AUBURN RESEARCH

FALL 2020

AUBURN UNIVERSITY

Campus and downtown Auburn at night

Photo by Jeff Etheridge

CONTENTS

30 STEADY GROWTH IN CHALLENGING TIMES

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Editor's note: Requirements for face masks have changed during the months we were putting this issue together. Photos taken without masks took place earlier in the process, before they were required.

On the cover:
A versatile cotton crop at Alabama Agricultural Experiment Station's E.V. Smith Research Center. In addition to cotton fibers for textiles, cottonseed oil is an important part of the human food supply, and other parts of the cotton plant are used in animal feed.
Photo by Jeff Etheridge

TELEHEALTH NETWORK ADDRESSES HEALTH ISSUES

by Mitch Emmons

As the COVID-19 pandemic continues to be a threat, health care professionals and other experts are developing ways to share information to aid in combating the virus, and to educate about protection and prevention.

Auburn has joined the University of Alabama at Birmingham and the Alabama Cooperative Extension System to form the Telehealth Network — a group of faculty and administrative professionals with diverse expertise who are holding regular meetings by virtual assembly to share information.

The group formed over the summer, according to Dr. Jennifer Kerpelman, associate dean and a professor in the College of Human Sciences. Discussions include not only the current COVID-19 pandemic but also information about such chronic conditions as diabetes and hypertension, as well as research funding opportunities.

"The group consists of a broad range of very knowledgeable people, and it continues to expand," Kerpelman said. "The COVID-19 pandemic certainly elevates the need for this group, but the network also serves as a significant information source for many important topics that relate to health, research and education."

The Telehealth Network goals and issues it strives to address include:

- Disproportionate chronic health conditions among underserved and rural populations;
- More effective use of technology for extending education, assessment and treatment options;
- Establishing a network of diverse collaborators engaged in advancing the capacity and reach of telehealth;
- Building on the strengths of multiple institutions and systems to provide innovative and effective prevention and intervention programs;
- Extending the reach of health education, assessment and treatment that help reduce health disparities and promote health equity;
- Facilitating novel, applied research activities by engaging rural and underserved populations;
- Seeking and sustaining multiple streams of funding to support telehealth research and practice.

HUNTSVILLE RESEARCH CENTER CELEBRATES A DECADE OF SUCCESS

By Morgan S. Martin

The Auburn University Huntsville Research Center (AUHRC) is celebrating its 10-year anniversary of advancing Auburn's research portfolio and presence in north Alabama and beyond.

Headed by Dr. Rodney Robertson as executive director, the AUHRC was created to match Auburn's research capacities with the needs of Huntsville's government agencies and industries. By facilitating collaborations between Auburn researchers and Huntsville industry leaders on a number of federal contracts, the AUHRC aims to increase research funding to both Auburn and the state of Alabama.

"We have had many successes in establishing meaningful and long-lasting partnerships between the university and the numerous industries and government agencies located in Huntsville," Robertson said. "Through these collaborations, Auburn's premier research capabilities have been used to address significant government and industry needs that benefit not only our region, but our nation as a whole."

The AUHRC has linked Huntsville-based industries to several of Auburn's colleges and programs, and created partnerships with the U.S. Army, NASA, Missile and Space Intelligence Center, Missile Defense Agency, FBI and HudsonAlpha Institute for Biotechnology, among many others.

The Auburn presence in Huntsville has grown to include five core AUHRC employees and an additional seven College of Engineering employees who are funded by government contracts and located on-site at Army facilities at Redstone Arsenal and at NASA's Marshall Space Flight Center. The center's focus areas include projects in defense, cyber security, aerospace, advanced manufacturing, life sciences, biotechnology, information technology and other federal and state government priorities.

"We are poised for even greater success in the future and look forward to the next decade," Robertson said.

For news and updates from the AUHRC, follow @AuburnHRC on Twitter.

RESEARCHERS AIM TO FUEL NEW MARKETS FROM HURRICANE-RAVAGED TIMBER

By Teri Greene

A team of researchers from Auburn University's School of Forestry and Wildlife Sciences is exploring ways to give new life to downed timber that has been decimated by hurricanes.

The Downed Timber Initiative aims to develop new methods of retrieving these fallen trees and branches that would otherwise go to waste or become fuel for wildfires, and then developing innovative products from the salvaged wood.

The research is funded by a $1.05 million federal appropriation to the U.S. Forest Service, an agency of the USDA. These funds will be allocated to four Auburn research teams led by faculty members: Dr. Sole Peresin, assistant professor of Forest Biomaterials; Dr. Tom Gallagher, the Regions Professor of Forest Operations; Dr. Brian Via, the Regions Professor of Forest Products and Dr. Yucheng Peng, assistant professor of Sustainable Packaging Systems. Each researcher will work with a Forest Service representative.

Dr. Graeme Lockaby, director of the Center for Environmental Studies at the Urban-Rural Interface (CESURI) and Clinton McClure, professor of forestry in the School of Forestry and Wildlife Sciences, said the idea began as they spoke to landowners who were facing the ravages of Hurricane Michael, a Category 5 tropical cyclone that in 2018 obliterated hundreds of millions of dollars' worth of timber in the Southeast.

Landowners had just 30 days to extract downed timber because the region's hot, wet climate leads to rapid decomposition. Lack of access to the wood for extraction exacerbated the dilemma. In addition, the immense volume of flattened timber in hurricane-impacted areas quickly saturates the market, resulting in dropping and often disappearing wood prices as mill quotas overflow.

When landowners asked for solutions, Lockaby reluctantly told the truth: "At this point, there's not very much you can do."

That led to discussions with Peresin, who saw potential for making commercially valuable products from partially decayed wood, and Gallagher, who envisioned developing a harvesting machine component capable of extracting fallen timber.

Lockaby said research often doesn't translate well to the people it will benefit the most. This case was an exception.

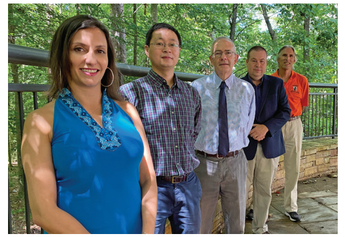
"Our work is technical, we're passionate about it, but it's difficult to understand if you're not trained in a specific discipline. Oftentimes people wonder, how relevant is that? Is it going to touch my life?" he said. "This will clearly touch people who live in those areas, especially forest landowners who depend on timber sales."

Hurricanes break off, tangle and lay down timber horizontally, Gallagher said, making harvesting difficult when using the equipment currently available. He is developing a new attachment that loggers could borrow — rather than buy — to make collecting the scattered timber easier.

Via is developing methods to use acoustics to measure timber strength and degradation of downed timber as a resource for making cross-laminated timber, or CLT — lumber glued together at 90 degrees into three or more layers.

"Stronger timber can be sent for use in structural applications like lumber and CLT, while partially degraded timber might be salvaged into other product areas," Via said.

Timber rated as "weak" or "degraded" by acoustics will be sent to develop other product streams such as wood composites, nanocellulose and wood plastic composites.



Pictured from left: Dr. Sole Peresin, Dr. Yucheng Peng, Dr. Graeme Lockaby, Dr. Brian Via and Dr. Tom Gallagher

Peng will use good-quality wood fibers from downed timber to develop bio-based composites for value-added applications in automobiles, construction and packaging.

"The goals are to maximize the utilization of our renewable natural resources for sustainability and to get the maximum return for the landowners, lowering their loss during natural disasters," Peng said.

Peresin will work with the USDA Forest Products Lab to process partially decayed timber into micro/nanomaterials, or CNMs, which will form the basis of an array of products that will allow harvested downed timber to penetrate large markets. Her team will also upscale CNM production and design bio-based carriers for pesticides and controlled-release nutrients for soil remediation.

"This is an opportunity for the Forest Products Development Center and the School of Forestry and Wildlife Sciences to offer innovative business opportunities to the forest industry in our region," said Peresin.

FROM WASTE TO WATER

Auburn researchers turning plant waste into water quality detection devices

by Mitch Emmons

Inside every plant and tree nature has hidden amazing fibrous building blocks called cellulose nanocrystals, and a team of Auburn researchers is turning them into microelectromechanical system (MEMS) sensors to help ensure that Alabamians have safe water.

The Alabama Department of Economic and Community Affairs (ADECA) has awarded a grant to support this research aimed at producing MEMS sensors that can be used in detection devices to ensure the safety of water resources such as lakes and individual wells. Specifically, the research targets developing MEMS sensors to detect the presence of antibiotics and pesticides in Alabama water sources.

MEMS manufacturing to date has required large, multi-million-dollar production facilities — that is until the Auburn team recently proved these micro miracles can be fabricated using readily available waste materials from the forest and agriculture industries. Moreover, they can be produced significantly more economically and in a more environmentally friendly way than is possible using current large-scale manufacturing processes.

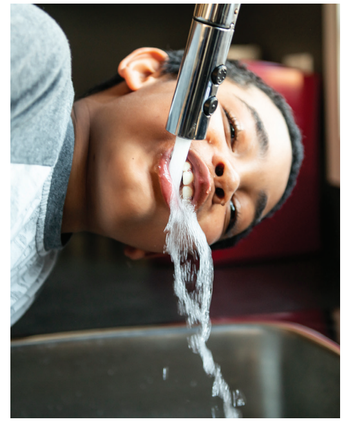
This "Cellulose MEMS" biosensor development program is conducted by Dr. Virginia Davis, Alumni Professor, and Dr. Robert Ashurst, the Uthlaut Family Associate Professor from the Department of Chemical Engineering in the Samuel Ginn College of Engineering, and Dr. Soledad Peresin, assistant professor of forest biomaterials in the School of Forestry and Wildlife Sciences.

There are two major types of sensors the team believes can be improved using the cellulose nanocrystals. First, that cellulose nanocrystals can be used to improve the sensitivity of a technique called ELISA — one of the most common sensing methods used by doctors and environmental researchers.

In previous work, Peresin and her colleague, Assistant Professor Dr. Sarah Zohdy, showed that cellulose materials can enhance the sensitivity of ELISA for detecting malaria biomarkers. However, since ELISA requires expensive equipment and sending samples to a lab, the team is also looking at a second area: MEMS which promise faster and more portable sensing.

MEMS devices have not been that widely used in sensors because of the associated manufacturing complexities, according to Davis. However, the team has proven that these cellulose nanocrystals can be used to economically produce MEMS, thus making MEMS more readily available and practical for sensor applications.

MEMS production technology, or microfabrication, uses the same technology to produce integrated circuits from silicon, Davis explains.



"This technology revolutionized circuit miniaturization, allowing powerful computers to shrink from the size of a room half a century ago, to the smart phones that we carry in our pockets today," Davis said. "But silicon MEMS fabrication processes are expensive, energy intensive — reaching temperatures of approximately 1000º C, and utilize hazardous chemicals — such as hydrofluoric acid.

"One of the really awesome things about using the nanocrystals for sensors is that they can simply be painted onto a surface and then fabricated into devices using a relatively easy process," Davis said. "It does not have to be done in a large-scale, major manufacturing environment like is needed for silicon. We have proven that our devices can be made very quickly and in a very small lab setting. This makes it an excellent opportunity for small business to become a player in the growing MEMS manufacturing industry."

Davis and her research collaborators are rising to meet the challenge of developing better sensor technologies — ones that are more affordable, more energy efficient and more environmentally friendly and — more tailored to meet specific detection needs. Their work has progressed through numerous stages of proof and development and has prior funding to explore a variety of potential applications, including cancer detection.

Their initial funding from the National Science Foundation resulted in two patents which are available for licensing through the university's Office of Innovation Advancement and Commercialization (IAC). The IAC assisted in pursuing the ADECA funding to study water sensors as well as Auburn LAUNCH Research and Innovation funding to progress the MEMS technology. The team has also received funding from Auburn's intramural grants program and Auburn University Research Initiative in Cancer.

Although their work in the cancer detection arena continues, the team's newest research is focused on the MEMS biosensors.

"We are really excited to receive this new funding from the state so we can use resources that are abundant in Alabama to develop better devices for the detection of antibiotics and pesticides in water," Davis said. "These are two significant concerns in the state of Alabama. These potential contaminants in water sources are simply a result of our modern life. A reliable, rapid, easy-to-use and economical detection system is a real need that we are excited to try to meet."

HINTON PART OF GRANT TEAM USING TELEPRACTICE TO SUPPORT EARLY INTERVENTIONS

by George Littleton

An Auburn University College of Education faculty member is leading a team to use telepractice and routines-based home visits to help families served through Alabama's Early Intervention System care for their children with developmental delays.

The award, sponsored by the Alabama Department of Early Childhood Education, investigates the implementation of routines-based home visits using telepractice to implement early intervention services when barriers, including COVID-19, prevent families from participating in home visits. The grant also supports fidelity checks and coaching through telepractice, and supplements service delivery through e-learning.

The grant began prior to the COVID-19 pandemic, but the need for remote instruction caused by the disease outbreak put an unanticipated emphasis on the need for telepractice.

Dr. Vanessa Hinton, associate clinical professor and coordinator for the college's special education distance master's degree program, has extensive experience in delivering remote instruction or distance education. Her role in the grant is to train practitioners in how best to use distance education to help their clients. Hinton has been working with the Alabama Department of Rehabilitation Services (ADRS), which is the lead agency for early intervention, on various projects promoting evidence-based practices over the past few years.

