# TABLE OF CONTENTS

Alabama Agricultural & Mechanical University
OFFICE OF THE PRESIDENT
P. O. BOX 1357, NORMAL, ALABAMA 35762

March 8, 2022

Greetings, STEM Day Participants!

It is with great pleasure that I extend my personal greetings and support to the participants of the Annual Science, Technology, Engineering and Mathematics (STEM) Day at Alabama Agricultural and Mechanical University. The 2022 theme is "STEMulate and Sustain Excellence Through Research." This is an appropriate theme in that all research provides STEMulation and sustenance through learning. We are especially privileged to be a part of an event that promotes and fosters education and research within STEM disciplines, while displaying the achievements of future scientists, technologists, engineers and mathematicians. STEM Day provides our students opportunities to partner and collaborate with faculty and professional mentors from local businesses and industry, exhibiting research projects and presentations in the STEM disciplines.

Because of the determination of our founder, Dr. William Hooper Councill, and his unparalleled contemporaries, Alabama Agricultural and Mechanical University, a Historical Black College and University, has been able to accomplish much with often meager resources. Thanks to their drive and vision, Alabama Agricultural and Mechanical University was recognized as one of only three HBCUs among the Top 20 producers of African-American STEM graduates (thehundred-seven.org). In the state of Alabama, Alabama Agricultural and Mechanical University enrolls and graduate the largest number of minority STEM majors. Alabama Agricultural and Mechanical University is a leading producer of African-American computer scientists, engineers, mathematicians and natural and physical scientists. Alabama Agricultural and Mechanical University ranks among the top institutions in the world in the production of minority physicists with Ph.D. degrees.

I applaud the efforts of our faculty, staff and students in promoting the importance and relevance of the STEM disciplines. We are confident that the quality of the scientific presentations, along with the fervor of the program will instill further interest and growth.

Sincerely,

Daniel K. Wims, Ph.D.
President

PHYSICAL ADDRESS: 4900 MERIDIAN STREET, HUNTSVILLE, ALABAMA 35810 • PHONE: (256) 372-5230
WEBSITE: WWW.AAMU.EDU

ALABAMA A&M UNIVERSITY

Academic Affairs
108 Patton Building, Normal, AL 35762
Office 256-372-5275
Fax 256-372-5278
www.aamu.edu

March 22, 2022

Dear STEM Day Participants:

It is with great pleasure that I extend personal greetings and support to all participants of the 15th Annual Science, Technology, Engineering and Mathematics (STEM) Day at Alabama Agricultural and Mechanical University. STEM Day allows our students to partner and collaborate with faculty and professional mentors from local businesses and industry, to exhibit research projects and presentations in the STEM disciplines. It is a privilege to be part of this event that promotes and fosters experiential learning through research.

The Theme for STEM Day 2022, "STEMulate and Sustain Excellence Through Research," reflects the importance placed on students and their mentors to cultivate a body of research, and plausible solutions and explanations in various STEM fields, to ensure a sustainable future for all. Essential concepts and techniques learned in the classroom provide excellent skill sets students apply toward addressing 21st century challenges. Much of this we owe to the dedication of our valued and highly accomplished faculty.

STEM Day continues to cultivate innovation, creativity, sustained collaborations, and student participation in researching, problem solving, and displaying their achievement in the science, technology, engineering, and mathematics disciplines. After fifteen years the enthusiasm and excitement around this event, remains high. I implore you to enjoy the experience but use it to create a foundation for your future endeavors.

Welcome to STEM Day 2022 at Alabama Agricultural and Mechanical University, and best wishes in today's competitions.

Sincerely,

L Walton

Lena Walton, Ph.D.
Interim Provost and Vice President of Academic Affairs

Alabama A&M UNIVERSITY

College of Agricultural, Life and Natural Sciences
College of Engineering, Technology and Physical Sciences
College of Education, Humanities and Behavioral Sciences
College of Business & Public Affairs

Offices of the Deans

March 24, 2022

Dear Participants:

As we have ushered in a new era, and fostered student innovation and success, this year Alabama A&M University (AAMU) will *STEMulate and Sustain Excellence Through Research*, presenting you, the 2022 STEM Day participants. We look forward each year to making this the opportune time to highlight your research interests and talents by displaying your accomplishments in our science, technology, engineering and mathematics programs.

In our efforts to prepare you to excel in and develop your spheres of influence, it is apparent that many of you have "understood the assignment" and have even now begun to blossom as young scientists, technologists, engineers, and mathematicians. For others, who are just beginning their academic journeys, we applaud you and hope that perhaps your appetites will be whetted by this experience and more to maintain this course of distinction.

Therefore, as Faculty, Researchers, Advisors, and Mentors, we continue to support STEM Day in word and deed through promoting these programs and funding STEM events. We extend our gratitude to the planners and organizations of this year's events and commend them for their efforts in making this a tremendous success. We look forward to an inspiring day and we thank you for your participation.

Sincerely,

Lloyd T. Walker, PhD
*Dean/1890 Research Director*
*College of Agricultural, Life & Natural Sciences*

Zhengtao Deng, PhD
*Interim Dean*
*College of Engineering, Technology & Physical Sciences*

Samantha Strachan, EdD
*Interim Dean*
*College of Education, Humanities & Behavioral Sciences*

Amin Sarkar, PhD
*Interim Dean*
*College of Business & Public Affairs*

Alabama A&M UNIVERSITY

Pyroelectric, Surface Properties
& Dielectric Materials Laboratory
Department of Physics, Chemistry
and Mathematics
P.O. Box 338
Normal, Alabama 35762
(Office) 256-372-8119
(Cell) 256-337-0340

March 24, 2022

**Theme: "STEMulate and Sustain Excellence Through Research"**

Dear STEM Day Participants:

As the founder of STEM Day at Alabama A&M University (AAMU), I am delighted to welcome you to STEM Day 2022. Through this correspondence, I wish to take a moment to address this year's theme, **"STEMulate and Sustain Excellence Through Research."** To stimulate (To STEMulate in this case) and sustain excellence through research suggest a commitment of research engagement in the STEM disciplines of unprecedented proportions by the faculty and students of the University with greater support of the same by administrators and stakeholders. This commitment points to the notion of having higher and higher levels of STEM programs, which provides students and faculty with a scholarly pathway to success that exemplifies the essence of AAMU STEM Day. As such, during the many activities of this day, STEM students with faculty mentors will showcase their research and other scholarly investigations, demonstrating the best of whom we are. Additionally, some faculty members, especially junior faculty members, will use this forum to achieve faculty development, through assuming leadership roles in organizing this multiple disciplinary conference. Collectively, in this regard, STEM Day 2022 provides a reflective quality, which allows students and faculty members to expand their appreciation for the entire STEM enterprises—from its earlier educational components to later career application and employment.

Additionally, this year's theme is important and extremely timely as a means to help galvanize our energies in a focused manner to tackle existing problems of science, engineering and technology, including climate change, energy demands, and health care needed. It invites the ascendancy to a new national normal for our country, where all individuals, regardless of their current location or place of origin, including persons from underrepresented groups—women, minorities, rural-dwelling Americans, the handicap, and immigrants, can participate in the scientific enterprise to the level of their individual abilities and talents with lesser restrictions. With this broader level of participation, we will encounter no problem that is beyond our ability to solve successfully when we serve with a personal commitment.

It is this level of participation that is available for you at STEM Day 2022. To that end, I wish you success in today's competitions, continued enjoyment throughout the day, and a deepening commitment for research engagement in the STEM disciplines!

Best regards,

Matthew E. Edwards

Matthew E. Edwards, Ph.D.
Founder of STEM Day
Professor of Physics, FAAS Fellow & IIIS Fellow
Former Dean, School of Arts and Sciences

Alabama A&M UNIVERSITY

Pyroelectric & Dielectric Materials Laboratory
Department of Physics, Chemistry and Mathematics
P.O. Box 338
Normal, Alabama 35762
(Office) 256-372-8119
(Fax) 256-372-5622

**The Origination, Value, and Sustainability of STEM Day:**

Before there was a STEM Day at Alabama A&M University (AAMU), I had attended numerous science and science education meetings, one of which was called Dynamic Days that considered chaos theory and differential equations. Moreover, I had worked previously at another institution, which at that time hosted an Annual Science Program. As an undergraduate student, I had worked at Argonne National Laboratory as a summer intern and later presented my first science talk at the Southeastern Section Meeting of the American Physical Society, while being a new graduate student. These experiences were all fulfilling, which further caused me to realize the significance of conducting research and sharing it with other individuals. In addition, I had previously organized science programs, and had taken students to government laboratories and to many science and engineering conferences. Although there can be no certainty of how or why it occurred, I believe that during the Fall Semester of 2006, somewhere between thinking about attending the Dynamic Days meetings, of presenting talks and posters at regional and national conferences, of taking students to meetings and government laboratories, of participating in previous Annual Science Programs, and of mentoring students at AAMU, the thought arose in my mind of the need for a yearly event at AAMU to be named "STEM Day."

