (AUCPLAB).

“WildFIRE is a unique facility among universities in that it is an intermediate-scale facility bridging the gap between traditional university bench-scale experiments, which are typically within the centimeter scale, and full-scale research fires conducted by governmental laboratories,” Scarborough said.

“Our research provides an intermediate-scale facility designed to obtain data on the combustion and emissions properties of wildland fuels under field-relevant conditions that can be used to validate computer simulations of wildland fires and compare with field wildfire and controlled burn observations,” he said.

Scarborough said the ultimate goal of the lab’s research is to develop optical diagnostics that are useful in study of wildland fires in the field and to provide data that help to validate existing wildfire data on combustion, controlled burning and other characteristics surrounding the nature of wildfires. Also, their hope is that by better understanding how wildfires interact with the fuel sources and environmental conditions feeding them, they can help in the development of better ways to mitigate the damage caused by out-of-control wildfires by providing a deeper understanding about the combustion properties of fire and fuels.



SUPPORTING STEM DIVERSITY

Auburn professors part of collaborative project to strengthen STEM graduate programs for underrepresented minorities

by George Littleton

In 2014, researchers from Auburn University joined with Tuskegee University and Alabama State University in a collaborative effort to develop, implement and study unique and innovative models that identify, eliminate or mitigate factors that impact persistence in STEM (science, technology, engineering and mathematics) graduate programs for underrepresented minorities (URM). The study, titled “Tuskegee Alliance to Forge Pathways to STEM Academic Careers” (T-PAC), was funded by the National Science Foundation (NSF). The total grant award across the three institutions was \$2,593,384; Auburn’s portion of the award was \$821,702.

Dr. Melody Russell, a professor in the College of Education’s Department of Curriculum and Teaching, served as Auburn’s principal investigator (PI) for the grant. Co-PIs from Auburn included Dr. Jared A. Russell (School of Kinesiology), Dr. Oladiran Fasina (Department of Biosystems Engineering) and Dr. Curtis Shannon (Department of Chemistry and Biochemistry).

“This interdisciplinary and collaborative project that focuses on broadening participation and promoting equity and social justice in STEM for traditionally underrepresented groups is important for many reasons. And for me it has special relevance because it has long been my primary area of research, as well as my passion,” said Dr. Melody Russell.

The award comes from the NSF’s Alliances for Graduate Education and the Professoriate (AGEP) program. The AGEP Transformation track targets strategic alliances of institutions and organizations to develop, implement and study innovative evidence-based models and standards for STEM graduate education, postdoctoral training and academic STEM career preparation that eliminate or mitigate negative factors and promote positive practices for URM.

“NSF’s investment in the project reflects its commitment to broadening the participation of underrepresented minorities in the STEM fields,” said NSF Program Director Dr. Mark Leddy at the outset of the study. “This AGEP Transformation project draws on the expertise of three Alabama universities with a strong record of federally funded grants to advance a new STEM education model for underrepresented minorities. It will lead toward increasing the diversity of academe and the broader STEM workforce.”

The AGEP project ultimately seeks to enhance the graduate experience, promote retention for students from underrepresented groups, and increase the number of those underrepresented in the STEM professoriate.

“The project is unique in the way that two Historically Black Universities that focus on baccalaureate degree production collaborated with a research university to develop, implement and study a model of STEM graduate education and professional development,” Russell said. “Our findings provide information that will help educators, administrators and policymakers, as well as the general public.”

Russell and her colleagues released some of their findings in an article, titled “Promoting Pathways to STEM Careers for Traditionally Underrepresented Graduate Students,” in the Negro Educational Review.

“The systemic and pervasive underrepresentation of some ethnic and cultural groups in the STEM workforce has been a much-discussed topic for a while now,” Russell said. “It has been my main research focus for many years. Identifying factors that promote STEM persistence and graduate school completion can help diversify the STEM workforce in industry and higher education.”

“It has been my main research focus for many years. Identifying factors that promote STEM persistence and graduate school completion can help diversify the STEM workforce in industry and higher education.”

– Dr. Melody Russell

Findings from the team’s research indicated that undergraduate research experiences, graduate education experiences, financial and institutional support, faculty/mentor and advisor support and intrinsic motivation influenced the study participants’ persistence in STEM undergraduate and graduate programs.

Many of the students who discussed their undergraduate STEM experiences described how they were motivated to pursue graduate studies based on experiences in a laboratory setting through various programs and projects while completing their undergraduate program.

Some participants discussed the importance of their institution fostering mentoring relationships, more social support networks and providing spaces that promote a sense of community and belonging.

Another key factor in graduate persistence was the influence of major professors and advisors relative to career aspirations and the overall graduate experience for the participants. These findings were well supported by existing literature that also described the critical role major professors play in helping their graduate students navigate the academy and influence their career decisions after graduate studies.