"We had been working on this for about a year and, of course, had no idea the pandemic was coming," Hinton said. "But I work in distance learning for our Department of Special Education, Rehabilitation, and Counseling, and through my partnership with the Alabama Early Intervention System, we were already discussing telepractice as a way of helping providers. I am basically instituting an established model or practice, but using my experience in distance learning to make it work. It is a collaborative effort."

Hinton explained that few investigators at the university focus on the importance of early intervention for children with developmental disabilities such as autism spectrum disorder or cerebral palsy. Early intervention is for families of children with disabilities from birth through age 2, and it can involve child care but it is not preschool.

Instead, it focuses on services provided to caregivers in a child's natural environment that empower caregivers to be the first and best teachers of their child. ADRS is the lead agency for the Alabama Early Intervention System, and it collaborates with the Office of School Readiness.

Dianna Tullier, an Auburn early childhood special education graduate and the director of First Teacher Home Visiting in the Department of Early Childhood Education, helped write an $11 million Preschool Development Birth to 5 grant for the state, funded through the federal Department of Health and Human Services. The telepractice portion is one of many grant-funded projects.

"What I do is locate early intervention agencies that have been trained in the Routines-Based Home Visiting Model developed by Dr. Robin McWilliam from the University of Alabama," Hinton explained. "This is the model that has been adopted by the Alabama Early Intervention System, and the model uses the in-home routines of the family. Using existing routines of the family, you support the caregiver in embedding strategies and interventions for the child. The intervention is performed by the caregiver. Too often professionals come in and tell the caregiver what to do and leave, but with this model we support them and help them build capacity. This derives from the adult learning theory because the caregiver and interventionist partner together. It must be done in a way that the interventionist is not coming off as an outside 'expert.' We may be experts in special education or therapy, but the caregiver is the expert about the child, how the child lives his or her life and what the child needs to accomplish daily living. Routines-based home visits require role release. The family member is in charge. You are there to support the caregiver, and in this phase of the grant that support is being offered through telepractice."

Telepractice is simply the application of telecommunications technology to deliver information, guidance and support — in this case, providing early intervention services to support the caregiver and child.

Meanwhile, as opposed to in-home visits, Hinton's role is to coordinate the telepractice aspect of the routines, instead of teach the routines. She helps professionals understand how best to use distance technology to help the caregivers at home.

"Telepractice and early intervention pair well together," Hinton said. "Because early intervention is a family consultation model, we do not feel the early intervention provider has to be directly in the home to help caregivers with their day-to-day routines. In the first part of the routines-based visit, the family sets the agenda. The family knows its routines and what they want to work on. So you are pairing a service with a family's routines. The professional must stay true to the model by letting the family lead the visits. Utilizing telepractice technology will allow us the opportunity to do this while maintaining a critical level of fidelity."

"These children are often frail and at-risk," she concluded. "So the original intent of the grant was given an even greater emphasis because of the virus outbreak. It's new, it's wide open and it is timelier than imagined because of COVID-19."

INNOVATION & RESEARCH COMMONS OPENS AT RBD LIBRARY

By Jayson Hill

Auburn University researchers have been asking for a dedicated research commons. Now they have one. The Auburn University Libraries used the COVID-19 campus closure to finish work on the newest addition to its services: the Innovation & Research Commons (I&RC). Located on the first floor of RBD Library, the I&RC offers a makerspace as well as physical spaces for interdisciplinary research activities and discussions.

The I&RC is a place for turning ideas into reality. Its purpose is to help faculty and students find new ways to incorporate digital and analog technologies into their classroom and research projects. It is also designed to serve as a campus-wide incubator for interdisciplinary research ideas and projects.

The I&RC makerspace offers 3D printers and 3D scanners for additive manufacturing, electronics, a laser cutter, sewing machines, a tabletop letterpress book press, virtual and augmented reality equipment for course development and virtual instruction, an audio editing studio, and large-format printers and scanners.

The I&RC also includes an Adobe Creative Cloud open learning space; a data services and visualization hub — the DataSpace — to help researchers organize their datasets, troubleshoot their computational workflows and comply with data-management requirements from federal and private funders; and a large, interactive digital display — the Liquid Galaxy — that provides a platform for 3D geospatial visualizations, panoramic images, exhibits, videos and tours in a shared immersive environment.

The I&RC is currently open. Library users may contact the I&RC staff or their liaison librarians to arrange an orientation tour.

CADC FACULTY AND STUDENTS CREATE AU-MED PAK

by Kelley Young

Over the course of several trips to Haiti, Dr. Scott Kramer, Atlanta Auburn BSCI Alumni Endowed Professor in Auburn's McWhorter School of Building Science, repeatedly encountered a challenging problem. Local medical missionaries shared their frustrations in trying to reach underserved communities in mountainous, rural and other inaccessible areas while carrying the supplies they needed to diagnose and treat the people there. Together, Kramer and his colleague Randy Bartlett, Bauhaus Endowed Professor of industrial design in the School of Industrial and Graphic Design (SIGD), developed an idea: The AU Diagnostic Medical Lab-in-a-Backpack, or AU Med-Pak for short.

> **"The internal components can be customized for work with different locations and diseases."**
>
> *– Randy Bartlett*

prototype fabrication facility manager David Gowan, took four prototypes to Haiti to test and receive feedback from medical professionals in the field. The best features of each design were identified and then incorporated into a more refined version of the backpack.

"We developed the AU Med-Pak from an industrial design viewpoint," Bartlett said, "keeping the end user in mind. The students' designs were heavily based on human factors, on what the medical missionaries need and want in a medical backpack."

The College of Architecture, Design and Construction (CADC) presented the project during the February 2020 Auburn Tiger Giving Day, raising the funding needed to create 12 backpacks for the purposes of further field testing. Before the impact of the COVID-19 virus took effect, Kramer was able to distribute five of the resulting prototypes to professionals in Kenya, Uganda, Jamaica and Bolivia who have been testing the usefulness and durability of the product, which currently holds a United States provisional patent.

As the pandemic changes the landscape of health care across the globe, Kramer and Bartlett are considering the development of a version of the AU Med-Pak specifically for use in underserved rural areas of the United States. They are also investigating ways to outfit the backpack with COVID-19 testing capabilities.

"The backpack is designed with modular components," Bartlett said. "The internal components can be customized for work with different locations and diseases."

Based on the success of his partnership with Bartlett and the strength of the students' design work, Kramer says this is just the beginning for the AU Med-Pak. "We will analyze data from users, clean up the ergonomics and go on to the next iteration."

PROTECTING OUR LANDSCAPE FOR THE FUTURE

by Mitch Emmons

The widespread destruction left by Hurricane Michael in 2018 significantly changed the middle region of the Florida Panhandle, and it spurred an Auburn researcher to extensively study the effects of the altered landscape and develop management tools to help preserve and protect the area's future water quality and aesthetics.

Dr. Chris Anderson, an associate professor of wetland ecology in the School of Forestry and Wildlife Sciences, leads a team of other Auburn scientists and colleagues from the University of South Alabama and the University of Georgia in a multi-year study of the watersheds along the Gulf Coast from Alabama, across Florida's Panhandle and into Georgia.

The multi-disciplinary team represents a combination of ecological, climate and hydrological scientists working with social scientists to understand how future stakeholder land decisions may contribute to changes in land use and eventually to coastal water quality. Focusing on watershed drainages from Perdido Bay in Alabama, to St. Andrews Bay in Florida, the project is extensive in its scope.

"We targeted this region because it affects parts of Alabama, Florida and Georgia," Anderson said. "We are looking at drainages that include much of the coastal counties of Alabama and west-Florida where large-scale land use changes are occurring and where events have happened to reduce forest cover in the region. All of this can eventually affect the coastal water quality in an area that is known for its clean, beautiful beaches and healthy bays. The primary goal of our project is to determine future land use trends and utilize existing models to predict and identify threats to coastal water quality. This project will ultimately generate information that can be used to plan, protect and preserve these coastal gems."

The designated study area, though there are some urban centers along the coast, has historically been heavily rural and forested, Anderson said. This project seeks to understand how climate and various socio-economic factors may change forest landowner decisions and ultimately reduce forest cover along the Gulf of Mexico.

Pictured from left: Dr. Latif Kalin, Dr. Wayde Morse and Dr. Christopher Anderson

"Using 10 regional watersheds along the northern Gulf of Mexico, we seek to understand the extent of future forest loss and how it may alter drainage patterns and water quality to estuaries and their associated communities along the coast," Anderson said.

The project is funded by a National Academy of Sciences, Engineering and Medicine grant through their Gulf Research-Healthy Ecosystems Program. Anderson is joined in this project by fellow Auburn researchers Dr. Kelly Dunning, Dr. Latif Kalin, Dr. Wayde Morse, Dr. Richard Hall and Dr. Sanjiv Kumar; University of South Alabama researcher Dr. John Lehrter; and Dr. Puneet Dwivedi of the University of Georgia. The study is intended to produce an extensive planning and analysis tool that will be developed in partnership with various state and local government planners, the forest and agriculture industry and others involved and interested in preserving the water quality of the region.

CONQUERING A CRISIS

When the COVID-19 pandemic struck in the spring, Auburn researchers adapted to the rapidly changing research environment, utilizing best practices in safety procedures to carry on with essential research programs.

Auburn design adapts CPAP machines into emergency ventilators

By Jeremy Henderson

In April a team of Auburn engineers developed a way to quickly and inexpensively convert CPAP machines into ventilators, one of the most important tools hospitals have for helping COVID-19 patients.

Continuous positive airway pressure (CPAP), machines are commonly used to help people with obstructive sleep apnea breathe more easily during sleep. The Auburn design, called RE-InVENT, is an accessory that safely repurposes a CPAP into a functional ventilator.

In the early stages of the COVID-19 pandemic, ventilators were in short supply at hospitals across the nation as the number of patients requiring respiratory assistance increased.

Dr. Tom Burch and Dr. Michael Zabala, faculty in the Samuel Ginn College of Engineering's Department of Mechanical Engineering, and Hayden Burch, a sophomore in mechanical engineering, initiated the project. Additional engineering faculty and alumni helped refine the mechanical design, control system, user interface and alarms. Critical respiratory care medical professionals contributed to the design of RE-InVENT.

Successful tests with live animals were followed by production of the machines through a partnership with Huntsville-based IS4S, an integrated systems solutions company. The emergency ventilators were distributed to several medical facilities across the country.

Auburn Engineering faculty collaborate on COVID-19 sensing device

by Cassie Montgomery

Researchers in the Auburn Samuel Ginn College of Engineering received a $200,000 grant from the National Science Foundation to develop a biosensor that will rapidly detect COVID-19.

COVID-19 belongs to a family of similar viruses known as beta coronaviruses. There have been two other such viruses that have emerged over the past two decades — Middle East respiratory syndrome (MERS), and severe acute respiratory syndrome, commonly referred to as SARS.

"The academic research community is working rapidly to reduce the impact that this pandemic has on our daily way of life."

- Dr. Robert Pantazes

"There are similarities between the viruses that cause MERS, SARS and COVID-19 to the point where the name of the current virus is SARS-CoV-2," said Dr. Robert Pantazes, assistant professor in the Department of Chemical Engineering and the principal investigator on the project. "What we're doing is using computational tools and experimental methods to try to take advantage of all the resources that were already in existence for these other coronaviruses and convert them into tools that will work with COVID-19 and potential future coronavirus outbreaks."

The research project, "Antibody-Based Nanoplasmonic Barcode Biosensors for COVID-19 Detection," is led by Pantazes in collaboration with Dr. Pengyu Chen, assistant professor in the Auburn Department of Mechanical Engineering and Dr. Jennifer Maynard, the Henry Beckman Professor of Chemical Engineering at the University of Texas.

Specifically, the team of researchers is developing an inexpensive, near-real-time, point-of-care diagnostic device that would meet the need to more quickly, and more conveniently, diagnose COVID-19 and understand its spread.

With the biosensor resembling a test strip in the device, test samples would be mixed with antibody modified nanoparticles and placed onto the absorbent end of the strip. If there is COVID-19 present, the nanoparticles would stick to the strip and change the color of the test line.

"My lab has a long history in developing nanomaterial-based biosensors for immune detection," said Chen, a co-investigator on the project. "This biosensor design originated from a barcode sensor for detecting immune proteins in mixtures of human fluids and can be applied to saliva and throat swabs."

The team plans to screen and select optimized antibodies that can target the spike protein on the surface membrane of the virus. They will then attach the antibodies to a glass surface in a barcode pattern to capture the virus.

"We will flow in complementary antibodies attached to signaling nanoparticles that can attach to the captured virus to form a so-called 'sandwich' structure," Chen said. "These nanoparticles can emit strong scattering light with specific color and can be visualized under a microscope or even by human eyes. So if we have a positive response, we will observe a brightened barcode or colored test strip."

The team is progressing toward a proof-of-concept device that can be used for lab testing to be followed by a prototype of an integrated test strip that could be potentially used at home or in clinics.

"The academic research community is working rapidly to reduce the impact that this pandemic has on our daily way of life," Pantazes said.

Auburn faculty evaluate COVID-19 public health order compliance

by Cassie Montgomery

Two faculty members in the Auburn Samuel Ginn College of Engineering were awarded a $145,000 National Science Foundation grant to evaluate the public's compliance with public health orders related to the COVID-19 pandemic by looking at social media behavior.