Initially, not only did I contemplate the thought but also knew I had to tell someone about it. Therefore, I requested a meeting with then Provost Beverly Edmond. In a few days after my request, I arrived at the Provost's office and settled into a chair before the desk where she was seated. In order to buffer or assuage myself against a total rejection, I decided to offer two suggestions hoping that she would accept one, at least, and both if I were very lucky, and while not mentioning it earlier, I had been thinking also of how to deliver science content material better to students and how that process could be improved at AAMU. Thus, after exchanging pleasantries, I told Dr. Edmond that I had two ideas that I thought would benefit or be of value to the entire University. I stated that a need exists for a Center for Teaching and Learning to help early career and retooling faculty members to improve their teaching abilities, and secondly a need exists for an annual event called STEM Day to serve scholarly students and faculty members to illustrate the results of their research and individual studies. After a few other exchanges between us, and a brief moment in reflection, Dr. Edmond did not hesitate before replying that the two ideas were meritorious, so "let's make them happen." Thereby, with that simple statement, the goal was achieved, resulting in no rejection of my suggestions but in two positive outcomes all completed with one effort.

I departed from the Provost's office and returned to V. M. Chambers Hall knowing of her support to begin STEM Day and an educational center. The Center was established soon after my meeting with her, without my intervention, and near the end of Fall Semester 2006, I called the first STEM Day Organization Meeting; the meeting was held in the Physics Library with Dr. Edmond in attendance. Starting with that meeting, STEM Day had also begun, and all else about this organization since that time has been about its worth and sustainability.

STEM Day has now existed for many years! What a wonderful reality this is for the University to have some of its brightest students to conduct research and present their findings via posters to persons who have an interest in their work. Moreover, I am delighted to have participated in, have observed faculty members mentoring students in this manner, and have seen faculty and staff members taking leadership roles to make each STEM Day a success, all done with the support of the administration of the institution. Finally, it is each of you who will find the worth in STEM Day and help to sustain its existence at AAMU.

Very sincerely yours,

Matthew E. Edwards

Matthew E. Edwards, Ph.D., Professor of Physics
FRM. Dean, School of Arts and Sciences, and Founder of STEM Day

## Biographical Sketch of Dr. Matthew E. Edwards, STEM DAY Founder at AAMU

**Employment and Scholarly Activity:** Since January 2002, Dr. Edwards has been a Professor of Physics at Alabama A&M University (AAMU) and served as the Dean of the School of Arts and Sciences from 2007 to 2011. Prior to 2002, academic positions he held included associate professorships at Spelman College and Fayetteville State University, and a visiting associate professorship and adjunct faculty position at the University of Pittsburgh, and an assistant professorship at the University of Arkansas at Pine Bluff. He has held summer-faculty-research positions at several Government Labs: the ROME Air Force Research Lab, NASA Langley Research Lab, and the Naval Research Lab. Dr. Edwards is a Condensed Matter physicist with expertise and interests in quantum physics/solitons wave theory, the materials of electrooptics, pyroelectricity, resistivity, and dielectric properties of crystals and nano-particles doped organic thin films, and in STEM Education. Dr. Edwards has more than 50-refereed papers and journal proceedings and has made greater than 55 professional and administrative presentations. He has guided seven students to advanced degrees: four to the Ph.D., and three to the Master's degree, has served on more than 20 dissertation and thesis committees, and has peer-reviewed greater than 25 research manuscripts. Currently, he is guiding two Ph.D.'s and one Master's degree student. Moreover, he sits on the Board of Directors of two science journals and one science education journal and serves on the executive committee of the Alabama Academy of Science.

**Formal Training:** Dr. Edwards graduated from Central High School in Goldsboro, North Carolina in 1965 and received the Master's and Ph.D. degrees in physics from Howard University, Washington, D.C, in 1975 and 1977, respectively, and received a B.S. degree in engineering physics from North Carolina A&T State University, in 1969. Additional studies included advanced physics courses at the University of North Carolina, Chapel Hill, North Carolina, in 1987, certificate studies at MIT, Boston, Massachusetts, in 2009, and Materials Science studies at the University of Alabama, Sumer 2000.

**Honors and Awards:** Dr. Edwards has received (1) the award of Fellow of Alabama Academy of Science, March 2022, (2) the award of Interdisciplinary Fellow of the International Institute of Informatics and Systemics (IIIS), July 2019 (3) The William Lesso Memorial Award for Excellence in Physics and Interdisciplinary Communications, July 2018 (4) Session Best Paper Awards, of the Proceedings of the International World Multi-Conference on Systemics, Cybernetics, and Informatics, in three years, July 2013, 2014, and 2016, (5) Top Faculty Award At Online Affordable HBCUs, 2013 & 2014, (6) Nuclear Research Commission (NRC) Faculty Research Participation Program Award, 2011 & 2012, (7) Madison Who's Who Recognition, 2011, (8) American Society for Engineering Education (ASEE) Fellowships, 1996, (9) Received the Noble Achievement Award from NAFEO, 2009, (10) The Special Recognition Award from Science Spectrum Magazine as a Top Minority in Research Science, September 2005, (11) Who's Who in American Colleges and Universities Recognition, 2004, (12) Presidential Award for Excellence in Teaching, from Spelman College, 2001, (13) Outstanding faculty of the year award from the Department of Natural Sciences, Fayetteville State University, 1994, (14) The Award from the National Institutes of Health (NIH)—National Institute of General Medical Sciences, 1991.

**Achievements:** Dr. Edwards was the Guest Editor of the special issue of the American Journal of Materials Science in 2015. He holds membership in several scientific and scholarly organizations. He has been the PI or Co-PI on more than 20 grants and contracts, totally more than 6.00 million dollars. He founded: (1) the Biomedical Research Program at Fayetteville State University, (2) the Interdisciplinary Center for Health Science and Health Disparities & Materials, at AAMU, and (3) STEM Day at AAMU,

**Personal Information:** Dr. Edwards's immediate family consists of wife, Glenda Robinson Edwards, a son, Matthew Edwards, Jr., with his significant other Rosalind Combs, two granddaughters, Megan and Misty Edwards, and their mother Shirley Haywood, a daughter, Natasha Hall with her husband Daniel, and two other granddaughters, Kaylie and Alexis Sellers, and Glenda's grandson, and great grandson, Courtland Cutler and Nicholas Cutler, respectively.

## Welcome and Greetings!

We are delighted that you are joining us for Alabama A&M University's (AAMU) 15th Annual Science, Technology, Engineering, and Mathematics (STEM) Day. As the STEM Day Committee, we are excited that our students have the opportunity to share what they have learned from their research experiences. Therefore, this day is extraordinary for our entire university and us. Because of the innovation in STEM, our theme, "STEMulate and Sustain Excellence Through Research," is most appropriate. AAMU is committed to serving the community and the global society by understanding the essence of students' STEM conceptual learning experiences that provide new tools for scientific development by participating in research experiences and professional training. This year, STEM Day included the graduate oral and poster presentation sessions and the undergraduate poster sessions to give conference experience to our graduate students. This year, the STEM Day 2022 event will be virtual due to COVID 19 situation.

One of the objectives of the Annual AAMU STEM Day event is to allow students the opportunity to present their scientific research results. Through these research experiences, our students are prepared to meet the challenges that wait for them as they pursue different careers in science. Therefore, events such as STEM Day are significant for our students.

The 2022 STEM Day Committee expresses its deepest gratitude to the United States Department of Agriculture-Agricultural Research Service (USDA-ARS). Dean of the College of Agriculture, Life & Natural Sciences; Interim Dean of the College of Engineering, Technology and Physical Sciences; Interim Dean of the College of Education, Humanities and Behavioral Sciences; Interim Dean of the College of Business and Public Affairs, Honda, Boeing, Torch Technologies, Macy's, Caterpillar Financial Services, Chime Financial, Inc., Ferguson, Constellium, Alabama Cooperative Extension System, and Dr. Matthew Edwards (Physics Professor, AAMU) for their sponsorship of this event. We would also like to acknowledge the support and backing of the AAMU Career Development Services Office. Also, we would like to convey a special thanks to our guest speaker and judges, who graciously devote time to our students. We would also like to thank our President, Dr. Daniel Wims, our Vice-President, our University's Administration, and the various departments and faculty members. They play a role in mentoring our students.

The 2022 STEM Day Committee is honored that you have chosen to spend the occasion with us. We sincerely hope you enjoy listening to our students present the research they have conducted.