Specifically, participants in the research study described the importance of positive and meaningful interactions with their major professors. However, for students who did not feel supported by their major professors, there was a deterrent effect in their aspirations to pursue faculty positions and careers



in the academy. There is some research that addresses the importance of having a major professor that helps students find their “scientific feet,” as well as characteristics of the “ideal” professor.

Some participants described the drawbacks of having a professor who was “hands off.” These students often felt they were on their own with little support to help them navigate graduate studies. Mentoring relationships (particularly between major professors and their graduate students) are critical and often a key determinant for the productivity and scholarship of graduate students. This is worth noting since retention of traditionally underrepresented groups is an important part of broadening participation and diversifying the STEM workforce.

Some students described an internal desire to persist in their programs. Many seemed to possess intrinsic motivation and “grit” which played a significant role in their persistence despite the barriers they encountered in their graduate programs.

Overall, the AGEP project highlighted several variables that could lead to increased student motivation to continue their graduate education. All the students described the faculty advisor as playing a significant role in supporting their graduate studies and encouraging their persistence. This can be a “make or break” relationship for graduate students’ career aspirations. Institutional support for graduate students increases student engagement and reduces the likelihood that students will drop out of the pipeline, and instead continue their pursuit of a career as a STEM professional, either in academia or industry. This is critical for diversifying the STEM workforce both in higher education and industry.

“Based on our research, more access to professional development programs for graduate students that provide knowledge on strategies for successfully navigating graduate school is important,” Russell said. “Furthermore, it is important to provide professional development for faculty and administrators to change policies and procedures that are barriers to persistence for traditionally underrepresented students. Institutional factors, increasing support and providing more opportunities to conduct research and publish at the undergraduate and graduate levels are all critical aspects of a graduate experience that prepares the student for success in academia or industry.”

Conclusions from this research can inform administrators and faculty in higher education of strategies that facilitate and support the career development of traditionally underrepresented students in pursuit of STEM degrees and will help diversify the workforce.



From left to right: Dr. Martha Escobar (Department of Psychology); Dr. Jared A. Russell (School of Kinesiology); Dr. Melody Russell (Department of Curriculum and Teaching); Dr. Curtis Shannon (Department of Chemistry and Biochemistry); Dr. Oladiran Fasina (Department of Biosystems Engineering)

FLIES CREATING BUZZ

Researchers studying how to eliminate spread of disease, especially from the common fly
by Mitch Emmons



Antimicrobial resistance remains one of the biggest threats to public health despite decades of efforts to slow down the selection and transfer of resistance through judicious use of antimicrobials.

A research team lead by Dr. Chengming Wang, a professor in the Department of Pathobiology in Auburn University's College of Veterinary Medicine, is conducting a multi-pronged program of federally funded research that is focused on zoonoses — diseases that are transferred from animals to humans — and antimicrobial resistance, with a goal of developing more effective mitigation.

Wang is assisted in this research by Dr. Kenneth S. Macklin from the Auburn College of Agriculture and other colleagues in the College of Veterinary Medicine: Drs. Stuart Price, Russel Cattley, Paul Walz, Terri Hathcock, Anil Poudel, Anwar Kalalah, Subarna Barua, Folasade Adekanmbi and Md Monirul Hoque. He also is working with Drs. Patrick Butaye and Patrick Kelly at Ross University School of Veterinary Medicine.

"We are looking at several areas of research as it relates to disease transmission and antimicrobial resistance," Wang said. "We are studying various ways that these antibiotic resistant bacteria are transmitted, what are

the most common ways that they are transmitted, and what vaccines can be most effective in treating against these pathogens that are resistant to many commonly used antibiotics.”

Surveillance for antimicrobial resistance is one of the research studies underway by Wang and his colleagues.

“Surveillance of antimicrobial resistance is critical for identifying emerging resistance and for developing and validating the effectiveness of prevention and control strategies,” Wang said. “A number of federal agencies are supporting research in this area that seeks to isolate and study such bacterial pathogens as Salmonella, Campylobacter, Escherichia coli and Enterococcus isolated from meat, food animals and human clinical samples.”

Wang’s team studies the transfer of these bacteria by common flies.

“Flies are common in and around livestock operations, easily making effective contacts with animals, manure and the environment,” Wang said. “Flies are not only associated with agricultural environments but reside also in urban locations where they contact humans and their environment as well as their waste. It has recently been shown that flies not only carry antimicrobial-resistant bacteria, but that their intestines provide a suitable environment for horizontal transfer of antimicrobial resistance genes.

“Flies are well-known vectors of bacterial pathogens, but there are little data on their role in spreading microbial community and antimicrobial resistance. This work is structured to provide the preliminary data on the possible dissemination of antimicrobial resistance between animals and human beings by flies.”