The effectiveness of these orders at slowing the spread of the virus is still being evaluated and largely depends on how the public responds to them. The faculty are using this data to create a simulation to help policymakers improve mitigation strategies in the future.

The research project, "Quantifying Social Media Data for Improved Modeling of Mitigation Strategies for the COVID-19 Pandemic," is led by Assistant Professor Dr. Konstantinos Mykoniatis and Dr. Alice Smith, the Joe W. Forehand/Accenture Professor, both in the Department of Industrial and Systems Engineering. The two are collaborating with Dr. Anastasia Angelopoulou, assistant professor of computer science at Columbus State University, to collect social media data, analyze the data to identify patterns and build a simulation model to evaluate the effectiveness of different mitigation strategies.

"The majority of mitigation strategies and policies are based on assumptions and how well a model can predict a specific situation depends on those assumptions," said Mykoniatis, the principal investigator on the project. "Most of these models have very oversimplified assumptions — namely that all people will follow a specific engagement strategy or public health order. We thought that, by studying the human behavior exhibited on social media, we could get a more accurate representation of how willing people are to follow these strategies and comply with these orders."

By collecting social media posts related to certain keywords such as "COVID-19," "coronavirus" or "pandemic," the researchers aimed to group the data by like characteristics, including demographics and geographic location. Understanding correlations between an individual's identifying characteristics and the degree to which like-minded people comply or resist shelter-in-place orders can help policymakers shape messaging to counteract potential resistance.

"We're going to concentrate on Twitter to try to build relationships about different clusters of people and their reactions to public health recommendations that might lead them to a certain degree of compliance or active resistance," said Smith, the project's co-principal investigator. "We're going to see what we can find out about the differences that can be used in models to ascertain the relative success or failure (noncompliance) of certain mitigations that could be proposed and understand for a given grouping of people or community of people that certain strategies are going to be preferred over others and why."

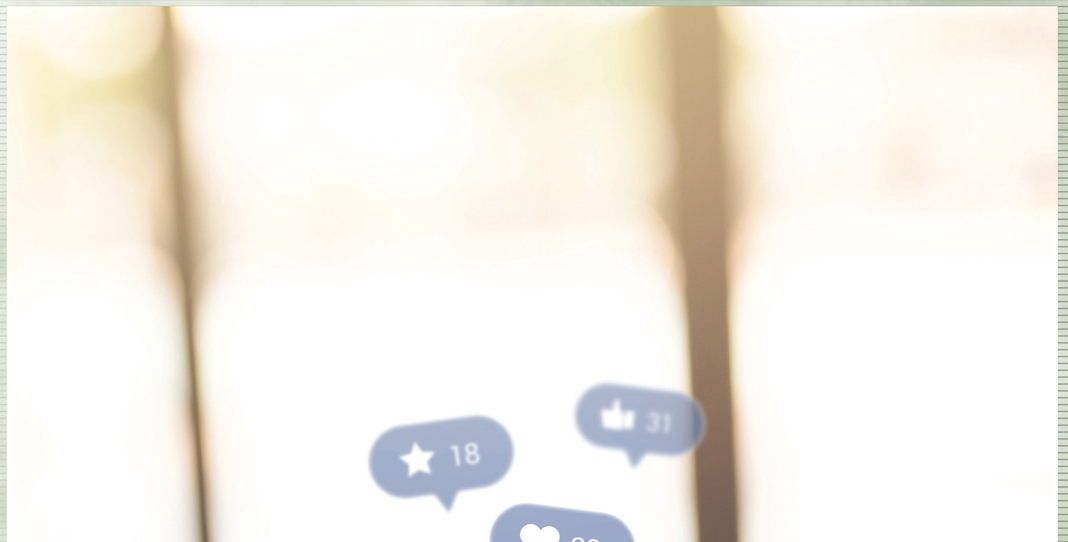
The team is also evaluating the role that rumors and false information about the coronavirus pandemic have played in determining the effects of compliance behavior.

Once the raw data is collected, Smith will analyze and cluster the data using unsupervised machine learning techniques. Mykoniatis will then use the findings to build a hybrid dynamic simulation model that can be used to evaluate the effectiveness of future messaging campaigns. The results will be made available to the public when the project ends in 2022.

Dr. Konstantinos Mykoniatis

Dr. Alice Smith

"With this simulation approach, we're considering how these groups of like-minded individuals behave and react to certain strategies and how likely they are to follow these types of orders going forward," Mykoniatis said.



Auburn researchers approach possible coronavirus vaccines from multiple angles

by Jayne Hart, Mitch Emmons and Mike Jernigan

Auburn College of Veterinary Medicine assistant professor Dr. Constantinos Kyriakis began work in the spring to test new vaccine candidates that could offer protection against COVID-19 and help prevent the spread of the novel coronavirus.

Working with Dr. Ted Ross, director of the Center for Vaccines and Immunology at the University of Georgia, Kyriakis conducted animal trials to investigate the immunogenicity of different vaccine doses and adjuvant combinations against SARS-CoV-2, the virus which causes COVID-19. Ross' research team is designing and generating multiple vaccine candidates as part of global efforts to combat SARS-CoV-2 that has infected more than 30 million people worldwide.

Kyriakis and a team of Auburn veterinary medicine researchers are testing the vaccine candidate's ability to trigger an immune response

in swine, when used alone or in combination with other ingredients. These additional ingredients, called adjuvants, are often used in vaccines to help the body create a greater immune response. Identifying the correct combination is vital to the effectiveness of any vaccine.

CytoViva Inc., a subsidiary company of the Auburn Research Park-based firm Aetos Technologies Inc. — and the registered name for patented microscope technology developed by Dr. Vitaly Vodyanoy of Auburn's College of Veterinary Medicine — partnered with Dr. Joanna Sztuba-Solinska, an assistant professor of biological sciences in the College of Sciences and Mathematics, to aid in her research efforts.

A molecular virologist, Sztuba-Solinska has focused her research on the herpesviruses, but with the current COVID-19 pandemic, she has begun to expand her research focus to studying SARS CoV-2, the virus that causes the COVID-19 disease.

"This is a dramatically different type of virus," she said. "I study Kaposi's sarcoma-associated herpesvirus, which is a DNA virus that as most herpesviruses, coevolved with the human population for a very long time, thus, it is much less virulent.

"SARS CoV-2 is a newly emerged virus with probably the largest RNA genome, and the unique capacity of proofreading its mistakes — which you usually don't see with RNA viruses. However, because it's an RNA virus it has more so to speak evolutionary flexibility, meaning, it can undergo mutations, and go from animal reservoir to, unfortunately, human reservoir. Also, because it is a newly emerged virus, it has a much greater virulence, that is, the capacity to cause the disease or even death."

While Sztuba-Solinska says she is optimistic that efforts underway to produce an effective COVID-19 vaccine will be successful, the process takes many months to develop, test and confirm the effectiveness and human safety of a new vaccine.

Meanwhile, her immediate research in the area of coronaviruses and COVID-19 is focused on working collaboratively with researchers in the Samuel Ginn College of Engineering on polymers to be used in antimicrobial materials for protective face masks, and in determining if the differences in types of coronaviruses can be detected visually by observing changes in their spectra.

Dr. Constantinos Kyriakis

Dr. Joanna Sztuba-Solinska

Dr. Vitaly Vodyanoy

Dr. Bruce Smith

Researchers from the Auburn University College of Veterinary Medicine are partnering with Humane Genomics Inc. to develop a potential vaccine for the COVID-19 virus currently at the heart of the ongoing global pandemic.

According to Dr. Bruce Smith, director of the Auburn University Research Initiative in Cancer, professor in the Department of Pathobiology and scientist in the college's Scott-Ritchey Research Center, the collaboration between Auburn and Humane Genomics is an outgrowth of cooperation between the two in the field of cancer research. Much of the science used in this particular vaccine development is adapted from the company's cutting-edge research into precision virus-based cancer therapies.

"We had previously worked with Humane Genomics in the area of cancer treatment," Smith said, "specifically an attempt to custom synthesize viruses to target tumors. The same basic concept can also be used to develop a vaccine. All that is necessary is to have the virus' genome — a genetic map of its DNA — to create a vaccine to target it."

The COVID-19 genome is available, so the custom development of a vaccine tailored to its specific vulnerabilities, a so-called "synthetic vectored vaccine," was a relatively rapid process. In this case, that process involved genetically synthesizing via computer modeling a harmless virus called vesicular stomatitis virus, or VSV, and giving it the same "spike" protein characteristic of COVID-19. This spike protein binds with so-called ACE2 receptors on human lung cells to allow the harmful virus to infect them. But if the vaccine functions as hoped, the immune system would be triggered to produce antibodies to recognize this spike protein and block infection, but in a harmless virus. That same triggered immune reaction — in theory — would then protect against COVID-19.

"The idea of developing vectored vaccines by 'cutting and pasting' virus DNA to alter its characteristics is a proven method of vaccine development and has been in use for more than a decade."

- Dr. Bruce Smith

"The idea of developing vectored vaccines by 'cutting and pasting' virus DNA to alter its characteristics is a proven method of vaccine development and has been in use for more than a decade," Smith said. "In the case of animals, vectored vaccines have been successfully developed for rabies and fowl pox. In human medicine, a vaccine approved in 2019 for the deadly Ebola virus was developed using the same technique.

"What makes the Humane Genomics approach unusual," added Smith, "is that they are skipping the traditional cutting and pasting process of removing and substituting DNA and instead synthesizing their targeted viruses using computer modeling. It allows for a much quicker process. If they have the target's genome, they can develop a vaccine in about a week."

It is the testing phase that takes time, and currently the company's COVID-19 vaccine is in the safety testing phase, which is where Auburn's contribution comes in. The Auburn College of Veterinary Medicine is testing the vaccine on rats to see if they develop the proper antibodies or become ill due to unforeseen side effects. Later, another vaccine partner will perform similar tests with guinea pigs, and if all goes well, the vaccine can then move on to human testing.

Smith says that, while he is cautiously optimistic a working vaccine will eventually be developed, there is still a long road ahead despite the urgent need.

"With a tremendous amount of luck, we could have a vaccine by the end of the year," he said, "but more likely, we won't know for sure if a vaccine is going to be successful until sometime in 2021."

PRESSURE ON TO SOLVE HYPERTENSION MYSTERY

by Mike Jernigan

If there is one thing that gets Dr. Vinicia Biancardi's blood pressure up, it is pondering the many mysteries surrounding hypertension and its causes.

A medical condition that affects a third of the adult U.S. population, hypertension, or high blood pressure, can lead to severe health problems if left untreated. These include significantly increasing the risk of stroke as well as occurrences of numerous heart and kidney diseases.

For such a common condition, however, the causes of hypertension remain something of a mystery in most cases. In some patients, the problem has a known origin, usually a secondary medical issue that is the root cause. Appropriately enough, these cases are known as "secondary hypertension." But in the majority of cases (more than 90%), the source of the problem is unknown. Occurrences of this type are called "essential hypertension," and it is these cases that cause Biancardi — an assistant professor in the Auburn University College of Veterinary Medicine's Department of Anatomy, Physiology and Pharmacology — to feel her own pulse quicken.

"A large number of patients within the essential hypertension group do not respond appropriately to currently available medications," Biancardi said. "Traditional treatment involves the use of monotherapy (one drug), or an association of different classes of medication, as needed, in an attempt to control blood pressure levels. These are things like diuretics, beta-blockers, ACE inhibitors, etc. In half of the patients in the essential hypertension group, the jump from monotherapy to multiple classes of drugs will allow the treatment to work for a short time, bringing blood pressure levels down.

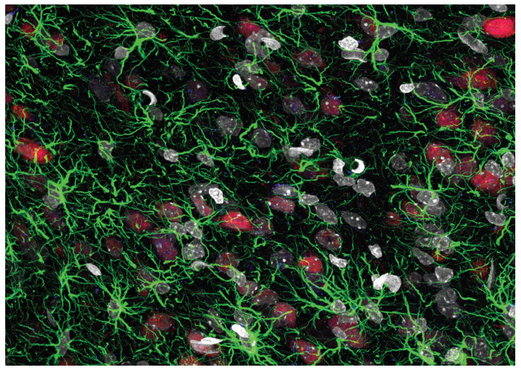
"However," she adds, "this anti-hypertensive effect fades with long-term treatment. This is where our interests lie. The pathophysiology of this type of hypertension is still unclear. Despite the variety in classes of medications available, the fact that patients remain hypertensive tells us we are missing something critical. By better understanding the mechanisms at play, we can hopefully identify new targets for future medications."

These "mechanisms" are not what one might expect. While the average person likely thinks of hypertension as largely a cardiovascular issue, its real origins are much more complex and involve far more than just the heart and circulatory system.

"In those patients in which their blood pressure does not fall or, after some period of time, begins to increase again with traditional treatment, it appears the hypertension is driven by some abnormality within the central nervous system such that there is an increase in 'hypertensive' signals sent from the brain to the cardiovascular system. Based on this idea of hypertension originating within the central nervous system, we call this 'neurogenic hypertension,' and this is the form of hypertension I study."

Biancardi is particularly interested in the neurotransmitter Angiotensin II (AngII) and its role in interfering with the brain's instructions regulating routine body functions. Neurotransmitters are chemical substances that play a role as signaling devices to deliver those instructions from the brain, including to the cardiovascular system.