Sincerely,

**Sadguna Anasuri, Ph.D., CFLE**
Chair, STEM Day 2022
Human Devt. & Family Studies
Family and Consumer Sciences
College of Education, Humanities and Behavioral Sciences

**Mamadou L. Kassama, Ph.D.**
Co-Chair, STEM Day 2022
Food Engineering/Processing
Food and Animal Sciences
College of Agriculture, Life & Natural Sciences

**Satilmis Budak, Ph.D.**
Co-Chair, STEM Day 2022
Electrical Engg. and Computer Science
College of Engineering, Technology and Physical Sciences

ALABAMA A&M UNIVERSITY

## 15th Annual STEM Day 2022 Opening Program
## March 24, 2022

Zoom Webinar ID: 986 3948 5168

| | | |
|---|---|---|
| 8:00 AM – 8:40 AM | Welcome & Opening Remarks | **Sadguna Anasuri, Ph.D., CFLE**<br>Chair, STEM Day 2022<br>**Daniel K. Wims, Ph.D.**<br>President, Alabama A&M University<br>**Lloyd Walker, Ph.D.**<br>Dean, College of Agricultural, Life and Natural Sciences<br>**Zhengtao Deng, Ph.D.**<br>Interim Dean, College of Engineering, Technology, and Physical Sciences<br>**Amin Sarkar, Ph.D.**<br>Interim Dean, College of Business and Public Affairs<br>**Samantha Strachan, Ed.D.**<br>Interim Dean, College of Education, Humanities, and Behavioral Sciences<br>**Allen Malone, Ph.D.**<br>Extension Director, Alabama A&M University<br>**Matthew Edwards, Ph.D.**<br>Founder, STEM Day |
| 8:40 AM – 8:42 AM | Introduction of Speaker | **Austin Smith**<br>Senior, Civil Engineering<br>Executive President, Student Government Association |
| 8:42 AM – 8:54 AM | STEM Day 2022 Keynote Speaker | **Karen Tarver**<br>New Model Delivery Unit Manager<br>Honda Development & Manufacturing of America, LLC |
| 8:55 AM – 8:58 AM | Special Presentations and Closing Remarks | **Sadguna Anasuri, Ph.D., CFLE** |
| 9:00 AM – 12:00 PM | Posters & Graduate Presentations: Viewing / Attending / Judging | Whova |
| 12:00 PM – 1:15 PM | Employers' Panel Discussion | ZOOM Meeting ID: 644 644 546 |
| 1:30 PM – 2:00 PM | STEM Day Awards Ceremony | Whova |
| | Whova & Zoom Help Desk | https://aamu.zoom.us/j/4956494860 |

# STEM Day 2022 Speaker

HONDA
The Power of Dreams

## Biography

**Karen Tarver**
New Model Delivery Senior Manager
Procurement Division
Honda Development & Manufacturing of America, LLC.

Karen Tarver is a New Model Delivery Senior Manager for Honda Development & Manufacturing of America, LLC where she is responsible for leading teams across the U.S. at various Honda facilities. Karen joined Honda in March 2008 as an associate in the Mass Production Parts Quality Body group.

In 2015, Karen became the New Model Purchasing Project Leader for Honda Manufacturing of Indiana, LLC., where she was responsible for leading new model quality, delivery, and packaging development of Honda's suppliers. She was assigned as the HMIN Purchasing New Model Department Manager in 2019 until being assigned to her current role as a Regional Manager within North America.

Karen is a graduate of The Ohio State University, where she earned a B.S. in Industrial and Systems Engineering. In addition to her role at Honda, Karen serves as the founding member and Chairperson of the African American Resource Collaborative of Honda (AARCH). She resides in Cincinnati, Ohio with her husband and two daughters.

Alabama A&M University
"Service is Sovereignty"

# STEM DAY 2022

# ABSTRACTS

15 YEARS
STEM DAY 2022
ALABAMA A&M UNIVERSITY

## ABSTRACT CATEGORIES

| POSTERS | |
|---|---|
| **Undergraduate** | **Graduate** |
| Biological and Environmental Sciences | Biological and Environmental Sciences |
| Community and Regional Planning | Community and Regional Planning |
| Family and Consumer Sciences | Family and Consumer Sciences |
| Food and Animal Sciences | Food and Animal Sciences |
| Accounting & Logistics | Accounting & Logistics |
| Electrical Engineering and Computer Science | Physics, Chemistry and Math |
| Mechanical and Civil Engineering | |
| Physics, Chemistry and Math | |
| **ORAL PRESENTATIONS** | |
| Biological and Environmental Sciences | |
| Community and Regional Planning | |
| Family and Consumer Sciences | |
| Food and Animal Sciences | |
| Mechanical and Civil Engineering | |
| Physics, Chemistry and Math | |

# ABSTRACTS

## POSTERS

### BIOLOGICAL AND ENVIRONMENTAL SCIENCES

**Undergraduate**

**Abstract # 101**

**Potential Application of Selenium Nanoparticles as a Food Additive to Inhibit Microorganism Growth**

Adrian Rhoden, M. Bomma, Z. Xiao, Q. Yuan

Mentor: Qunying Yuan

Department of Biological and Environmental Sciences

Application of food preservatives is a common practice to suppress the growth of microorganisms and oxidation reactions, thus, extend the shelf-life of foods. Selenium nanoparticles (SeNPs) gained increasing attention for their potential applications to protect food quality and reduce food spoilage. To explore the potential applications of selenium nanoparticles as food additive to inhibit microorganism growth, we synthesize SeNPs using vitamin C as a reducing agent and tested the antimicrobial activity of SeNPs against Listeria monocytogenes. TEM revealed that SeNPs have a size of 22.8 ± 4.7 nm and a spherical conformation. Colony Forming Unit assay showed that, at a concentration of 1µg/mL and 2.5 µg/mL, the selenium nanoparticle reduced the L. monocytogenes growth by 50% and 78%, respectively, while it only showed significant inhibition on the growth of Staphylococcus aureus when concentration reached 10 µg/mL, and it significantly decreased the colony forming unit of Salmonella enterica at a concentration of 15 µg/mL or above. Our results suggested that the vitamin C-synthesized selenium nanoparticles can significantly inhibit a common food-born bacterium L. monocytogenes, but it needed much higher concentration of selenium nanoparticles to inhibit the growth of Staphylococcus aureus and Salmonella enterica. More studies will be carried out to test the antimicrobial activity of SeNPs against other pathogens that may contaminate food and/or cause food-borne diseases.

**Abstract # 102**

**Ferns of Paint Rock ForestGeo**

Casey Mills, and D. Lemke

Mentor: Dr. Dawn Lemke

Department of Biological and Environmental Sciences

Ferns are an indicator species that can be used to reveal information surrounding their ecological niche. The association between ferns and their environment makes them an ideal species of study when looking to learn more about water availability, forest health, and the conditions of microclimates within their ecosystem. For this study, we surveyed the ferns at the Paint Rock ForestGeo site in Northern Alabama, a long-term study site of forest ecology. Base information such as species identification and exact location was collected along with environmental traits such as topography, orientation, substrate type, and surrounding flora. Collecting these data traits then allowed us to develop species distribution models, gaining habitat data surrounding the ferns and fern communities of Paint Rock. Overall, this aids in better understanding the role of biotic and abiotic factors in relation to fern species diversity and estimate the condition of our Paint Rock Forest. For rarer species, this documented data will enable estimation of locations where vulnerable flora populations might be found, as well as identify habitats where species occurrence data is lacking.

**Abstract # 103**

**Evaluation of DNA extraction bias among metagenome isolation methods in soil samples**

Christopher McCoy, C. M. Holland, and V. R. Sripathi

Mentor: Dr. Venkateswara R. Sripathi

Department of Biological and Environmental Sciences

Sequencing the environmental samples is challenging. However, the rapid advancements in next-generation sequencing (NGS) technologies helped us study complex and dynamic soil metagenomes and enabled community-level profiling. All metagenome sequencing methods rely on isolating the DNA from a sample. So, the isolation method determines the DNA quality and quantity. Unfortunately, both gentle and harsher DNA isolation methods commercially available have their limitations. Therefore, a modified DNA extraction method was developed to maintain the uniformity and representation of diverse microbial population from samples collected. This study compared and evaluated the DNA extraction bias among six commercial kits, namely, DNeasy PowerMax Soil Kit (Qiagen), GenElute Soil DNA Isolation Kit (Sigma-Aldrich), Soil DNA Isolation Plus Kit (Norgen Biotek Corp.), FastDNA Spin Kit for Soil (MP Biomedicals), Quick-DNA Fecal/Soil Microbe Kit (Zymo Research), EZNA Soil DNA Kit (Omega Biotek), and a modified soil DNA extraction procedure by screening 36 samples collected from

six counties of Alabama. The DNA purity was assessed using NanoDrop 1000 Spectrophotometer, Agilent TapeStation 2200, Qubit Fluorometer, and Agarose Gel Eletrophoresis. Our findings suggested that our modified method performed better in eliminating humic acid substances than the commercial kits tested. While among the commercial kits, Quick-DNA Fecal/Soil Microbe Kit (Zymo Research) performed well. Further, the DNA is PCR amplified with universal bacterial and fungal primers and reniform nematode-specific primers. To conclude, our modified method reduces DNA extraction and microbial representation bias, thus allowing for improved profiling of characterized and uncharacterized microbes within microbial communities found in diverse soils.