Another area of Wang’s research examines Rickettsia felis, an emerging human pathogen causing flea-borne spotted fever.

Although found in a wide range of arthropods including fleas, ticks, mites and lice, the cat flea is currently believed to be the most likely primary vector of R. felis, according to Wang.

“There is growing evidence that mosquitoes might be involved in R. felis transmission,” Wang writes about his findings. “Our results show that R. felis occurs in mosquitoes in the United States. The growing reports of R. felis occurring in mosquito species around the world and the known role of mosquitoes in transmitting a wide range of very important human and animal pathogens indicate an urgent need for further studies to determine the role mosquitoes might play in the epidemiology of R. felis infections in people.”

Raw meats used as animal feed sources also comprise an area of zoonoses that Wang and his team are investigating.

“Advocates of raw meat diets claim various health benefits for dogs, and while none of the purported benefits have been validated, owners of raw meat fed animals stand by their convictions,” Wang writes. “But a two-year study conducted by the U.S. Food and Drug Administration found that raw pet food is more likely than other types of pet food to carry bacteria, including salmonella and listeria monocytogenes.

“As a result, FDA issued a public health warning about the risks of raw pet food diets and both the American Animal Hospital Association and the

American Veterinary Medical Association officially recommend against feeding raw meat-based diets to dogs,” Wang said. “Our research is making deeper investigations into this condition, which is shown to harbor antimicrobial resistant bacteria.”

In addition to their investigation of antimicrobial resistance bacteria and its transmission, Wang and his team also are interested in learning more about available antibiotics and improving the effectiveness of those known to be effective in mitigating bacterial infections. Wang is particularly interested in the antibiotic colistin.

Colistin is a last-resort drug used to treat infections caused by multidrug-resistant Gram-negative bacteria that have developed resistance, Wang explains.

Wang writes: “Antimicrobial resistance to colistin has emerged worldwide, threatening the efficacy of one of the last-resort antimicrobials used for the treatment of infections caused by multidrug-resistant Gram-negative bacteria. Until 2016, only mutation-mediated resistance was described in bacteria from humans and animals, but it is now clear that other common bacteria are colistin resistance.”

Colistin has been around since the late 1940s. Although it is used to treat a number of human illnesses, such as pneumonia, it is largely reserved for agricultural and veterinary medicine use because of the possible side effects.

“Colistin has many possible side effects,” Wang said. “It can affect the kidneys, it can cause neurological problems and it can produce muscle weakness and even breeding problems. But it has long been used when the bacteria proved resistant to other antibiotics.”

As recent as 2017, the reliable last resort colistin began showing ineffectiveness in combating antimicrobial resistant bacteria.

Wang and his research team are among a rapidly growing number of scientists focused on research involving the transmission of diseases and the development of ways to mitigate or eliminate them. The spread of disease from animal to human is an important area within this vast research, and many of the treatments that have been effective in the past are beginning to lose their strength.

“Antimicrobial resistance is rising globally at an alarming rate,” Wang notes. “Our research hopefully will make new discoveries that increase our knowledge and help to keep us winning the battle against zoonotic diseases and their transmission.”

“Flies are well-known vectors of bacterial pathogens, but there are little data on their role in spreading microbial community and antimicrobial resistance. This work is structured to provide the preliminary data on the possible dissemination of antimicrobial resistance between animals and human beings by flies.”

– Dr. Chengming Wang

CLOSING THOUGHTS

FROM THE VICE PRESIDENT



James Weyhenmeyer, Ph.D.
*Vice President for Research & Economic Development
President, Auburn Research and Technology Foundation*

One of the newest buildings in The Park at Auburn is named, appropriately, the Research and Innovation Center. Research and innovation — these are core elements of what the park is all about. Not only do Auburn researchers conduct internationally recognized work in cutting-edge fields, they also innovate, bringing scientific discoveries and new technologies into the marketplace for the benefit of Alabama’s citizens, the nation and the world.

Society’s most pressing problems change over time, and Auburn innovations bring timely solutions to bear in meeting these evolving challenges head-on. When COVID-19 struck in full force over a year ago, Auburn researchers were there, tackling this new problem from every angle — researching vaccine candidates, creating new diagnostic options, developing new and better face masks, examining behavioral and economic factors of the pandemic and more.