Normally AngII — produced by the circulatory system — is unable to penetrate the blood-brain barrier, a highly selective border of endothelial cells that prevents harmful substances in the blood from crossing into the brain. But in cases of neurogenic hypertension, Biancardi has found that AngII, which is produced in excess due to the disease, damages the blood-brain barrier in a manner that allows it to cross into the brain and affect the regions that control the cardiovascular function directly. Within the brain, excess AngII has inflammatory properties that change the normal pattern of instruction from the brain to the body, sending altered instructions to the cardiovascular system and contributing to neurogenic hypertension.



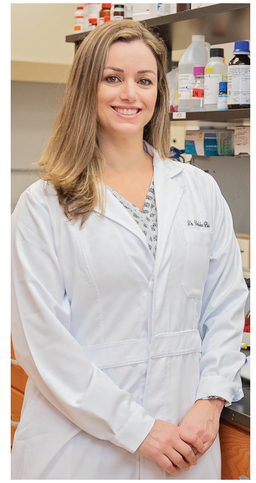
Fluorescent microscopy imaging is used to look at changes in specific proteins and the appearance/morphology of different cells. Briefly put, this particular one is a high-magnification (60x) image from the hypothalamus that's stained for astrocytes (green), neurons (red), Nrf2 (blue) and cell nuclei (white).

Penetration of AngII into the brain can also cause an increase in reactive oxygen species (ROS), a type of unstable molecule that contains oxygen and easily reacts with other molecules in a cell. An excess of ROS in cells can cause not only more inflammation, but in severe cases even damage to DNA, RNA and proteins, which can cause cell death.

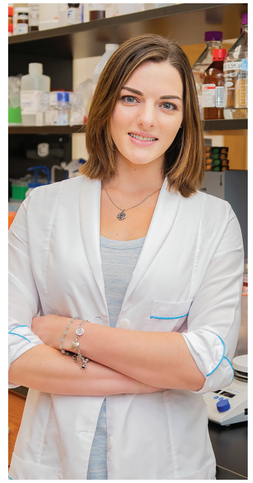
According to Biancardi, the body's normal response to oxidative stress would come in the form of antioxidant defenses, many of which are controlled by a protein in the body called Nrf2. Interestingly, Nrf2 is found in curcumin, or turmeric, a member of the ginger plant family and a widely used herbal supplement that can help reduce inflammation.

IN MORE THAN
90%
OF CASES
THE SOURCE OF HYPERTENSION IS UNKNOWN

Sarah Peade



Dr. Vinicia Biancardi



Francesca Mowry

Recent evidence points to failure of the Nrf2 response in hypertension. An imbalance between Nrf2-based antioxidant defenses and ROS production can cause oxidative stress and lead to further inflammation, which may allow for additional AngII to cross the blood-brain barrier, creating a perfect storm of worsening symptoms. Finding the reason or reasons for the failure of Nrf2 to respond to and combat ROS properly — and if there is a link between Nrf2 and AngII in neurogenic hypertension — is one of the research team's main goals.

If Biancardi and the Auburn team can solve that mystery, it could go a long way toward improved therapies for hypertension. And better treatments could potentially impact millions of people who are prone to one of America's most common and confounding health problems, as well as have possible applications to many other neuro-inflammatory diseases.

"Given the almost universal nature of brain inflammation across a wide spectrum of neurological diseases, we hope that a better understanding of these mechanisms will also have far-reaching impacts beyond hypertension," Biancardi notes. "While a true cure for hypertension is unlikely given our current knowledge, we do know that the key in mitigating the risks associated with the disease is managing blood pressure and bringing it down to normal levels. We are very hopeful that teasing apart the contribution of Nrf2 to the maintenance of neurogenic hypertension and better understanding the interactions between AngII and Nrf2 will allow us to possibly identify new treatments."

INITIATIVE BRINGS PHARMACOGENOMICS TO FOREFRONT

By Matt Crouch

Recognizing the importance of genomics in modern health care and a rise in precision medicine, the Auburn Harrison School of Pharmacy created the Center for Pharmacogenomics and Single-Cell Omics Initiative (AUPharmGx). One year later, the initiative — a first of its kind in the state of Alabama — is seeing early positive returns, placing Auburn at the forefront of the growing science.

AUPharmGx is built on advancing the study of pharmacogenomics, which is how genes affect a person's response to drugs. It combines the study of pharmacology, the science of drugs, with genomics, the study of genes and their functions, to understand the inter-individual variations in response to drug therapies, predict whether a medication will be effective for a particular person and help prevent adverse drug reactions.

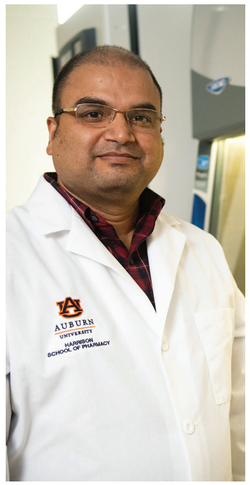
"Pharmacogenomics is the study of the contribution of genomics and of other 'omics,' such as epigenomics, transcriptomics, proteomics and many others to a patient's response to drugs," said Dr. Amit Kumar Mitra, director of AUPharmGx. "The ultimate goal is to individualize drug selection and drug use in order to maximize drug efficacy and to avoid adverse drug reactions."

By facilitating collaborative research and providing state-of-the-art technologies to generate omics data, as well as cutting-edge data analysis, AUPharmGx puts Auburn at the forefront of an increasingly important area of health care.

"This is the first-of-its-kind initiative in the state of Alabama, offering such a broad range of facilities under one roof aimed at pharmacogenomics research," Mitra said. "This core facility provides all the services required in a typical pharmacogenomics study from consultation to data analysis."

Mitra, an assistant professor in the Harrison School of Pharmacy's Department of Drug Discovery and Development, has more than 15 years of experience in pharmacogenomics, functional genomics, molecular biology and translational research, working with next-generation methodologies to generate omics data as well as the computational and bioinformatics skill sets to analyze big data.

Prior to coming to Auburn, he spent time as a research associate at the Institute of Human Genetics and research assistant professor with the University of Minnesota's Department of Genetics, Cell Biology and Development, as well as a senior scientist and technical lead of a multiple myeloma single-cell consortium in the pharmaceutical industry at the Celgene Corporation. Mitra has more than 60 peer-reviewed publications in internationally acclaimed scientific journals, a book chapter and two patents.



Dr. Amit Mitra, assistant professor in the Harrison School of Pharmacy's Department of Drug Discovery and Development, is also director of the Center for Pharmacogenomics and Single-Cell Omics Initiative or (AUPharmGx). The pharmacy school formed the center in 2019, recognizing the importance of genomics in modern health care and a rise in precision medicine.

Precision medicine, also referred to as personalized or individualized medicine, is a field of medicine that focuses on the development of effective, safe medications and doses that will be tailored to a person's genetic makeup. The goal is identifying the right drug at the right dose at the right time.

"This bench-to-bedside approach is increasingly being incorporated into mainstream clinical practice, thereby changing the way many diseases are identified, classified and treated," Mitra said. "From helping patients live longer and healthier lives to creating a better quality of life, precision medicine strategies are bringing great value not only to patients, but also to the health care system."

AUPharmGx helps researchers answer questions that lead to discovering novel biomarkers for disease and/or therapeutic efficacy, as well as advance our current knowledge of pharmacogenetics. Additionally, AUPharmGx also offers education and training on how to conduct proper pharmacogenomic research, including consultation on where and how to start specific projects, help in sample preparations, data generation using next-generation methods and also help in data analysis and interpretation.

The strategic investment by the Harrison School of Pharmacy, or HSOP, in AUPharmGx is providing early positive returns.

"As a health professions school with a strong commitment to advancing health and well-being in large part through pharmaceutical sciences-based research, AUPharmGx is designed to foster collaborative efforts between multidisciplinary health scientists and health care providers," said Dr. Tim Moore, HSOP's associate dean for research. "In less than one year of accepting projects, AUPharmGx has provided support for nearly a dozen separate research efforts, covering a wide spectrum of services, including RNA sequencing, gene expression analysis, Sanger DNA sequencing, whole-genome sequencing and microbiome analysis/metagenomics. These projects have also addressed a wide range of health issues such as Alzheimer's disease, neurotoxicity, cancers (including breast cancer), hypoxia and lung injury.

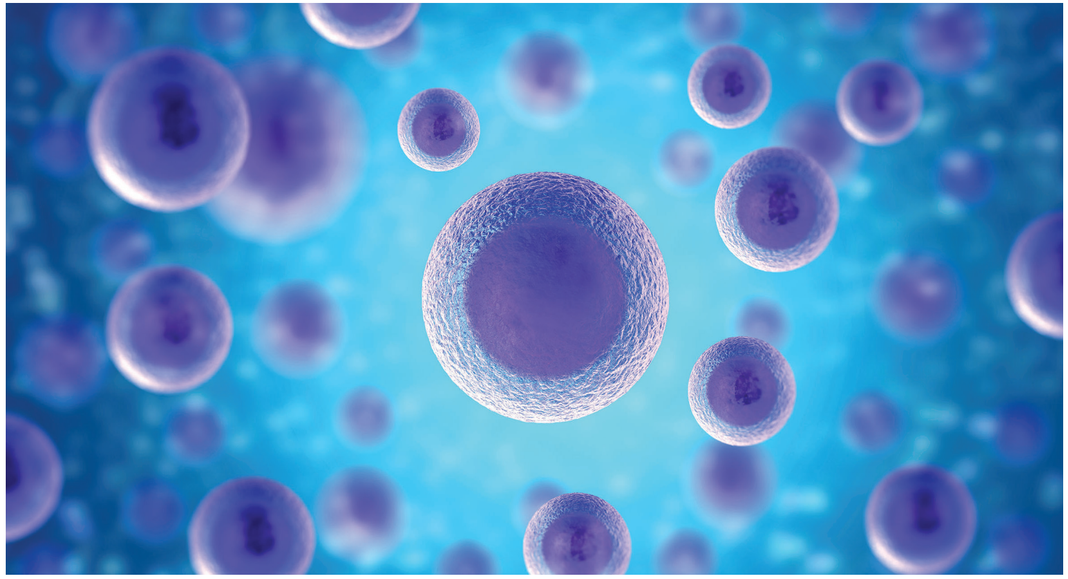
"We are also grateful for the university efforts to sustain research activities during the COVID-19 pandemic, and AUPharmGx is able to continue its work uninterrupted."

AUPharmGx is conveniently located within the Harrison School of Pharmacy's Walker Building along War Eagle Way and the Thach Concourse.

The center offers a variety of services and resources, including:

- Consultation for genomics, pharmacogenomics, epigenomics and metagenomics-based research study
- High quality nucleic acid (DNA/RNA) isolation
- DNA/RNA Quality Check (QC): quantitative and qualitative analysis
- Sanger DNA sequencing
- Next-generation sequencing: Gene expression (RNA sequencing) and DNA (whole genome and exome sequencing)
- Quantitative real-time PCR (qPCR) for mRNA/Gene expression
- Single-cell analysis
- Microbiome analysis/metagenomics
- MicroRNA analysis
- Targeted gene expression analysis
- Targeted SNP genotyping
- Cell line authentication
- Generate CRISPR-edited knockout cell pools
- Bioinformatics and data analysis
- Support for grant writing

To learn more about the Center for Pharmacogenomics and Single-Cell Omics Initiative, or schedule an appointment or consultation, email aupharmgx@auburn.edu and visit wp.auburn.edu/aupharmgx/.



RESEARCH INITIATIVE SEEKS TO END HEALTH DISPARITIES

by Charlotte Tuggle

The early months of 2020 were ravaged by disease and ignited racial injustice. But the link between the two runs deeper than face masks at protests. At the intersection of health and inequality, Auburn researchers work to inform, educate and end health disparities for disadvantaged communities.

By combining forces across campus, the interdisciplinary Health Disparities Research Initiative (HDRI), led by the Department of Human Development and Family Studies Associate Professor Dr. Thomas Fuller-Rowell in the College of Human Sciences, drives the development of health disparities research and instruction to implement positive, systemic change.

“Health disparities are insidious and harmful to society. Health disparities are also present to a disturbing degree in most societies around the world. Just as we need to be prepared to fight physical disease, we also — just as importantly — need to be ready to fight social and societal level ‘diseases’ like health disparities,” Fuller-Rowell said.

“If stark health disparities and their underlying causes are left unaddressed, perceptions of fairness are undermined, and social unrest in various forms is likely to ensue alongside economic stagnation. In our view, addressing health disparities should be an urgent item on the agenda of scientists, political leaders and society as a whole.”

The HDRI’s pillars of study are socioeconomic and racial health disparities. Socioeconomic health disparities spring from the level of income or education a person has, which will affect their health and longevity. Fuller-Rowell suggests that different types of socioeconomic disparities must be addressed in different ways.

“For instance, access to high quality education and safe neighborhood environments for children from less advantaged families are examples of things that can be addressed through policy,” Fuller-Rowell said.

“Other examples include elitist attitudes that influence our ideologies relating to social class and how we treat each other, as well as discrimination in the labor market relating to social class background. Each of these things can be addressed through policy or intervention and would be likely to have an impact on socioeconomic health disparities.”

One of the HDRI's latest projects is an examination of whether the COVID-19 pandemic has had a differential impact on the health of black and white undergraduate students. The project builds on an ongoing study of undergraduate students at Auburn, which had already assessed the health of 263 students prior to the start of the pandemic. The new assessment, which was carried out two months into the national shutdown, reassessed student mental and physical health and documents exposure to various stressors associated with the pandemic. Their results will provide insight into how the novel coronavirus has affected black and white students, in addition to the broader mechanisms of racial health disparities.