**Abstract # 104**

**Effectiveness of dental products on the bacteria in the human mouth: A case study**

Elijah K. Nix, and Florence Okafor

Mentor: Dr. Florence Okafor

Department of Biological and Environmental Sciences

This case study was conducted to explore the effectiveness of dental treatments such as toothpaste, mouthwash, or a combination of both. The data gathered from this research can be used to determine whether some dental products can prevent bacteria from growing. Bacteria can cause a range of problems in the mouth such as gingivitis and cavities, so knowing if the dental products we use on a daily basis can prevent bacterial growth will be useful. The Colony Forming Unit (CFU) count of each culture was used to calculate the effectiveness of each dental product. The results of the study show that the CFU count of the cultures swapped after using a dental treatment was higher than the cultures which did not use a dental treatment. The results also show that the toothpaste and mouthwash contributed to a greater number of colonies grown. These results could mean that some ingredients in the dental products may have contributed to microbial growth. The artificial sweetener in the Listerine, saccharin, could be an example of some ingredients causing the growth. The effectiveness of toothpaste and mouthwash can be understood more with this research as it explains how some dental products may contain ingredients that stimulate microbial growth.

**Abstract # 105**

**The effects of radiation on fruits**

Jer'Michael K. Nix, and F. Okafor

Mentor: Dr. Florence Okafor

Department of Biological and Environmental Sciences

This case study is used to find the effects of radiation on fruits to understand how it could change the growing and processing of growing fruit for good. This experiment was conducted to find the effects of radiation on fruits to see if there is a better way to sterilize fruits while maintaining the taste. This experiment was also used to compare the microbial growth on fruits between different types of sanitizing solutions one being radiation and another being chlorine. The results will help determine what is the most effective way to sanitize fruits without losing their taste and having the least amount of microbial growth while extending their shelf life. Radiation was tested on fruits and vegetables for many years. UV lighting has become a common alternative to sanitizing both fruits and vegetables after harvest. The results from this case study show that UV light can delay microbial growth without altering the quality of the product. The UV light has been tested and has been proven to extend the shelf life of fruits and delay tissue softening that can defend against grey mold. This means that radiation would be better against stronger bacteria. Chlorine, hydrogen peroxide, and ozone have been used to reduce microbial growth, but they have also been proven to leave residue and reduce the quality of the fruit and vegetables resulting in altering their natural taste. With this information, I have been able to answer the problem as radiation is a clear winner of the best way to sanitize fruits as it has less microbial growth, longer shelf life, and is stronger against bacteria while maintaining its original taste.

**Abstract # 106**

**Assessment of bioactive plant products on bacterial and yeast cell growth**

Taniya Rainge, T. Hatchet, T.L Farmer

Mentor: Dr. Tyesha Farmer

Department of Biological and Environmental Sciences

Plant extracts are known to contain many components that aid in the treatment of various health conditions including infections by microorganisms. Some of the evidence supporting the use of bioactive plant extracts as antimicrobial agents also show molecular effects on signaling pathways that influence cell growth, apoptosis, and metabolism. The purpose of this study is to develop assays for determining the effects of various bioactive plant products on cell growth in bacteria and yeast under varying nutritive conditions. The compound 6-gingerol and extracts from *Securinega virosa*, Khaya senegalensis, and Curcuma longa were selected for their

previously described antioxidant, antiproliferative, and antimicrobial growth profiles. Methanol extracts of the leaves of *S. virosa* and the bark of K. senegalensis were obtained using a soxhlet extraction method of 20 g of plant material for 6 hours. Further reduction of the extract volumes was performed using a rotary evaporator for 30 minutes. The extracted products and 6-gingerol were diluted and evaluated in yeast spot tests or by Kirby-Bauer disc diffusion test on rich and synthetic complete agar media. Plates contained 50 ug/ml – 100 ug/ml 6-gingerol +/- 5 ng/mL rapamycin, while discs contained 20 uL of 1:1000, 1:100, 1:10, and undiluted plant extract. Differential responses to the rapamycin treatment were observed depending on the media type and the specific yeast strain. Inconclusive results from combination treatment with 6-gingerol were likely due to compromise and handling of the reagent used. To date, extensive inhibition of growth in yeast by plant extracts was not observed. This may be due to the expression of multidrug resistance pumps in S. cerevisiae. These studies will be extended to examine extracts of various *Curcuma spp*. and develop assays to examine bacterial cell sensitivity under limiting nutritive conditions.

**Abstract # 107**

**Designing novel mRNA vaccines for SARS-CoV2 delta and south African variants**

Tierney Mays, Z. Williams, T. Smith, K. Hughes, and T.L. Farmer

Mentor: Dr. Tyesha Farmer

Department of Biological and Environmental Sciences

SARS-CoV2 (Severe Acute Respiratory Syndrome Coronavirus 2) is a virus that causes respiratory illness in humans. Symptoms of SARS-CoV2 include but are not limited to fever, cough, shortness of breath, fatigue, loss of taste or smell, nausea, and/or vomiting. Although coronavirus vaccines targeting the spike protein have been developed, infections persist across the world. In anticipation of new variant mutations, more effective vaccine therapies may be needed in the near future. The purpose of this research project was to design and test mRNA vaccine candidates against theoretical derivative variants of the Delta and South African isoforms of SARS-CoV-2. NCBI database resources were queried for amino acid sequences of the 7 different coronaviruses that infect humans. A MUSCLE alignment was performed in DNA Subway and regions of major differences notated. Protein structures of the Delta and South African variants were modeled using UCSF Chimera program and mutation sites of potential consequence were analyzed. For each variant, five new derivative variants were created by mutating specific codons in the amino acid sequence. The Delta subvariants were designated as 1.) Stitch (A352V, Q506P), 2.) Angel (N343T, G502D), 3.) Richter (D428A), 4.) Phantasmo (Y449F), and 5.) Slushy (P384L, R457K). The South African subvariants were designated as 1.) Diamond Head (L368P), 2.) Goop (D442Y, R408S), 3.) Upgrade (I472F, Q506P), 4.) Overflow (V511G, S366A, K444N), and 5.) XLR8 (Y421F). The mRNA codon sequence was optimized for each new variant and submitted for testing as a potential vaccine candidate. If coronavirus

variants continue to mutate, the efficacy of current vaccines will decrease, thereby increasing the risk of vaccinated individuals to develop and spread COVID-19. In the next phase of this project, the ability of each candidate vaccine to illicit an immune response in model platforms will be investigated.

**Abstract # 108**

**Evaluation of essential oil hemp varieties in Northern Alabama**

Zaria Smith, X. Kuang and E. Cebert

Mentors: Dr. Xianyan Kuang, and Dr. Ernest Cebert

Department of Biological and Environmental Sciences

Industrial hemp, or hemp (*Cannabis sativa* L., 0.3% THC and below), upon its legalization through the 2018 Farm Bill, has become an important emerging crop in the U.S. due to its versatility and its environmental benefits. Depending on the end-use, hemp can be used for fiber production, seed production, and medicinal purposes. In particular, essential oil hemp (EOH) is one type of hemp that (e.g., CBD, CBG) can be extracted from inflorescences to treat a wide variety of physical and mental issues, thereby possessing promising health benefits. Due to the half a century's ban and thus knowledge gap in the U.S., it is of great importance to evaluate how EOH hemp genetics interact with different growth/environmental conditions. The purpose of this study is to evaluate a number of auto-flowering and full-season EOH varieties for identifying the locally adaptive varieties in northern AL. Six and five EOH varieties were planted and evaluated respectively in 2020 and in 2021 as a replicated field trial (Randomized Complete Block Design, 4 reps) at the Winfred Thomas Agricultural Research Station (Hazel Green, AL). For each plot, plant stand, vegetative data, flowering data, maturity data, and post-harvest whole-plant terminal sampling data were collected; stress in weed pressure, insect, and disease were also monitored. Data analysis is now underway and results will be presented. Preliminary analysis suggests these varieties exhibited statistically significant variation in plant height, biomass and cannabinoid profiles. Our work evaluated diverse EOH germplasm in a climate and soil type-specific context and contributes as part of a nationwide uniform EOH variety testing network (led by Oregon State Univ) that aims to determine optimal environments and practices to produce EOH and to identify potential challenges in growing hemp.