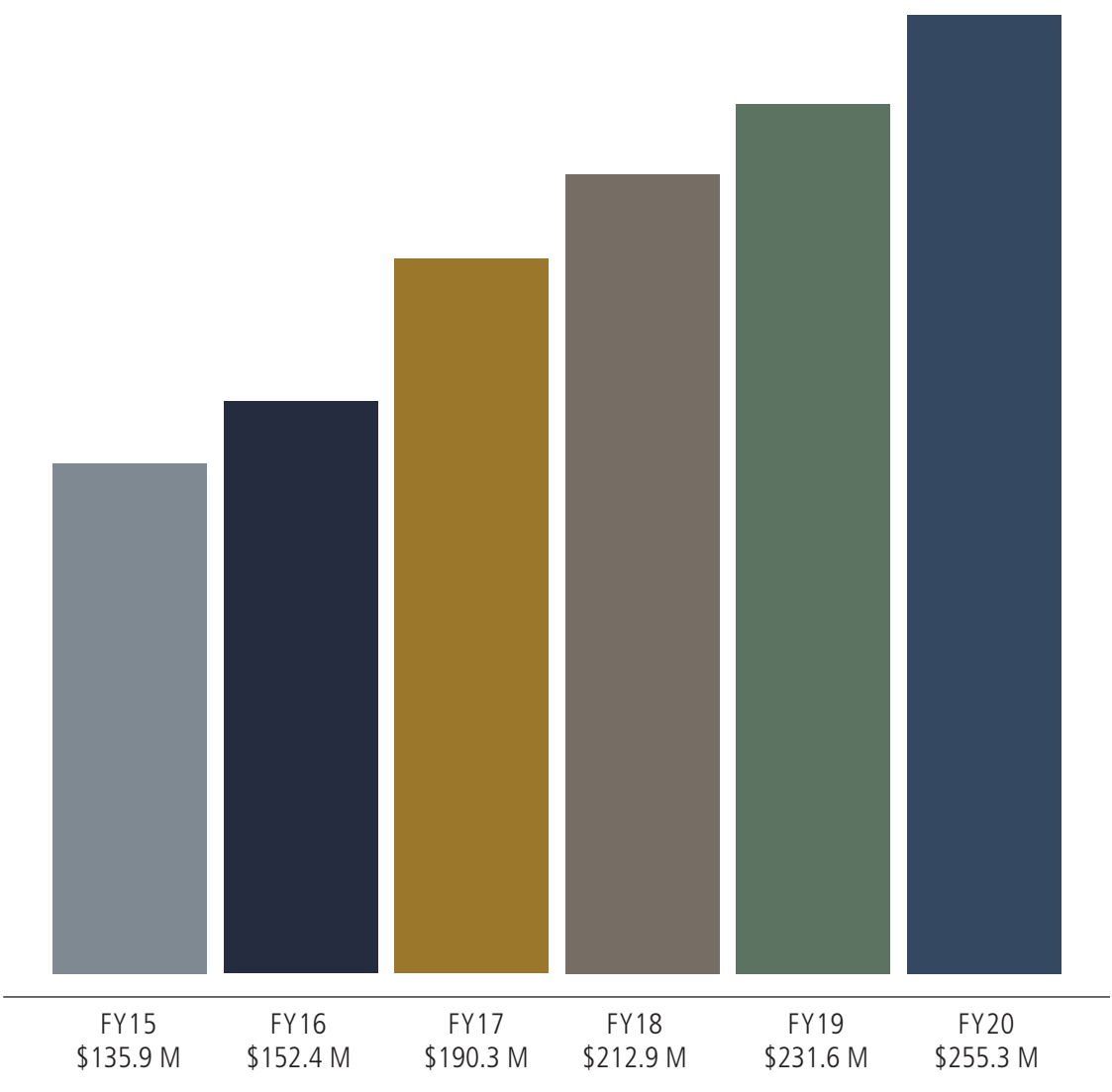
The bottom line is that tackling the world’s tough problems is what Auburn researchers do. From working on cures for catastrophic childhood illnesses to protecting our food supply, our environment and our critically important cyber landscape, the dedicated

researchers of Auburn University are leveraging discovery and innovation for the public good, every day.

When we see the level of dedication and ingenuity that Auburn researchers bring to their work, it’s no surprise that industry partners seek out our faculty members’ expertise to solve an array of problems, and these collaborations have made for a thriving and dynamic research park and university-wide research enterprise. We invite you to reach out to us, to learn more about the exciting research and scholarship activity happening at Auburn University, and we look forward to sharing more about current and future developments in Auburn’s research success story.

2020 YEAR-END METRICS

RESEARCH EXPENDITURES



Research expenditures* have increased 88% since FY2015.
**as reported in the NSF HERD Survey*

COMMERCIALIZATION METRICS

60
INVENTION DISCLOSURES

17
STANDARD U.S. PATENT APPLICATIONS FILED

80
PROVISIONAL U.S. PATENT APPLICATIONS FILED

14
OTHER U.S. PATENT APPLICATIONS FILED

17
U.S. PATENTS

22
LICENSES/OPTIONS EXECUTED

1
STARTUP COMPANY FORMED

\$4,609,824
OPTION AND LICENSE INCOME



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