Fuller-Rowell said that given the centuries of oppression, marginalization and exclusion of Black Americans, combined with the well-documented racial disparities surrounding the pandemic, it is no surprise that there’s much more work to be done in our own country.

“Our work in health disparities research today is to understand how the poorer health outcomes of Black Americans are transmitted across generations in contemporary society, and to generate cutting edge science around the types of policies and interventions that can successfully eradicate these disparities."

Across campus, faculty members have made a commitment to engage together and move forward the goals of the HDRI. Professors from human sciences, nursing, pharmacy, veterinary medicine, psychology and more steer the interdisciplinary trajectory of the initiative. At the student level, graduate students and junior scholars are trained to become the next generation of health disparities researchers.

“The pressing nature and complexity of health disparities require fresh perspectives,” said Dr. Jennifer Kerpelman, associate dean for research, graduate studies and outreach in the College of Human Sciences. “Involvement of diverse students and junior scholars will foster innovative contributions to emerging research and outreach programs that offer real solutions and promote greater health equity.”

In addition to its collective body of research, the HDRI also facilitates grant proposals, distributes a triannual health disparities newsletter that highlights new developments in health disparities research and oversees the certificate in health equity science in the College of Human Sciences, which provides research training opportunities to both graduate and undergraduate students.

Fuller-Rowell said the HDRI’s work is an essential first step to ultimately end health disparities. Moving forward, he has plans to grow the HDRI’s efforts in research and instruction at Auburn and use their findings to enact change that will improve quality of life for all.

“Understanding the degree to which health disparities are present and how they emerge makes it possible to inform policy and programmatic changes to address them,” Fuller-Rowell said. “Without data to define the problem, the existence of disparities can be ignored or denied. High quality research shines a light on the issue and is an important component of any plan to address health inequality.”

SECURING OUR ELECTIONS

by Chris Anthony

As millions of Americans prepare to vote this election season, the security and integrity of our elections is a topic at the forefront of many people's minds.

Will there be voter fraud or voter suppression? Could hackers try to tamper with voter rolls or even votes? How will the COVID-19 pandemic affect my ability to vote?

As people ponder these questions, thousands of election managers across the United States are already grappling with these issues and many more. For these election officials, their roles have grown increasingly challenging over the years as election systems have become more complex and technology has become more widely used in elections and their management.

It's for that reason that a new interdisciplinary collaboration is combining two of Auburn University's greatest strengths in the interest of securing our elections.

The McCrary Institute for Cyber and Critical Infrastructure Security is teaming up with Auburn University's Election Administration Initiative, housed in the Department of Political Science, to integrate its cyber expertise into established certification and academic programs offered by Auburn.

"Having both the McCrary Institute and the Election Administration Initiative under one roof at Auburn University is absolutely exceptional. No other university has this combined level of expertise," said Dr. Kathleen Hale, professor of political science and the initiative's director.

Auburn has been a national leader in election administration for decades — the university has the nation's largest group of faculty in the field of political science and public administration that focus on election administration.

The university offers the only national certification program for election officials through its 25-year partnership with the Election Center – known more commonly as the National Association of Election Officials. In addition to the certification program, Auburn is also one of two universities that offer a graduate certificate in election administration, either as a stand-alone program like Auburn's or in conjunction with a Master of Public Administration program.

Given its focus and national prestige, partnering with the Election Administration Initiative was a natural fit for the McCrary Institute and its affiliated Center for Cyber and Homeland Security.

"They're doing amazing work already, and we at the McCrary Institute saw lots of opportunities to plug our work into theirs," McCrary Institute director Frank Cilluffo said. "We have had a number of conversations with government entities that are involved with this, including federal, state and local officials, who expressed real interest and excitement about our teams collaborating on these activities."

The Election Administration Initiative's work is largely focused on professionalizing the field of election administration and building capacity across state and local election offices. Its training covers everything from maintaining election systems to continuity of operations planning. With the McCrary Institute's help, the initiative hopes to layer in additional training on IT systems in election administration, election vulnerabilities and detecting and responding to cyber breaches.

These issues present challenges to election offices of all sizes and across all jurisdictions.

"Despite the differences in laws and institutions across the states and even within states, the problems are all exactly the same," said Dr. Mitchell Brown, professor of political science. "What this certification and this community of election officials offers is cross-fertilization of best practices and adapting other people's best practices to different contexts."

As the collaboration between the Election Administration Initiative and the McCrary Institute continues to unfold, aspirations include the development of a free-standing graduate certificate that focuses on cybersecurity in elections from a policy and governance perspective.

Some of that curriculum could potentially dovetail into the certification training offered through the Election Center.

"The exciting part of this partnership with the McCrary Institute and developing the synergy that comes from these two expert areas working together is that we will build new capacity for preparedness, build new capacity for continuity of operations as well as for administrative practices and for thinking about how people can vote safely and securely," Hale said.

> **"Having both the McCrary Institute and the Election Administration Initiative under one roof at Auburn University is absolutely exceptional. No other university has this combined level of expertise."**
>
> *– Dr. Kathleen Hale*

By adding additional curricula and training to address these evolving threats to our election systems, the Election Administration Initiative and the McCrary Institute are aiming to ensure the kind of elections that Americans expect — ones that are secure, transparent and where every vote is counted.

"We're talking about arming and educating our administrators with knowledge to better maintain the trust and efficacy of our election systems," Cilluffo said. "At the end of the day, our election systems are all about trust."

FACULTY ACHIEVEMENT **HIGHLIGHTS**

Dr. Gheni Platenburg, assistant professor of journalism in the School of Communication and Journalism, led an online workshop this summer for the Alabama Humanities Foundation as part of their series, "Humanities and the Future of Journalism in Rural Alabama." Platenburg presented on "Multimedia Approaches to Community Journalism." Her research interests include race and media, the Black press, Black identity, media portrayals and pop culture. Platenburg teaches multimedia journalism courses and advises the university's chapter of the Society of Professional Journalists.

Dr. Daniel Tauritz, an associate professor of computer science and software engineering in the Samuel Ginn College of Engineering, was named interim director of the Auburn Cyber Research Center, effective June 1. In this role, Tauritz leads more than a dozen faculty and staff affiliated with the center, which integrates cutting-edge engineering technology with research to develop innovative methods of protecting our nation's cybersecurity. The center's research has focused on four main thrusts: secure software engineering, cloud security and forensics, artificial intelligence (AI) for security and advanced manufacturing security.

Dr. Elizabeth Ann Benson, associate professor and music theatre singing specialist for the Department of Theatre, was selected to assistant-direct "Carousel" with director Kathleen Belcher (The Metropolitan Opera) in Hawaii in 2021. Out of an international pool of applicants, she is one of only three directing fellows in the Hawaii Performing Arts Festival (HPAF), and the only musical theatre directing fellow. Since 2014, Benson has served as music director and/or vocal director for 12 theatre productions at Auburn.

Dr. Kelly Dunning, assistant professor of conservation governance in the School of Forestry and Wildlife Sciences, was named one of 20 recipients of a National Academies of Sciences, Engineering, and Medicine 2020 Early-Career Research Fellowship. Each fellow receives a $76,000 award for research on Gulf Coast ecosystems. Dunning received her Ph.D. in natural resource management and planning policy from the Massachusetts Institute of Technology and serves as director of the Conservation Governance Lab at Auburn University.

Dr. John Beckmann, assistant professor in the College of Agriculture's Department of Entomology and Plant Pathology, has been awarded $868,145 by the Alabama Department of Economic and Community Affairs (ADECA) to develop a lightweight material that blocks mosquito bites while retaining coolness in hot weather. Beckmann holds bachelor's degrees in art and physiology, as well as a Ph.D. in entomology, from the University of Minnesota. He conducted postdoctoral research in molecular biophysics and biochemistry at Yale University.

Dr. Natalie Hohmann, assistant professor in the Harrison School of Pharmacy's Department of Pharmacy Practice, is researching the psychological factors that affect the decision to pursue genetic testing as part of a precision-medicine approach to health care. The project, "Psychosocial Factors Affecting Genetic Testing Decisions in Cancer," is funded by the Pharmaceutical Research and Manufacturers of America Foundation (PhRMA Foundation), with a $100,000 Research Starter Grant in Health Outcomes.

Dr. Dongye Zhao, the Auburn Alumni Engineering Council Professor in the Department of Civil Engineering, was awarded $193,960 by the Alabama Department of Economic and Community Affairs (ADECA) to develop a filtering process to remove perfluoroalkyl and polyfluoroalkyl substances from water and landfill runoff. The manmade substances are used in food packaging, stain repellants, cookware and firefighting foam, and do not readily break down.

Dr. David Paradice, Harbert Eminent Scholar in Business Analytics at the Harbert College of Business, has been named editor-in-chief of the academic journal Foundation and Trends in Information Systems. Paradice has published over 50 articles and book chapters on the use of information systems in support of managerial problem formulation and has been a department chair, senior associate dean, center director and teaching award winner. He has also served on several corporate advisory boards and worked as a consultant.

PLASMA PLANNING

Auburn physicist and associate dean participates on committee for the National Academies of Sciences, Engineering and Medicine's decadal assessment of plasma science

by Maria Gebhardt

Dr. Ed Thomas, Jr., earned his doctorate degree at Auburn and has spent more than two decades immersed in teaching, conducting research and engaging communities throughout the nation in outreach programs. In a process that lasted five years, Thomas oversaw the development and 2014 opening of Auburn's Magnet Laboratory, which features a one-of-a-kind, 6,000-pound superconducting magnet. As of 2019, he had led research activities exceeding more than $11 million in external funding.

With decades of experience, he is truly passionate about plasma science.

According to the National Academies of Sciences, Engineering and Medicine's (NASEM) decadal assessment, plasma research has helped make jet turbines, medical implants, lighting, solar cells, nanomaterials and even spacecraft possible. In the future, plasmas will help unlock improvements for our entire society, including medical breakthroughs, agricultural advancements and carbon-free electricity.

Thomas was selected to serve as a committee member for the decadal assessment of plasma science report Plasma Science: Enabling Technology, Sustainability, Security and Exploration (Plasma2020). The 18-member group worked to increase awareness about plasma science funding, workforce diversity and development, and guiding research principles.

"Participating in the Plasma2020 process was a very intense but ultimately extremely rewarding experience," Thomas said, noting that "the most enjoyable parts were the debates and discussions with my fellow committee members as we tried to create a roadmap for plasma science for the next decade."

The work by the committee directly impacts federal agencies, policymakers and academic institutions, and encourages collaboration among them. A virtual report briefing about this team of scientists was held in May 2020, which was livestreamed by more than 500 attendees. To watch the entire recorded presentation, visit vimeo.com/425254776.

Key findings and recommendations were presented in four major areas:

- Stewardship — advancing interdisciplinary research
- Education, workforce and diversity
- Research enterprise and international competitiveness
- Better serving the plasma science and engineering community

Thomas is the Charles W. Barkley Endowed Professor and associate dean for research and graduate studies in the College of Sciences and Mathematics (COSAM), a fellow of the American Physical Society and the director of the unique Magnetized Plasma Research Laboratory that studies the physics of dusty plasmas.

Thomas has dedicated his career at Auburn to helping shape the university's plasma program — gaining international recognition and a respected reputation in plasma research. Now, he is helping to impact the field of plasma science for future generations.

To download a copy of this entire report or learn more about NASEM, visit nas.edu/plasma.

Dr. Ed Thomas

NATIONAL SCIENCE FOUNDATION CAREER AWARD RECIPIENTS

The National Science Foundation's Faculty Early Career Development (CAREER) Program issues research funding "in support of early-career faculty who have the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization." During the 2019-2020 fiscal year, the following Auburn faculty members received this prestigious recognition.

DR. MAJID BEIDAGHI

Department of Mechanical Engineering

PROJECT TITLE

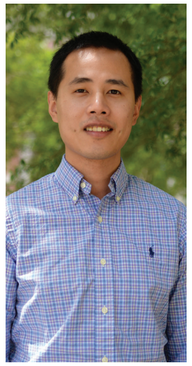
Cathode Materials for Aluminum Batteries: Understanding Factors Influencing Aluminum Ion Intercalation into MXenes

DR. DEBSWAPNA BHATTACHARYA

Department of Computer Science and Software Engineering

PROJECT TITLE

Bringing Models to Native: Open Access Bioinformatics for Protein Structure Refinement



DR. PENGYU CHEN

Department of Mechanical Engineering

PROJECT TITLE

Nano-Plasmon Ruler Imaging for Direct Visualization of How Cells "Talk"

DR. BYRON FARNUM

Department of Chemistry and Biochemistry

PROJECT TITLE

Multi-Electron Nickel Redox Cycles for Solar Energy Conversion and Storage

DR. EVANGELOS MILIORDOS

Department of Chemistry and Biochemistry

PROJECT TITLE

State-of-the-Art Quantum Calculations on a Novel Class of Super-Atoms: Discovering Exotic Chemical Bonding Schemes and Proposing New Two- and Three-Dimensional Materials

DR. NEHA POTNIS

Department of Entomology and Plant Pathology

PROJECT TITLE

Investigating the Mechanistic Basis of Host Adaptation in Close and Distant Relatives Within Xanthomonas Species Complex

DR. DAVID ROUECHE

Department of Civil Engineering

PROJECT TITLE

Theory-Guided Statistical Framework for Advancing Learning from Post-Windstorm Engineering Assessments

DR. DANIEL WARNER

Department of Biological Sciences

PROJECT TITLE

Testing Alternative Routes of Adaptive Phenotype-Environment Matching Across Heterogeneous Landscapes in Wild Populations

DR. MATTHEW WATERS

Department of Crop, Soil and Environmental Sciences

PROJECT TITLE

Identifying Primary and Secondary Drivers of Cyanotoxin Production Utilizing the Sediment Record and Paleolimnology

ESTIMATED

$6M

COMBINED VALUE

FOR THIS YEAR'S NSF CAREER AWARDS AT AUBURN

Steady Growth in Challenging Times

College of Agriculture fulfills role in food supply chain during COVID-19 pandemic

By Paul Hollis

As the specter of a worldwide pandemic continued to grow this past spring, so did the importance of the land-grant institution's role in providing an abundant and safe food supply to a nation and world in crisis.