**Graduate**

**Abstract # 109**

**Determining the effects of organic manures on the growth and yield of *Stevia***

DeAnthony Price, S. R. Mentreddy, S. Kumar, K. Scott, and T. Pham.

Mentor: Dr. Srinivasa Rao Mentreddy

Department of Biological and Environmental Sciences

*Stevia rebaudiana* (Asteraceae), a perennial herb native to South America, is a source of natural sweetener and is considered safe for consumption. People with diabetes consume stevia-based sweeteners because the bloodstream does not absorb them and thus, does not increase blood sugar levels. Due to increasing demand for stevia, the U.S. imports stevia from South American countries and China. There is a need to develop adapted, high-yielding stevia varieties and cultivation practices for stevia production in the U.S. The research objective was to determine optimal levels of organic manures for stevia production in an organic production system. The field experiment comprised of four treatments, no manure (Con); chicken manure (ChM); vermicompost (VM); and cow manure (CM) was laid out in a randomized complete block design with three replications of each treatment. Each manure was applied to provide 150 Kg/ha of N. The plant height and biomass production were measured to determine treatment effects. The ChM treated plants were taller (82.5 cm) and showed relatively better growth than plants in other treatments. Plants receiving CM had heavier stems (46.3 g dry weight/plant), and leaves were bigger and heavier (22.8 g/Plant dry weight) than those in other treatments. The plants in the chicken manure, vermicompost, and control (no manure treatments) did not differ in leaf or stem dry weights. Also, the application of cow manure enabled plants to produce more fresh leaf weight (64.9 g/plant) than chicken manure (53.3 g/plant), vermicompost (61.1 g/plant), or control (44 g/plant) treatments. Plants in the control treatment produced the lowest leaf biomass compared to manure treatments. Application of cow manure to stevia could help increase its fresh leaf and stem biomass production in Alabama.

**Abstract # 110**

**Impact of food deserts on health outcomes in individuals with metabolic disorders**

Jah-Nice Washington, and E. Weems

Mentor: Dr. Ebony Weems

Department of Biological and Environmental Sciences

Currently, within the United States, 36.5 % of Americans are faced with obesity, and 39 % of Alabama adults are faced with this challenge as well. Alabama is ranked as one of the twelve states that has a higher rate of obesity in comparison to the rest of the nation. Since the early 1960s, obesity has continuously been on the rise within the United States, becoming an epidemic. From 2019 to 2020, Alabama was the only state within the top twelve states that had an 8.03% increase, 39.0%, in the percentage rate of obesity. Within this study, we sought to determine the association of social determinants such as transportation methods, global health crisis, and built environments in correspondence with metabolic disorders such as obesity, diabetes, and mental health. It is hypothesized that social determinant factors are associated with an increased body mass index (BMI) in food desert areas. Geospatial analysis revealed that there were several counties within the state of Alabama where there were significant percentages of adults with Type II diabetes. Within those same counties, adults ages 18-65 had limited accessibility to fresh fruits and vegetables. Data suggest the direct association of limited access and an increased rate of obesity in these areas. Analyzing Geographic Information System (GIS) data, it is shown that in 2015 only 5.97% of counties had more than 50,000 adults with access to grocery stores, and few counties had a percentage range of 0-1.5% where adults had access to a car. Although there is a correlation between Type II Diabetes and obesity, to fully determine if they correspond from analyzing GIS maps, further studies will have to be done which will show more in-depth evidence of adults that are living within a food desert area who are challenged with obesity, are also impacted by Type II diabetes.

**Abstract # 111**

**Functional analysis of the glucose response in intestinal epithelial cells *in vitro***

Karl Pruitt II, R. Green, and E. Weems

Mentor: Dr. Ebony Weems

Department of Biological and Environmental Sciences

Type 2 Diabetes (T2D) is a complex metabolic disease that impacts glucose regulation and energy conversion. Continually building in the blood rather than energy conversion, resulting in elevated blood sugar levels. Previous studies have shown that glucose-dependent molecular

mechanisms and the complement pathway contribute to the onset of insulin resistance, leading to T2D. Nonetheless, the gene expression and morphology of the enterocytes located in the small intestines, the primary nutrient absorption site, in response to glucose, and the linkage to the complement pathway have not been comprehensively studied. Therefore, it is critical to understand the molecular mechanisms of intestinal enterocytes and the role of the complement pathway as both leading causes of T2D. We hypothesize that further analysis of high glucose-regulated genes will reveal a link between the complement pathway and the development of insulin resistance leading to T2D. Therefore, this study seeks to understand the molecular responses of enterocytes to high glucose in vitro. Six candidate genes were identified using transcriptional differentiation to understand the molecular responses and interactions in intestinal epithelial cells associated with increased glucose levels. A gene set enrichment analysis was performed utilizing the Database for Annotation, Visualization, Integrated Discovery (DAVID), and Gene Ontology. DAVID demonstrated a functional annotation and analysis that identified the differential expression of over 800 genes involved in several biological processes. The Kyoto Encyclopedia of Genes and Genomes (KEGG) and Panther Database were used to analyze the known pathways of the candidate genes. Two genes, GLUT2 and C3, were identified to be associated. Therefore, we can believe that the complement pathway does play an active role in the onset of insulin resistance leading to T2D. Furthermore, understanding the glucose response in the small intestine will elucidate the molecular interaction of the complement pathway and its role in the onset of T2D.

**Abstract # 112**

**Evaluation of three Vietnamese turmeric (Curcuma spp.) Varieties for growth in the high tunnel and open field**

Khadejah Scott, S. R. Mentreddy, T. Pham, L. Duong, D. Price, and S. Kumar

Mentor: Dr. Srinivasa Rao Mentreddy

Department of Biological and Environmental Sciences

Turmeric (*Curcuma* spp.) is a rhizomatous, perennial plant native to Asia, commonly used as an herbal product. Due to concerns with international production, U.S. herbal product producers seek domestically grown turmeric. The accessible growing season and suitable varieties are fundamental challenges for turmeric production in Alabama. This research sought to determine if high tunnel production could extend the growing season of turmeric. Three varieties of Vietnamese turmeric, VN39, VN50, and CL11, were utilized for the experiment. Five rhizomes from each variety were planted in single-row plots at a spacing of 1' between plants in a row and 3' between rows in both the high tunnel and open field. The experiment was in a

randomized block design and replicated three times. A mixture of organic manures, composted chicken manure, and vermicompost was added at the time of planting to provide an equivalent of 50 lb. of N/Ac. Moisture- stress-free conditions were maintained using drip irrigation. Plant heights and shoots were recorded at weekly intervals during the growing season. The high tunnel extended the growing season of turmeric by 26 days. Plants in the high tunnel had an average of 2.4 shoots compared to the open field which had 2.7. The plant height in the high tunnel ranged from 8.7" to 42.9", 8.5" to 38.1", and 10.7" to 48.8" for C11, VN39, and VN50, respectively. In comparison, the plant height in the open field ranged from 10.2" to 35.5", 8.0" to 33.5", and 8.3" to 34.8" for CL11, VN39, and VN50, respectively. Among varieties, VN 50 plants were consistently taller than other two varieties in both the high tunnel and open field. The plants height of VN39 was consistently shorter than other varieties. These results indicate high tunnel production may be an efficient way to extend the growing season of turmeric.

**Abstract # 113**

**Soil water and temperature variability in corn row cropland**

Moonsun Yang, X. Xiao, X. Kuang, D. Davis, and M. Mbila

Mentor: Dr. Monday Mbila

Department of Biological and Environmental Sciences

Soil water and temperature are key components impacting plant growth, but their variability in time and space remain less studied. The purpose of this study was to determine the effects of row position on soil water and temperature variability in a corn (*Zea mays* L.) field. The study was conducted in a field at the Winfred Thomas Agricultural Research Station, Hazel Green, Alabama. Soil water content and temperature was measured by using 5TE soil moisture/temperature sensors connected to a datalogger (METER Group, Inc., Pullman, WA, USA). The sensors were installed at 5, 10, and 25 cm soil depths at Within-row and Between-row positions and monitored throughout the growing season. Results showed that soil at Within-row positions received more water and showed higher soil moisture increases after rainfall events. The Within-row soil dried out faster during the periods between rainfall events, compared to Between-row position soil. The ratios of soil temperature at Between-row and Within-row positions corresponded with the different growth stages of corn growing season. The distribution of soil water and temperature at Within-row and between-row positions supports the concept of water and heat transfer in multi-dimensions and indicates the period of the growing season in row crops when water and heat transport revert from one dimension to multiple dimensions.

**Abstract # 114**

**Rhizospheric science: Fertility status and metal uptake in hemp production**

Soni Omontese, and Z. Senwo

Mentor: Dr. Zachary Senwo

Department of Biological and Environmental Sciences

*Cannabis Sativa* is a hemp cultivar grown mainly for industrial, agricultural or medicinal use. Hemp contains very low (0.3%) levels of tetrahydrocannabinol (THC). The heavy metals that occur naturally in the soil by pedogenetic processes of weathering are rarely toxic and usually occur at levels regarded as trace (<1000mgkg−1). Disturbances that involve accelerated geochemical cycling of metals by human activities tend to increase the amount of heavy metals above defined background levels. However, metals pose threat to plants, animals, humans, and the ecosystem. This study is to gather information that promotes sustainable organic hemp production. The objectives are to determine the fertility status of the soil to support hemp production, determine heavy metal fractions in rhizospheric soils and hemp varieties. Five newly acquired hemp varieties namely: Alpha Explorer, Queen dream, Sour-Kush, Rogue, Photo CBD collected from 4 replica plots have been employed for this study and were collected for their roots, stems and leaves. Soils, plant, and root samples were dried and will be subsequently grounded and sieved. The soils and hemp will be subjected to digestion using a micro-wave digester, and subsequently analyzed with the Induced Coupled Plasma-Optical Emission Spectrometer (ICP-OES). Split-plot designs repetitions and responses according to metal translocation in different hemp cultivars will be recorded. This study will identify bio-chemical processes occurring in the rhizosphere; explain the mechanism of heavy metal uptake from soils and distribution in parts of the hemp tissues (roots, stem, and leaves); identify the most effective hemp variety for metal uptake; and suggest the possibilities of growing hemp easily using its biomass in multiple non-food areas such as making heavy metal-contaminated soils productive.

**Abstract # 115**

***Saccharomyces cerevisiae* exhibits varying sensitivity to rapamycin when grown on distinct media containing Curcuminoid Mix**

Tanesha Hatchett, and T. L. Farmer

Mentor: Dr. Tyesha L. Farmer

Department of Biological and Environmental Sciences

The therapeutic benefits of turmeric (*Curcuma* spp.) are primarily attributed to the presence and abundance of 3 bioactive curcuminoids: curcumin, bisdemethoxycurcumin, and desmethoxycurcumin. Previous investigations in our lab demonstrate dissimilar sensitivity profiles of individual curcuminoids in *S. cerevisiae*. In addition, yeast cells grown on distinct media types were less sensitivity to Tor kinase inhibition in the presence of curcumin. In this study, the ability of curcuminoid mix (CM) to alter cell growth on different media types during TOR inhibition was evaluated. FY251, BY4741, and fet3Δ isogenic strains of *S. cerevisiae* were 10-fold serially diluted and spotted onto rich media and synthetic complete agar plates containing 100-300ug/mL CM+/- 5ng/mL rapamycin. Plates were incubated at 30 °C for up to 6 days and examined for colony formation. Each experiment was repeated at least 3 times. Remarkably, all three yeast strains displayed sensitivity to CM when grown on rich media, regardless of rapamycin presence. In contrast, CM was antagonistic to rapamycin in control cells grown on synthetic complete media. Antagonism did not increase with increasing concentration of CM, suggesting the need for evaluation at lower concentrations. The fet3Δ isogenic strain was hypersensitivity to CM under all conditions assayed. This observation is consistent with previous reports for curcumin sensitivity in this strain. Liquid culture assays of BY4741 in SC media confirm apparent antagonism of CM and rapamycin. Studies to assess additional sensitivity profiles in liquid culture are underway. These studies will help provide an understanding of the synergistic anti-proliferative effects of curcuminoids, particularly in the context of Tor kinase signaling inhibition.

**Abstract # 116**

**Comparison of four Virginia mountain mint (*Pycnanthemum virginianun*) varieties for regrowth and biomass production over two years in North Alabama**

Trang Huong Pham, L. Duong, S. Kumar, D. Price, K. Scott, C. Nguyen, and S.R. Mentreddy

Mentor: Dr. Srinivasa Rao Mentreddy

Department of Biological and Environmental Sciences

Mountain Mint (*Pycnanthemum* spp.), a peppermint flavored herb of the Lamiaceae family, is used for making aromatic and medicinal teas. The oil is used in confectionery and medicinal

products. A need exists for adapted and easily grown varieties for production in North Alabama. Towards this end, four varieties (M1, M2, M3, & M4) were planted in field plots in 2020, and after three harvests, they were left to overwinter and regrow in 2021. The study's objective was to compare the four varieties' regrowth potential and biomass yield in Year 2. The planting, crop management, yield, and oil content and composition from Year 1 (2020) trials have been published. In Year 2 (2021), all four varieties sprouted in late March and were evaluated for regrowth and biomass production at two harvest times of 128 and 228 days after regrowth (DAG) in Year 2. The seasonal total fresh whole plant biomass ranged from 398 g/plant (M4) to 1719 g/plant (M1); the M3 variety had the highest leaf yield of 896.6 g/plant, followed by M1 (864g/plant). The total season whole plant biomass of M1, M2, & M3 in Year 2 was respectively 26, 34.2, & 41.8% more than that of Year 1. The fresh leaf biomass in Year 2 was greater than that of Year 1 by 4.4 %, 14.2 %, 26.9% for M1, M2, & M3, respectively. However, the fresh whole plant, stem, leaf biomass of M4 decreased by 2.7 %, 53.2 %, 22.3 %, respectively, in Year 2 compared to that in Year 1. The study showed that mountain mint offers potential for production in North Alabama, and farmers can maximize its yield and minimize production costs by growing the crop over multiple seasons. Varieties M1 and M3 with higher plant and leaf biomass consistently over two seasons merit consideration for commercial production in North Alabama.

## COMMUNITY AND REGIONAL PLANNING

### Undergraduate

**Abstract # 117**

**An assessment of affordability of housing and its effect on homeownership in Alabama**

Aneisha Ingram, and J. Oluwoye

Mentor: Dr. Jacob Oluwoye

Department of Community and Regional Planning

Homeownership is often associated with wealth and stability. It is a human necessity that helps to mold the society we live in. However, there is still the concern of housing being affordable. The purpose of this research is to assess housing affordability in Alabama and find out if homeownership is impacted by the requirements and costs. There are eighteen variables of data collected from 2010 to 2018 that were used to establish the results of this study. Majority of the data was collected from the U.S. Census Bureau. Other secondary data was collected from the World Economic Forum and PDF forms of comprehensive plans for cities in Alabama.

The results presented in this research justify that housing is not necessarily affordable and is often not to the convenience of the potential homeowner. More persons are now seeking to rent rather than to purchase. Admittedly, there might be other factors affecting homeownership to uncover, though that would require extensive research The United States Department of Housing and Urban Development needs to enforce policies that ensure equal opportunities at homeownership without persons having to meet strict requirements and fighting against high housing prices. Housing policies can also be altered to encourage persons to buy homes instead of rent. Evidently not everyone is interested in becoming homeowners, however, variation in the type of housing made accessible to these persons will ensure that everyone can afford whichever housing type they prefer.

## Graduate

**Abstract # 118**

**The role of alternative fuel in reducing US public transit greenhouse gas emissions**

Abimbola Babatunde, and J. O. Oluwoye

Mentor: Dr. Jacob O. Oluwoye

Department of Community and Regional Planning

Transportation sector is the second largest energy consumer after industrial sector in 2020 with up to 35%. (US EIA April 2021). However, the sector accounted for the largest portion of total US greenhouse gas emission in 2019 (29%). Public transportation provides low emissions to driving, by reducing the need to travel long distance, thus lowering the carbon footprint of transit operations, and mitigating the climate change crisis. Proportion of alternative energy in public transit is gradually improving, most especially the usage of compressed natural gas (CNG), more effort should be geared towards utilization of other biofuels. The purpose of this study is to assess the economic impact of alternative fuel usage in energy market of US public transportation system while secondary data was obtained from US Energy Information Administration and American Public Transit Association on fuel consumption (conventional and alternative), vehicle miles per travel and emissions between 2000 to 2019. Furthermore, simple direct (variation) equation was used to analyze the relationship amongst the variables. The result revealed a significant need to improve on utilization of alternative energy source in transportation to lower emissions. This paper concludes that further research work is proposed to improve energy efficiency of alternative energy sources.

**Abstract # 119**

**Assessing poverty among Hispanics/Latinos in Limestone and Madison Counties, Alabama**

Luis Balderrama, and E. Erickson

Mentor: Dr. Emily Erickson

Department of Community and Regional Planning

Latino and Hispanics groups have existed in the United States since after the Mexican - American war, when the United States won in the war, the Southwestern states. This added a new minority group into the nation, which now faces the same kind of racial and socio-economic challenges as other minorities in the nation. Hispanics and Latinos have historically resided in the Southwest and later in Chicago, New York City, as well as south Florida due to immigration from Latin America. Now many are skipping these traditional areas, and many are immigrating to the South. Limestone and Madison County in North Alabama are currently experiencing this, and it appears that this trend is only going to continue as it has since the 2010 census. This fast-growing community is affected by high poverty rates way above other racial groups in the region. With data collected from the American Community Survey (ACS) for the years of 2015-2019, primarily looking at unemployment, income, poverty, and educational attainment, this poster helps understand why poverty is so high in this community. These connections show that Hispanic poverty is prevalent in both counties due to low educational attainment, high unemployment and low-income wages below the county's median income. This poster's analysis also offers a deeper look into how all these causal factors differ and affect the poverty rates for Hispanics/Latinos in these two counties while also developing policy that helps improve the rate at which poverty is happening.