In Auburn's College of Agriculture and Alabama Agricultural Experiment Station (AAES), faculty, staff and students recognized early on that their core mission must continue in the face of unprecedented challenges.

"We made the decision to keep all experimental operations going forward during the period of adjusted operation," said Dr. Paul Patterson, dean of the College of Agriculture and director of the AAES. "Failing to proceed with our experimental work would result in the loss of one year's worth of experimental data and a failure to perform on contracted research work."

"We are grateful to our faculty, staff, students and other personnel for their flexibility and creativity during this challenging time. It is truly a display of the Auburn spirit."

- Dr. Henry Fadamiro

Fortunately, critical research activities and agricultural operations were allowed under Alabama's initial "stay-at-home" order. Critical research includes sponsored research supported by a grant or contract, ongoing research that requires multiple years of data collection, or research with living organisms that require regular maintenance or care.

"The challenge of protecting our food systems and food supply chain are only more real during this difficult time, and we have not wavered in our efforts to address the needs of our stakeholders," said Dr. Henry Fadamiro, associate dean for research for the College of Agriculture and associate director of the AAES.

One core mission of a land-grant university and experiment station is to conduct cutting-edge research to provide solutions to grand challenges including food insecurity, human health and the environment, Fadamiro said.

"Researchers in our life science programs study living organisms such as plants, animal, microorganisms and cell lines in the laboratory and field. These living organisms do not take time off and require constant management.

"But we recognized the need to protect the health of our Auburn Family and the public, and we made some adjustments to our operations, including provisions for faculty, staff, graduate students and other research personnel to continue their research endeavors with minimal disruption," he said.

"They have come in at off-peak hours to collect data or maintain animals or plants and then go home and continue to work for the betterment of the citizens of Alabama and the country," Fadamiro said. "We are grateful to our faculty, staff, students and other personnel for their flexibility and creativity during this challenging time. It is truly a display of the Auburn spirit."

Experimental trials continue

For the 15 AAES research centers located strategically throughout the state, spring can be the busiest time of the year because that's when hundreds of field experiments are installed by research scientists.

The spring of 2020 was no different, except for the many extra precautions taken to ensure everyone's safety, said Greg Pate, director of research operations for the AAES.

"We performed all normal operations to install all of our experiments," Pate said. "We normally carry approximately between 700 and 800 trials across all of our centers including field crops, plant breeding, horticulture, beef cattle and biosystems engineering.

"During the initial stages of the pandemic, we limited interaction so that employees stayed on their respective units and maintained personal distances within units. Tours and station events such as grower meetings were canceled until further notice."

Pate said research centers have continued to work at normal capacity.

"College of Agriculture administrators meet with the research center directors via Zoom video conference biweekly to check on health status and needs," he said.

No disruptions in animal food chain

In the Department of Animal Sciences, faculty, staff and students made necessary transitions in the areas of animal care as well as animal harvest for those scheduled to enter the food chain, said Dr. Wayne Greene, professor and head of the department. "Our farm crews have worked tirelessly during this pandemic to ensure that they were cross-trained and had adequate student workers available, while maintaining social distancing to take care of our animals for teaching, research and Extension," Greene said.

approximately 700 – 800 trials across all of our AAES centers

The department continues to be AAALAC accredited and must follow the guidelines set forth by the organization for quality animal care, he said. AAALAC International is a private, nonprofit organization that promotes the humane treatment of animals in science through voluntary accreditation and assessment programs.

"As animals grow and reach maturity, they must continue entering the food chain, and our meats laboratory personnel have worked tirelessly while maintaining social distancing to make this part of our program continue uninterrupted," Greene said. "Our animal-related teaching laboratories have continued to operate by the use of video and other creative ways in the distance education protocols we have been experiencing during this pandemic."

Focus on poultry production chain

Ensuring a safe food supply requires that research activities be spread across the entire poultry production chain, from live animals through processing and finally to the consumer.

Dr. Ken Macklin, professor and Extension specialist in the poultry science department, has been conducting research with broilers to evaluate litter treatments over three trials on salmonella persistency within a poultry house over time. The third trial was conducted during the COVID-19 pandemic.

In addition, Macklin's research group also has been collaborating with Dr. Rishi Prasad, assistant professor and Extension specialist in the Department of Crop, Soil and Environmental Sciences, and USDA-ARS scientists on

Dr. Ken Macklin's research team

Dr. Dianna Bourassa

using gypsum mixed with pine shavings to assess the impact of litter quality in broiler production along with the nutritive value of the resulting litter.

Poultry scientists also continue research to gain a better understanding of coccidiosis — a sometimes deadly intestinal disease of chickens. Assistant Professor Dr. Ruediger Hauck has tested samples from a variety of poultry flocks for the presence of coccidiosis in intestinal tissue.

In addition, interactions between coccidiosis and bacteria were investigated to lay the groundwork for developing and evaluating pre-and probiotic feed additives to alleviate the damage done by the disease.

Assistant Professor and Extension Specialist Dr. Dianna Bourassa has been investigating the potential for the transmission of salmonella on dust generated from poultry litter. Identifying the level of risk associated with dust-borne salmonella will denote the importance of implementing strategies to minimize the presence of dust within chicken grow-out houses.

Bourassa's lab also is working to enhance food safety by improving the effectiveness of peroxyacetic acid for reducing the levels of campylobacter on raw chicken products. Campylobacter is the most common bacterial cause of diarrheal illness in the United States and is transmitted to humans from animals or animal products.

Fresh food production a priority

Despite the ongoing COVID-19 pandemic, the vital daily nutritional need of Alabamians for healthy and safe fresh fruits and vegetables has remained unchanged.

Undeterred by the crisis, Auburn horticulture researchers have carefully and painstakingly continued efforts to address the needs of Alabama's commercial fruit and vegetable industry.

"Our researchers evaluate everything from traditional crops and growing practices to new crops and state-of-the-art, cutting-edge technologies," said Dr. Desmond Layne, head and professor of the Department of Horticulture.

"Some of the numerous fruit, nut and vegetable crops that we are actively researching include apple, blackberry, blueberry, cantaloupe, citrus, grape (muscadine, bunch, wine), honeydew melon, kiwifruit, lettuce, peach, pear, pecan, strawberry, tomato, turmeric and watermelon," he said. Current research projects are determining climatic adaptability, pest/disease tolerance, flavor/nutritional quality, yield and potential for sustainable/organic production systems, Layne said.

"New, indoor aquaponics systems that combine the production of tilapia fish and lettuce, tomato, and other vegetables look at the combined production of both protein (fish) and vegetable for year-round food production," he said.

15 AAES research centers throughout the state

Auburn horticulturists, driven by the land-grant mission, are laser-focused on developing and improving resilient, intensive and safe local food production systems to benefit Alabamians during this pandemic and beyond.

Food crops sustain global population

Scientists in the Department of Crop, Soil and Environmental Sciences were able to continue conducting research in important food crops such as peanuts, corn, wheat and soybeans, all of which provide the proteins and carbohydrates necessary to feed and sustain a global population.

"One of the greatest sources of a plant-based protein is peanut, and in the College of Agriculture, peanut research includes breeding and genetics for improved cultivars and protection from pests such as insects, diseases and weeds, as well as soil fertility and plant nutrition," said Dr. John Beasley, head of the Department of Crop, Soil and Environmental Sciences.

Dr. Charles Chen leads the efforts in the breeding and genetics of new peanut cultivars that are higher yielding due to improved levels of resistance to pests, especially viruses and fungi. His research efforts also address improved water-use efficiency through increased drought tolerance.

Despite the interruption of many day-to-day activities in the spring and summer because of COVID-19, critical research that directly relates to food security continued, Beasley said.

"Our scientists were able to continue their research in plant breeding and genetics, crop physiology, agronomics, water quality, soil fertility, plant nutrition and the other associated soil sciences during a difficult time in the state of Alabama and our nation," he said.

On the front line of COVID-19 management

When Dr. Robert Norton, professor of veterinary infectious diseases in the Department of Poultry Science, became a member of a Department of Defense Working Group in early February 2020, the COVID-19 pandemic was just beginning to gain a significant foothold in the United States.

The purpose of the working group was to develop protective strategies for individuals who had not been infected by SARS-CoV-2 virus. Early in this effort, massive amounts of public health data were collected and analyzed.

"Rather than focusing on models, which continuously had to be modified because of new data, the group focused on overall trends," Norton said. "By the first week in March, the group shared the first of the analytical conclusions with Department of Defense decision-makers. This data indicated that the disease was primarily caused through respiratory infection."

It also indicated that "fomite"-related infections were rare and didn't contribute significantly to the overall pandemic. Fomites are inanimate objects and surfaces that can become contaminated with pathogens, enabling the spread of disease. These conclusions contrasted significantly with those of other research groups, including those in the federal government, which later recognized that COVID-19 was, indeed, primarily respiratory in origin.

"These findings were also shared with agribusiness and the food processing industry, which has been severely disrupted by COVID-19, causing meat processing plant shutdowns and meat shortages," Norton said.

Norton was co-developer of a "Clean Air Strategy" and is a co-author on a soon-to-be-published research and policy paper, "A Multi-Layered Air Defense Model to Protect Shared Air in Critical Infrastructure Sectors," which will be jointly published by the U.S. Air Force and the McCrary Institute for Cyber and Critical Infrastructure Security, the first such jointly published paper.

The Clean Air Strategy utilizes a multilayered approach to lower viral particle numbers in the air, using filtration, "pathogen-scavenging" and maximized air flow (i.e. air exchanges) in confined work spaces, transportation systems and critical infrastructures, including agriculture and food processing.

The article will be followed by an additional series of four research papers which will specifically focus on food processing and the impact of COVID-19, as well as provide solutions that will help prevent future disruptions in the food supply.

DOGGONE DIABETES

School of Nursing project enlists canine companions to combat prevalent metabolic disease

by Latha Bhavnani

Diabetes was the seventh leading cause of death in the United States in 2017, based on the 83,564 death certificates in which diabetes was listed as the underlying cause of death.

According to the Centers for Disease Control (CDC) National Diabetes Statistics Report for 2020, cases of diabetes have risen to an estimated 34.2 million. An estimated 26.8 million people (10.2% of the population) had diagnosed diabetes, and approximately 7.3 million more people have diabetes but have not yet been diagnosed.

Diabetes mellitus, commonly known as diabetes, impacts all social, economic and ethnic backgrounds. Diabetes is a metabolic disease that causes high blood sugar (glucose). The spike in blood glucose is the result of the body's inability to create or effectively use its own insulin, which is produced by islets of Langerhans found in the pancreas. Insulin helps regulate blood glucose levels — providing energy to body cells and tissues. Many people with type 2 diabetes can control their blood glucose by following a healthy meal plan and a program of regular physical activity, losing excess weight and taking medications.

Auburn University's School of Nursing (AUSON) is conducting a pilot research study, Doggone Diabetes, to increase physical activity among people living with diabetes or prediabetes through a walking program implemented with animal-assisted therapy dogs. The Caring Foundation of Blue Cross and Blue Shield of Alabama has provided funds for the School to support the study, which is expected to continue for six months.

"The American Diabetes Association recommends that people living with diabetes mellitus and prediabetes should participate in 150 minutes of moderate to vigorous exercise each week spread over at least three days," said Dr. Caralise Hunt, associate dean of academic affairs at AUSON, and principal investigator of the study. "Current literature indicates that many people do not achieve that goal. The Centers for Disease Control reports that only 52% of Americans get the recommended amount of aerobic activity per week," Hunt added.

The research project, led by Hunt, includes Drs. Morgan Yordy, Stuart Pope (AUSON) and Chih-Hsuan Wang (College of Education, Educational Foundations, Leadership and Technology department) as co-investigators. According to Hunt, Yordy and Pope will be involved in all aspects of the study such as planning, recruitment, enrollment, walking with dogs and participants and evaluation of data.

CASES OF DIABETES
have risen to an estimated
34.2
MILLION
IN 2020

Hunt has worked in diabetes management throughout her career. "The numbers for Alabama are even worse," Hunt added. "Approximately 610,458 people in Alabama (15.2% of the adult population) have diabetes. In 2017, the American Diabetes Association estimated that 1,334,000 people in Alabama (37% of the adult population) had prediabetes."

Hunt believes that this study is important to the citizens of Alabama and beyond as the rates of type 2 diabetes and obesity continue to steadily increase. Pope, Yordy, and Hunt began a conversation about how people enjoy being around the dogs and wanted to investigate whether the dogs would be a motivator for people with prediabetes and diabetes to increase

Pictured from left: Dr. Caralise Hunt, Dr. Stuart Pope, Dr. Chih-Hsuan Wang and Dr. Morgan Yordy, with therapy dogs CHOA, Miller and Daisy

their physical activity. The research hypothesizes that incorporating animal-assisted therapy dogs into a walking program will encourage increased physical activity.

"Our primary goals for this pilot study are to implement a walking program and increase and sustain physical activity (walking) in study participants to 150 minutes per week.

"The plan is to recruit adults 19 and older living with prediabetes or diabetes from the campus and the Auburn-Opelika community. We will use a crossover design so that for one month, participants will walk with the dogs from AUSON animal-assisted therapy, and the following month they will walk with the group without dogs. This will allow us to study the effect of this therapy.

"If the intervention is effective, we would like to continue and expand the program. Our primary study outcome is minutes of physical activity per week. Secondary outcomes include evaluations of hemoglobin A1C, weight, BMI, waist circumference, blood pressure and heart rate," Hunt said.

"This study is very important in light of the [COVID-19] pandemic. People with diabetes face a higher chance of experiencing serious complications from the virus. The risk of developing severe sickness and complications from COVID-19 is lower if diabetes is well-managed. When people with diabetes do not manage their condition and experience fluctuating blood glucose values, they are generally at risk for several diabetes-related complications," Hunt added.

CNSI FUELS WORK IN NEUROSCIENCE AND DRUGS OF ABUSE

by Matt Crouch

Established as part of the inaugural Presidential Awards for Interdisciplinary Research (PAIR) in 2018, the Auburn University Center for Neuroscience Initiative (CNSi) has added a new avenue for collaboration and creative research relating to a variety of neurological and substance-use disorders.

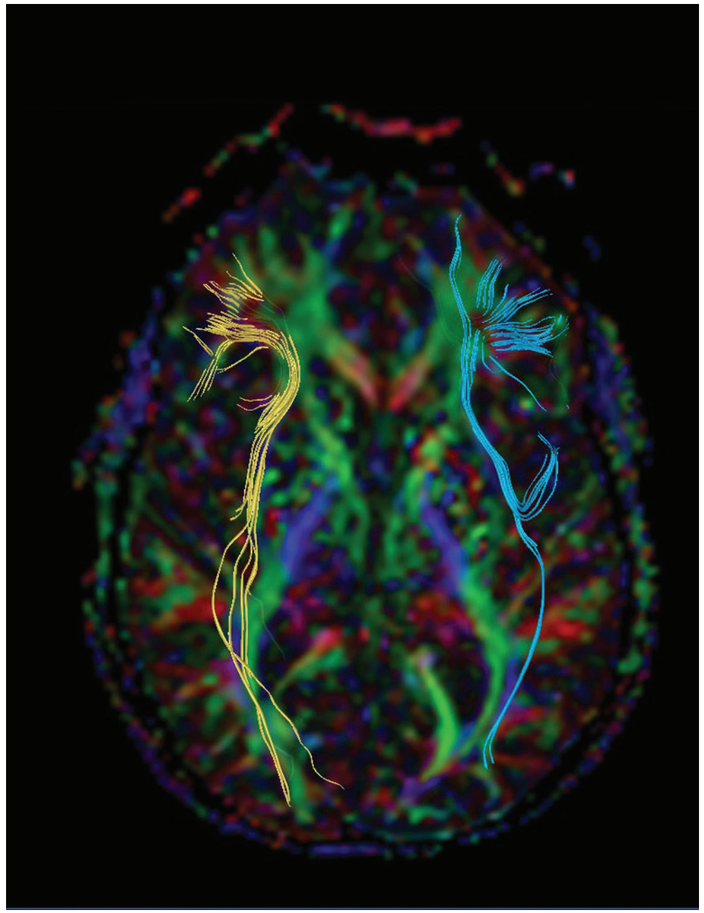
Led by co-directors Dr. Miranda Reed and Dr. Vishnu Suppiramaniam, the CNSi involves more than 60 investigators across the university with particular focus on Alzheimer's and other neurodegenerative conditions, drugs of abuse, neurodevelopmental alterations and metabolic aspects of brain disorders.

Having a centralized and multi-disciplinary center for such work has already brought accolades and funding, including a recent $1.7 million grant to study the effects of marijuana use during pregnancy. Funded by the National Institutes of Health-National Institute on Drug Abuse, the project will look at the prenatal effects of THC while also investigating treatment options.

Led by Reed and Suppiramaniam, both of the Harrison School of Pharmacy's Department of Drug Discovery and Development, the project is titled "Elucidation of molecular mechanisms of prenatal cannabinoid exposure: Identification of targets and therapies." The NIH-R01 grant is funded for five years with $352,843 in the first year for a total of more than $1.7 million.

With increased legalization of marijuana in recent years, a rising trend has been its use by expectant mothers as a way to ward off nausea and morning sickness. While many recognize the dangers of smoking, tetrahydrocannabinol (THC), is still found in other forms like vaping, gummies and brownies, and can have an effect on neuronal communication.

"Marijuana has shown to have some potential medicinal properties, which can alleviate nausea in patients undergoing cancer chemotherapy and help with appetite in patients with AIDS-associated wasting syndrome," Suppiramaniam said.



"These effects have led to the popular belief that marijuana can also help with nausea and reduced appetite associated with morning sickness during pregnancy. With more and more states legalizing the medicinal and recreational use of marijuana, its use during pregnancy is also rising. Nonmedical personnel at marijuana dispensaries are also currently recommending marijuana to pregnant women for nausea in some states, while medical experts strongly warn against it."

As part of the study, the duo plans to look at how prenatal cannabis/marijuana exposure affects adolescent offspring.

MORE THAN
$1.7
million
OVER FIVE YEARS
for this project

Initiative includes
MORE THAN
60
investigators
ACROSS THE UNIVERSITY

In particular, they are studying the communication among neurons, synaptic functioning and the resulting consequences in cognition, learning and memory.

"The effect of THC on neurons is complex and is shown to have both excitatory and inhibitory effects on neurons," Suppiramaniam said. "It can lead to impaired learning and memory and also affect mood and emotions."

Use during pregnancy can impact almost all the major neurotransmitters in the brain, including glutamate, adrenalin, serotonin and dopamine. This can lead to a variety of behavioral and memory issues, as well as future drug use, anxiety and depression.

"Marijuana use during pregnancy is associated with elevated risk for miscarriages, birth defects, developmental delays and learning disabilities, including lasting harm to intelligence, attention, executive functioning skills and memory," Reed said.

The second part of the study is identifying therapeutic targets for the treatment of cognitive deficits associated with prenatal marijuana exposure. Reed and Suppiramaniam have already identified one target, the polysialylated neural cell adhesion molecule (PSA-NCAM), which plays a critical role in learning and memory.

"For the current studies, we are examining alterations in the prefrontal cortex and hippocampus, brain regions that mediate executive functioning skills and memory," Reed said. "We are focusing initially on alterations in the glutamatergic neurotransmitter system as it plays a critical role in these processes and the endocannabinoid system is a critical master regulator of glutamatergic signaling."

The information will be used to test whether increasing PSA-NCAM with a novel drug can stabilize neuronal communication and improve the cognitive deficits observed after prenatal cannabis/marijuana exposure.

"Currently, we are exploring postnatal therapeutic options," Suppiramaniam said. "We are exploring novel drugs and molecules that can be delivered to the offspring during the early adolescence period to stabilize the synaptic transmission and improve learning and memory."

Reed and Suppiramaniam work out of the Harrison School of Pharmacy's state-of-the-art Pharmacy Research Building and are co-directors of the CNSi.

"The Pharmacy Research Building has allowed for easy integration of our collaborative work and personnel," Reed said. "The in-house vivarium has allowed for a reduction in time spent traveling to off-site buildings, thereby increasing productivity."

Additionally, bringing investigators together under the umbrella of the CNSi has fostered collaboration and innovation in pursuing and receiving grants such as this R01 grant from the National Institutes of Health.

"We are very grateful that the CNSi has partially provided support to enhance the existing infrastructure and to recruit expertise needed to carry out this project," Suppiramaniam said. "It certainly provides a conducive and collaborative environment for exchange of ideas among faculty, staff and student scientists and is a catalyst for cutting-edge research."

FINANCIAL LITERACY MATTERS

Research shows types of available financial services have major impact on households

by Joe McAdory

How much should one be saving today for retirement in the future? What do interest rates mean when you borrow money only to be paid later? How do fees compare to interest rates on loans? How does inflation impact your personal spending power over time? Answers to these questions, and more, are valuable to everyone, regardless of income, in making informed financial decisions.

That's why understanding the terms used in these questions — and why they are important — often go hand-in-hand with one's financial success. Harbert College of Business finance professors Dr. Jim Barth and Dr. Jitka Hilliard, and doctoral student in finance Nguyen Nguyen, find people who are more financially literate obtain services from more traditional, and less costly, financial institutions. Those who are less financially literate typically rely more heavily on alternative financial service providers such as payday lenders and pawnshops.

Their paper, "Does Financial Literacy Matter for the Type of Financial Services Used by Households?" shows that increased financial literacy is associated with the use of more traditional financial firms like banks instead of alternative financial services, including high-interest payday operations. Importantly, they find that an increase in financial literacy among a greater number of individuals and households contributes to more financial inclusion — it becomes less costly and less difficult for individuals to obtain financial services from banks.

"People sometimes might not know enough, or fully understand the consequences of their financial decisions, because they were not provided with the information they need to make better choices," said Barth, the Lowder Eminent Scholar in Finance. "People sometimes just aren't trained in school to make more informed decisions. The need for personal finance courses is becoming increasingly important because more, and more complicated, financial products exist today."

A proposed solution?

"Start teaching people financial literacy at a much younger age," Barth suggested. "Yes, it's taught in some high schools, but there needs to be more done for more people. For example, it could be taught at the community-level, perhaps by universities located within small communities where you have high rates of unemployment or older people who didn't get the chance to go to college and/or weren't exposed to personal finance courses."

"People need to better understand their respective budgetary situations," Barth added. "What funds are coming into a household? What funds going out for mortgages, rent, utility bills or food? Knowing this, a person is in a better position to make more informed decisions when borrowing money."

Informed decision-making at the ground level by consumers is ultimately good for the economy, Barth suggested.

"If people make more informed decisions, then we will have a better working financial system," he said. "In that case, we would expect people not to have borrowed too much and therefore have less trouble repaying it. This means fewer defaults, which makes for stronger financial institutions. Better financial decisions that are made are simply good for the economy — it means that funds are going where they ought to be going rather than going to the wrong place."

Dr. Jim Barth

Dr. Jitka Hilliard

A COMET'S LONELY JOURNEY

by Maria Gebhardt

Comets are left-over building blocks of planets, composed of ice, dust and gases. Dr. Dennis Bodewits, associate professor in Auburn University's Department of Physics, unlocks information hidden inside these dirty snowballs through laboratory astrophysics and observations with space telescopes.

"I am truly excited that our research on comet 2I/Borisov has received tremendous news coverage," Bodewits explained. "Being able to promote Auburn University on a global scale helps to showcase the importance of our research and the impact we can make."

Bodewits used both the Hubble Space Telescope (HST) and the Neil Gehrels Swift Observatory space telescope to research interstellar comet 2I/Borisov that traveled through our solar system in late 2019, and is only the second interstellar comet ever observed from outside our solar system.

Bodewits uses laboratory astrophysics to understand more about the water in comets. His research provides insight about the origins of the universe and tells us more about planetary objects from millions of years ago.

Comet 2I/Borisov contained very large amounts of carbon monoxide gas, and Bodewits used it to trace the origins of the object to planetary systems with much colder temperatures than ours. Such environments can be found around M-type stars, red dwarfs, which are the most common stars in our galaxy.

Nature Astronomy published the research from Bodewits titled, "2I/Borisov is a carbon monoxide-rich comet from another star." The research received international coverage from USA Today, BBC News, Scientific American, EarthSky, New Scientist and numerous other outlets.

NASA showcased the research from Bodewits and Dr. Zexi Xing, a post-doc at Auburn, whose collaboration measured the water production of comet 2I/Borisov as it approached the sun. To view NASA's video about this comet, visit aub.ie/comet.

Bodewits and Xing also participated in a live discussion on April 28 on Reddit's AskScience forum, where they interacted with people from around the world, answering questions and sharing their research. To view a transcript of the discussion with more than 300 comments, visit aub.ie/askscience.

Xing, who studied at the University of Hong Kong and is from mainland China, recorded the activity of the comet using ultraviolet light. She led the work on the Neil Gehrels Swift Observatory space telescope published in Astrophysical Journal Letters and promoted by the American Astronomical Society.

"I am truly excited that our research on comet 2I/Borisov has received tremendous news coverage," Bodewits explained. "Being able to promote Auburn University on a global scale helps to showcase the importance of our research and the impact we can make."

– Dr. Dennis Bodewits

BEHIND THE WHEEL

Auburn University building new autonomous vehicle research facility

by Chris Anthony

For researchers in Auburn University's GPS and Vehicle Dynamics Laboratory, prepping autonomous vehicles outside in Alabama's elements — from the sweltering summer sun to pop-up thunderstorms — has become a near daily occurrence.