**Abstract # 120**

**The impact of COVID-19 pandemic on food insecurity in Alabama**

Mitchell Edwards, and D. Rukmana

Mentor: Dr. Deden Rukmana

Department of Community and Regional Planning

According to the U.S. Department of Agriculture (USDA), food security is described as having, "depend- able access to enough food for active, healthy living (Webster p1)." Conversely, food insecurity, or the lack of consistent access to adequate food, means that the "the food intake of one or more household members was reduced and their eating patterns were disrupted at times during the year because the household lacked money and other resources for food. Investigating the cause and effects of food insecurities because of Covid-19, will hopefully bring awareness to this nationwide problem. Food insecurity has increased sharply in America

because of the economic crisis caused by, deaths, employee lay off, furloughs, and reduced-time workers struggling to put food on the table as a result of Covid-19. According to Alabama Public Health, Alabama is the fifth poorest state in the nation, causing 17% of adults and 23% of children (1 out of 4) to struggle with food insecurity. 29 percent of poor households (households with income below 100 percent of the poverty level) reported food insecurity among children compared with seven percent of non-poor households. Feeding America Data shows an increase in the state regarding food insecurities in the last two years. In conclusion, Covid-19 has truly affected the state of Alabama negatively. Almost every county in the state has had a rise in food insecurity. The projections for 2021, indicates continued increases that will take years to reverse. Hopefully the spread of Covid-19 will slow, as citizens increase immunizations and with increased utilization of safety measures the communities and the country are taking. A decline in Covid-19 cases and its effects will help relieve the economic crises and thusly reduce food insecurities in Alabama and in the Nation.

**Abstract # 121**

**Creating affordable housing for low-income families in Huntsville and student housing for AAMU students: a planning study**

Nigeria A. Jones, and A. Ouf

Mentor: Dr. Ahmed Ouf

Department of Urban and Regional Planning

The city of Huntsville is rapidly growing in population. Huntsville is now the largest city in Alabama, population-wise. Between 2010 and 2020, Huntsville has added approximately 35,000 people to its population. While expansion is a great problem to have, it also brings with it challenges that Huntsville must address. Huntsville must plan for the deployment and development of new housing and infrastructure to support the thousands of new inhabitants who will be arriving. They also have to deal with the issue of housing shortages and rising housing prices and values. How are low-income families going to be able to afford these homes or pay for rising rent costs? What about AAMU students? There is not nearly enough off-campus student-housing options for students that are near the campus. A study was conducted to understand the socio-economic structure of the city of Huntsville and the areas that surround AAMU. This study has revealed that in most areas that surround AAMU, over 60% of households' income is $50,000 or less, all while home values continue to rise. In accordance with the zoning ordinance, can Huntsville be creative in helping the redevelopment of the areas that have aged and dilapidated commercial centers? We will be able to create more homes not only for low-income families, but can we also create more affordable off-campus student housing options for our students. Huntsville will continue to attract more people, we cannot

disregard the groups of people with different circumstances that will be affected by this rapid growth, and rising home values. Huntsville must build for equity and AAMU can be a help too.

**Abstract # 122**

**Comparative analysis of Jefferson and Walker counties Alabama population projection based on the Hamilton-Perry cohort component method**

Peter Oyewale, and J. Oluwoye

Mentor: Dr. Jacob Oluwoye

Department of Community and Regional Planning

This paper presents a comparative analysis of the 2040 population projection for Jefferson and Walker Counties Alabama based on the Hamilton-Perry Cohort-Survival method. However, the model which did not directly consider the three components of population change (natality, mortality and migration) was used to compute the county's population projection using parameters on age and sex of Jefferson and Walker County obtained from the American Community Survey 5-year estimates detailed tables. The result revealed that Walker and Jefferson Counties total population is projected to decline by 7.2% and 2.1% by the year 2040. It is expected that there will be a high decrease in people aged 50 and above in Walker County which contrasts with the expected high increase in the elderly population of Jefferson County. It is concluded from the result that there is need for social intervention in Walker County to attract young workers to strengthen the workforce while raising the retirement age in Jefferson County to forestall negative economic impact.

**Abstract # 123**

**Effect of mass housing development scheme on housing provision and delivery in Abuja, Nigeria**

Zainab O. Adedo, J. Oluwoye, and D. Rukmana

Mentors: Dr. Jacob Oluwoye and Deden Rukmana

Department of Community and Regional Planning

Housing problem remains an ever-increasing issue in Nigeria with so many policies being formulated to address the issue. Mass housing scheme emanated as a result of this to provide housing accommodation to the low- and middle-income group in the country especially Abuja which is the capital city of Nigeria. Mass housing represents one of the largest most established project-based sectors of the construction industry in most developing economies. This research examined the effect of mass housing development scheme on housing provision and delivery in Abuja, Nigeria. The work adopted the survey research approach. Data was collected through

the use of oral interview, observation and questionnaires. The simple random sampling approach was used and the sampling size of the study was put at 80. The data collection through this method was analyzed using descriptive and inferential statistics: descriptive statistics involved the use of charts, tables, figures and percentages to arrive at the findings and inferential statistics involved the use of Regression model to measure the relationship between the frequency of the respondent's responses. The conclusion of finding revealed that only two variables have significant influence on number of housing units intended to be provided by the developers. In particular, target occupants and factors responsible for gap such as lack of finance by the developers and lack of accessibility to mortgage facilities have significant and positive association with the number of housing units proposed by developers at 0.5% significance level.

## FAMILY AND CONSUMER SCIENCES

### Undergraduate

**Abstract # 124**

**eating habits and behaviors among recent Texas high school graduates: A pilot study**

Alaylia Brown, A. Williams, E. Culbreath, and. R. Miller-Cebert

Mentor: Dr. Rhona Miller-Cebert

Department of Family and Consumer Sciences

Behaviors such as eating habits, physical activity, and sleep quality remain a concern among teenagers in the United States and across the world. This study aimed to investigate the eating habits of recent high school graduates in the community of Little Elm, Texas. A twenty-six- the questionnaire survey was created following approval from Alabama A&M Institutional Review. Board, a consent form, and a survey were distributed electronically to teenagers who graduated from Little Elm High School in May 2021. A total of sixty-five high school graduates participated in the study (males: n=18; females: n = 44; other: n = 3). The survey solicited responses to questions relating to eating, physical activity, and sleeping habits. Statistical analysis was carried out using SAS 9.4 for Windows. In response to the question "do you consider yourself healthy" there was no significant difference in the responses among the three gender groups. However, males consider themselves "healthy" compared to the responses from their counterparts. Participants were asked if their "eating habits improved compared to a year ago," The 17 and 19 age groups indicated "yes," while 18-year-olds indicated that there

was no improvement. The gender groups other, female and male, sometimes responded, most of the time, and always, respectively, when asked if they sleep at least seven hours nightly. Male participants indicated that social media sometimes influenced their food choices, while females responded that celebrities do not influence their eating and exercise habits. Participants indicated that they were diagnosed as overweight (24%) and obese (9%). Understanding the eating habits of recent high school graduates can allow for targeted intervention as individuals transition to college, where their dietary lifestyles are likely to change. This may help combat some eating disorders and related health issues seen in young adults today.

**Abstract # 125**

**Sustainable and ethical fashion - A reflective response**

Kelsey Ball, C. Ward, and P. Gitimu

Mentor: Dr. Pricilla Gitimu

Department of Family and Consumer Sciences

Sustainable and ethical fashion is an essential topic of discussion because the fashion industry is the second-largest polluter globally, second only to the oil industry. Sustainable fashion has been a goal in the fashion industry for a long time, but the has been an increase in fast fashion. Students of color watched and critiqued the film, the 'True Cost Movie", which depicts lots of imagery of the harsh reality of fast fashion. The ten students then wrote a reflective response to the movie. The qualitative analysis from this class activity showed these five themes: Reduce purchase of clothing=5; Reuse clothing=5; Recycle clothing=4; Use Sustainable clothing =7; Oppose fast fashion=11. Students agree that foreign countries are at risk due to fast fashion contamination. The students also believe that the workers are being extorted in poor conditions to get the fast fashion out in unbearable conditions. These individuals make our clothing deserve respect and dignity with decent salaries. Fast fashion is convenient but should be made morally to enjoy; it comes with a high cost for the individuals who produce it and has a negative environmental footprint. Students, as a group, agreed that the first step to improving the issue is recycling more. Buying less and reusing more will slow fast fashion production because people are not buying as much. This chain reaction means the demand for clothes will decrease, which will help slow down pollution production. This study aims to bring awareness to fast fashion and advocate change in the fashion industry.