Whether researchers are debugging algorithms, installing sensors or running data analyses, much of the work from the GPS and Vehicle Dynamics Laboratory, or GAVLAB, is done outdoors — and easily impacted by changes in the weather.

That situation will improve greatly with the planned addition of a sophisticated new autonomous vehicle research facility at Auburn's National Center for Asphalt Technology (NCAT) test track. The facility is expected to provide a garage with multiple bays and lifts for commercial trucks and passenger vehicles, office space for researchers, a conference room and an observation area overlooking NCAT's 1.7-mile oval test track.

"Our department is proud to commit resources, along with the Samuel Ginn College of Engineering, to support high-impact researchers. We think this facility will really help set us apart from other universities in autonomous vehicle research."

- Dr. Jeff Suhling

The building, estimated to cost approximately $800,000, will be one of the few autonomous research facilities in the nation attached to a test track.

"The fact that we'll have our own test track where we can run autonomous vehicles and autonomous testing attached to this facility I think will be an unbelievably unique asset," said Dr. David Bevly, the Bill and Lana McNair Distinguished Professor of mechanical engineering and co-director of the GAVLAB, along with assistant research professor Dr. Scott Martin.

Since Bevly joined the Auburn engineering faculty in 2001, the GAVLAB has built a strong reputation in autonomous vehicle navigation and developed a broad sponsored research portfolio, with projects ranging from the Department of Defense and the Federal Highway Administration to many private industry partners.

With various sponsors visiting each month, the facility's planned observation area will give the GAVLAB team a high-quality space to demonstrate its research. Bevly's group has also conducted demonstrations for legislators and the Alabama Department of Transportation.

"I think it will be a great facility for us as a team, but also to showcase our work," Bevly said.

With a growing research thrust in transportation engineering, the autonomous research facility also demonstrates Auburn's commitment to supporting these research initiatives.

"Dave and his GAVLAB team are one of our top research groups on campus, and their work has elevated Auburn to an internationally prominent position in navigation and vehicle dynamics for autonomous vehicles," said Dr. Jeff Suhling, the Quina Professor and department chair for mechanical engineering. "Our department is proud to commit resources, along with the Samuel Ginn College of Engineering, to support high-impact researchers. We think this facility will really help set us apart from other universities in autonomous vehicle research."

MUSIC TO HIS EARS

Faculty member recognized as Steinway Artist

By Victoria Santos

Growing up in Manitoba, Canada, Dr. Jeremy Samolesky learned how to play two things — piano and hockey. When the time came to choose one, the decision was easy for Samolesky. As the youngest child from a musical household, he couldn't wait to play piano.

Dr. Jeremy Samolesky

"My mom teaches piano, so most days after school we had kids from the neighborhood in our living room taking lessons," Samolesky recalled. "I grew up hearing many different kinds of music — my parents played a lot of classic rock and disco, along with my brother's punk and heavy metal, which I loved. My brother and sister both took piano lessons when I was a kid, and since I was the youngest in the family, I had to do what they were doing.

"When I was 7 years old, I was allowed to begin taking piano from the woman at the end of the street. My mom refused to teach us, I think, wisely. So, I would walk to my weekly lesson and immediately fell in love with it."

Access to his mother's music books at home enticed him to read music when he had finished his daily practice assignments.

"It was just like reading a novel, I would sit and read books of music from the start to the finish," he said. "We had a Beatles anthology that was around 500 or 600 pages, and it would take me about six-and-a-half hours to play from start to finish through the whole thing. I didn't know it then, but those reading skills would become an incredibly valuable asset — it has made a big difference in allowing me to learn music quickly and play in a variety of styles.

"I loved practicing so much to the point that my parents had to discipline me by limiting my practice time. That was their form of discipline."

Samolesky serves as professor of piano and head of keyboard studies at Auburn. He received a bachelor's degree in music from the University of Manitoba, and when it came time to prepare to audition for master's programs, Samolesky said he knew that most of the important music schools were in the U.S.

"I finished my undergrad and worked for a year so that I could afford plane tickets to audition for master's programs," he said. "After much research, I picked six of my favorite schools, auditioned at all of them and got full scholarships to all of them. That was a fun part of my life, getting to choose exactly where I wanted to go," Samolesky said.

"For my master's, I found an amazing teacher, Dr. Robin McCabe in Seattle at the University of Washington. After completing my studies there over three years, I attended the Eastman School of Music for my doctoral studies. It's one of the top schools in the country, and I was able to complete two doctorate degrees there in four years, so I had a total of 12 years of university studies before coming to Auburn."

Perhaps it's only fitting that someone so dedicated to playing the piano would become a Steinway Artist.

"I first applied to become a Steinway Artist in February 2019," Samolesky said. "It has been a lifelong dream of mine to be included on the International Roster of Steinway Artists, a feat that I honestly did not think was possible a couple of years ago. Many of the greatest pianists in history are included in this roster, including Sergei Rachmaninoff, Arthur Rubinstein, Vladimir Horowitz, Martha Argerich, — so even to be considered is a tremendous honor.

"I felt like I had nothing to lose by applying, and especially with Auburn University in the midst of our All Auburn, All Steinway Campaign, I thought that becoming a Steinway Artist could provide greater momentum as we move further with the campaign."

Applying to be a Steinway Artist is a lengthy process — one that requires meetings and unanimously positive votes from several international committees (including New York, Hamburg and Shanghai) and takes into consideration the artist's performance history, future and stature of performance venues, including a thorough examination of audio and video recordings.

Only a small handful of artists are welcomed to the Steinway Artist roster each year. Samolesky did not yet know of his accomplishment and was presented with the news during a ceremony in March at the Gogue Performing Arts Center.

"To say that I was surprised when I found out that I was awarded the Steinway Artist designation is an understatement. It still humbles me every day to be included among a class of pianists and musicians of the highest level, many of them that have been my lifelong heroes," Samolesky said.

After Samolesky played Gershwin's "Rhapsody in Blue" with the Auburn University Symphonic Winds, Alabama Steinway Manager Jon McClaran made a touching presentation, officially recognizing Samolesky as a Steinway Artist.

"It was my high honor to recommend Jeremy for this elite designation as a Steinway Artist," McClaran said. "His talents as an artist are amazing; and at the same time his professionalism and skill as an educator are also profound. Auburn University is indeed fortunate to have him in the Auburn Family."

The revered title of Steinway Artist offers to the very best pianists in the world a priceless association with Steinway & Sons, a brand synonymous with the highest standard of excellence in music making. Steinway Artists become part of the Steinway Family, a worldwide community, including legendary artists such as Horowitz, Rachmaninoff and Argerich, as well as legends-in-the-making like Lang Lang, Billy Joel and Diana Krall.

"I was speechless, literally!" he said. "I am grateful that the students of the Auburn University Piano Studio were there to be a part of the honor, and I look forward to passing on to them the gift of music that I received from my teachers and mentors."

The Steinway Artist relationship is built upon the mutual conviction to strive for the greatest level of achievement in performance and craftsmanship. The Steinway Artist designation is not intended to help launch and/or promote new careers, but rather to recognize and honor exceptional musicians gracing the professional world stage today.

The College of Liberal Arts is excited to continue the All Auburn, All Steinway Campaign, and has exciting plans for the 2020-21 season. This includes several student and faculty performances and donor events throughout Alabama and surrounding states.

"The Steinway Artist designation speaks volumes about Jeremy's tremendous talent and dedication," said Dr. Joseph Aistrup, dean of the College of Liberal Arts. "I congratulate him on this prestigious and well-deserved recognition, and I look forward to our continued efforts of becoming an All Steinway school."

"Our students have already reaped the benefits from our new Steinway acquisitions thus far, and we are pumped to continue the campaign," Samolesky said, adding, "The excitement for Auburn Piano and the Auburn Department of Music is electrifying, and we are thrilled to be a part of this incredible movement!"

For more information about the All Auburn, All Steinway campaign, visit: cla.auburn.edu/perspectives/articles/all-auburn-all-steinway-campaign-to-benefit-auburn-university-students-and-faculty/.

CLOSING THOUGHTS
FROM THE VICE PRESIDENT

James Weyhenmeyer, Ph.D.
Vice President for Research & Economic Development

We often hear about "the Auburn Family" and how great it is to be a part of it. This year, especially, has shown that to be true, as students, faculty and staff have pulled together to respond to the challenges of the COVID-19 pandemic.

Auburn's research enterprise has remained strong, as critical research continued, even while many other institutions opted for a full shutdown of their research efforts. Thanks to the dedicated work of researchers and staff across the university, and aided by careful adherence to best practices in safety, impactful research at Auburn has carried on, despite the difficulties of a public health crisis.

As our cover story explains, researchers in Auburn's College of Agriculture have continued to do the important work of helping keep Alabama's food supply safe and secure. Faculty members in other areas have tested coronavirus vaccine candidates, engineered emergency ventilator systems, and studied the social and economic implications of COVID-19. Issues of health disparities in the rural South have come into the spotlight again, and Auburn researchers, in collaboration with other institutions across the nation, have responded with renewed efforts to combat these inequities. As family members do in hard times, those who make up the research enterprise across Auburn University have worked together to evaluate problems, find solutions and provide real help in a time of need.

As is often the case, our strengths shine brightest in difficult times, and in what has proven to be a year of unprecedented challenges, Auburn has carried on, steady and strong. With a hopeful eye toward better days ahead, we will continue our commitment to solve real-world problems through discovery and innovation, leveraging the talents and dedication of Auburn researchers to benefit our local communities and the people of Alabama, our region and beyond.

quick take

EXECUTIVE DIRECTOR, AUBURN RESEARCH AND TECHNOLOGY FOUNDATION

BILL DEAN

by Leslie Chapman

Bill Dean, a veteran research park and financial executive with more than three decades of experience in developing innovative ideas for research parks, life science parks and biotech incubators, has joined Auburn University as executive director of the Auburn Research and Technology Foundation. Dean is a past president of the Association of University Research Parks and former director of other research parks in Alabama and North Carolina.

What has it been like to take over the helm of the Auburn Research and Technology Foundation in the midst of a pandemic?

Challenging, but we're making it work. We've continued to move forward with our construction and infrastructure projects while simultaneously shining a light on park success stories.

Given your more than thirty years' experience building and leading research parks, what do you see as the role of a university research park?

University research parks are catalysts for innovation that drive regional and national economies. More than just a built environment, a park should be strategically crafted to foster the growth of research and tech-based communities. As an example, private sector, knowledge-based businesses whose interests align with university expertise frequently locate in research parks to access talented students and researchers and to benefit from the park's network of business leaders and entrepreneurs. Skillfully developed solutions translate to measurable economic impact, job creation and improved quality of life.

Auburn Research Park is evolving rapidly at the moment with multiple projects under construction. What's going on?

For nearly a decade, Auburn Research Park has been a key contributor to the economy of our state and region. The 171-acre park was established by the state of Alabama, the city of Auburn and Auburn University in 2007. In the years that followed, a park community formed — a community that encouraged engagement, partnership and exchange of ideas. Members of that community include the Auburn Research and Technology Foundation, the Auburn University MRI Research Center, the Center for Advanced Science Innovation and Commerce, the Edward Via College of Osteopathic Medicine; and, as of June of 2019, Big Blue Marble Academy, a state-of-the-art childcare facility serving the university, park and city.

In 2019, the Auburn Research and Technology Foundation broke ground on a 100,000-square foot Research and Innovation Center. This facility, located on Devall Drive, will be home to Auburn's Office of the Vice President for Research and Economic Development, as well as a range of commercial clients. The ground floor will house the New Venture Accelerator, a new event center (540 at the Park) and a restaurant operated by Amsterdam Café. We've just opened the doors to the Research and Innovation Center this fall.

In late 2019, East Alabama Medical Center broke ground on an 84,000-square foot health sciences center that will house a free standing emergency department, an ambulatory surgery center with four surgical suites, as well as health science and medical research units. East Alabama Medical Center's presence in the park will create additional opportunities

for internships and clinical research, and will help serve the medical needs of Auburn's growing population. Supporting this growth on the west side of the park, we have a significant infrastructure project underway that will create a new entrance off of Shug Jordan Parkway, pave Old Camp Auburn road, create a traffic circle and most importantly, deliver critical utilities to areas identified for current and future development. Both the health sciences center and infrastructure projects should be complete in March of 2021.

Combined, these projects (along with the new childcare center) represent nearly 90 million dollars of new investments into Auburn Research Park — investments that will help drive our innovation economy.

What is Auburn Ventures?

Since its inception, Auburn Research Park has been home to an entrepreneurial ecosystem, a place where tech and knowledge-based businesses are developed. As the park begins this next chapter, we want to brand that ecosystem and expand its scope.

Auburn Ventures is the programming and people that make-up our ecosystem—the experience of living and working in a vibrant discovery district. Auburn Research Park is truly a community of innovation where faculty and students pursue the next "big idea." As a dynamic hub for creativity, Auburn Ventures will establish Auburn Research Park as a destination, promoting research-based business ventures while offering easy access to arts, entertainment, retail shopping, hospitality and event space, as well as residential opportunities.

We're creating a convergence zone where Auburn's best and brightest minds can, with flexibility and agility, meet today's and tomorrow's challenges head on. Transforming technologies into needed products and services is part of Auburn's mission as a land-grant university. We look forward to welcoming both campus and community members to join us as we begin a new and exciting era of discovery.

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