**Abstract # 126**

**Back to life: Is upcycling the new fashion buzz?**

Maliah Harris-Smith, T. Hampton, and C. Bobwealth-Omontese

Mentor: Ms. Carmi Bobwealth- Omontese

Department of Family and Consumer Sciences

The fashion industry has been reported to contribute substantially to greenhouse gas emissions and the utilization of scarce environmental resources. Fashion stakeholders need to reevaluate their approach to reduce fast fashion's rapid cycle of consumer acquisition and disposal of apparel products. Upcycling is becoming increasingly popular in the contemporary fashion industry, which entails transforming old, damaged, worn-out, or unwanted apparel into new, one-of-a-kind pieces. This study aims to present and discuss the participation of Apparel, Merchandising, and Design (AMD) students in an upcycling project. To challenge the fashion industry's ideas and concepts and increase creativity, AMD students used materials like old denim pants, shoes, and curtains to create new pieces. Designs were developed using fashion design principles and techniques. The description of the different stages of the design process (initial drawing, material selection, pattern drafting, cutting, sewing, and finishing) is presented. Implications for fashion designers, consumers, and the fashion industry are also discussed.

**Abstract # 127**

**Impact on college students' mental health: A collateral damage of COVID-19**

Melody Dickerson, S. Anasuri, and B. Wheeler

Mentors: Dr. Sadguna Anasuri, and Dr. Brandan Wheeler

Department of Family and Consumer Sciences

The COVID-19 pandemic required an immediate change in the daily routines and experiences of many college students. Within days, these changes included the transition from in-person to virtual classes, the need to leave college campuses, and the return to home towns as they entered quarantine protocols. These abrupt changes have had a significant and often negative impact on the mental health of many adults, including college students. The purpose of the current study is twofold: (1) to determine the impact of COVID-19 and its subsequent lockdown on the mental health outcomes (anxiety, depression, and stress) among college students and (2) to explore potential differences in this impact by age and gender. Among all adults, existing research has demonstrated that women experienced greater stress levels than men, although stress levels were lower for older adults (Gloster et al., 2020). Among college students, 71% of students (aged 18-25) expressed increased anxiety and stress from the pandemic. In comparison, 20% of students indicated similar anxiety and stress levels, and 9% reported

decreased anxiety and stress (Son et al., 2020). College students also expressed greater fears and worries about their health and the health of their family members (Son et al., 2020). As a result of these changes in their mental health, many college students also reported decreased motivation, concentration, academic performance, and social interactions (Son et al., 2020). Information about this impact by COVID is still being gathered as we enter the third year of this pandemic.

**Abstract # 128**

**Role of mass media on food, fitness, and lifestyle behaviors among young adults: An exploratory study**

Nia A. Freeman, and S. Anasuri

Mentor: Dr. Sadguna Anasuri

Department of Family and Consumer Sciences

In today's society, individuals continuously use the Internet daily. Young adults, 19-26-year-olds, are more dependent on the media. They use the media for various daily activities and lifestyle habits such as fitness, health tracking, online ordering, etc. The study was aimed to examine four dimensions: (a) daily living patterns, (b) lifestyle, use of various lifestyle mass media (Television, Internet), social media (Facebook, Twitter, Instagram, YouTube), (c) eating habits (order online, eating out, grocery shopping), and (d) fitness (exercise at the gym, home, walk/jog, dieting). The sample consisted of random young adults across the United States using a 50-question survey that used a 5-point Likert scale. The data were analyzed using Spearman's rank correlation coefficient, and a partial set of results (only those with $p<.01$) are given here. Results showed that female participants felt they needed to lose weight ($r=-.187$), exercised at home/ gym ($r=.257$), and tracked their health/weight/ exercise with an online friend ($r=.116$). Further, the use of media impacted their consumption of packaged foods ($r=.093$), carbonated water ($r=.102$), energy drinks ($r=.135$), ate while watching Television/computer ($r=.108$), ordered food online ($r=.122$ among women and .071 among 24-27-year-olds). Regarding their amount of media use, 40% spent 3-4 hours/day, while 24% spent 1-2 hours/day watching TV and browsing the Internet. Regarding their cellphone use, 64% used their smartphones often or always. Extensive use of mass media played a critical role in food, choices, lifestyle, fitness practices, and perceptions of their image.

**Abstract # 129**

**Thrifting to save the planet: Conversation with secondhand apparel consumers**

Tate Hampton, M. Harris-Smith, P. Gitimu, and C. Bobwealth-Omontese

Mentor: Ms. Carmi Bobwealth-Omontese

Department of Family and Consumer Sciences

Excessive consumption is evident in the fashion industry. Fast fashion contributes to the depletion of non-renewable sources, emission of greenhouse gasses, and the use of massive amounts of water and energy. Secondhand shopping opposes conventional consumption views, which are dominantly inclined toward purchasing new products. This study aimed to understand the motivations and lived experiences of secondhand consumers. In addition, the study examined consumers' perceptions of secondhand shopping attributes that either encourage or deter their decision to engage in secondhand shopping. Questions developed to address the research objectives were as follows: 1) What are consumers' experiences with shopping secondhand apparel? 2) What incentives drive secondhand consumers to patronize secondhand apparel? The study adopted a qualitative approach using phenomenology to collect data from black female participants who engage in secondhand apparel shopping using multiple secondhand shopping channels. Data was collected using open-ended follow-up questions in the interview with individual participants. The themes that were generated from the interviews are discussed. This research contributes to the existing literature on consumer behavior and collaborative fashion consumption. Limitations and suggestions for future studies are discussed.

## Graduate

**Abstract # 130**

**Intuitive eating and depression among young adults: A correlational study**

Ashley F. Knight, M. Sexton, and N. Sistani

Mentor: Dr. Nahid Sistani

Department of Family and Consumer Sciences

Obesity rates in the United States are increasing, emphasizing dieting. Research has shown that dieting can negatively affect all aspects of health – physical, mental, and social. Decreased physical, mental, and social health can lead to a more severe condition such as depression. Intuitive eating is a new health approach that has been extensively studied and found to improve individuals' physical, mental, and social health. It teaches individuals to reject the diet

mentality and build a healthy relationship with their bodies and food. This study was designed to determine if there was a negative correlation between intuitive eating and depression. A sample of 124 participants from Alabama A&M University was randomly selected to fill out a questionnaire that examined their eating behaviors and the presence of depressive symptoms. The researcher found a statistically significant negative correlation between intuitive eating and depression among young adults ($p < 0.05$). There was also a negative correlation between the two variables among females and Caucasians ($p > 0.05$). However, no significant correlation was found between intuitive eating and depression among males and African Americans ($p > 0.05$). The researcher also found a significant linear relationship between intuitive eating and depression. Based on the findings of this study, intuitive eating could potentially decrease the prevalence of depression in young adults.

**Abstract # 131**

**Financially fit: Empowering youth to spend and save wisely**

Darlene Minniefield and S. Anasuri

Mentor: Dr. Sadguna Anasuri

Department Family and Consumer Sciences

About 7.6 million children live in households that do not have a bank or credit union account. Studies show that financial account experience, combined with financial education at an early age, can shape some young person's habits to last for a lifetime. It was found that only four in seven Americans are financially literate and only 24% of the millennials understand basic finance concepts. National Credit Union Administration, Office of Consumer Financial Protection promotes empowering our youth to save by creating and developing a basic financial plan that can be utilized in healthy financial habits early. The goals of this program include (a) Learning how to develop a budget, (b) Opening a savings account, (c) Maintaining a minimum balance of $50.00 or more in a saving account for six months, and (d) Limit the # of withdraws from your saving account by one within six months. Taking a hands-on approach with our youth who at an early age can develop and participate in financial education programs that include real-world financial experiences, which are more likely to develop positive attitudes about money and saving. This will help them benefit beyond money and help them develop healthy financial habits early, which can start as early as preschool. Classroom activities and lessons focused on healthy financial practices such as saving, spending, credit, debt, employment, and income can be learned at home by watching parents or caregivers when they shop, save, and borrow. Youth can also learn in school with a credit union and bank branches inside schools that offer students basic saving accounts. It was found that youth with a higher level of financial literacy are more likely to cope with financial crises, less susceptible to financial scams, and more likely to become financially responsible.

**Abstract # 132**

**Nutritional content on social media: Effects on college students' food choices and behaviors**

Alexis Presnell, S. Anasuri, R. Miller-Cebert, S. Khan, and N. Sistani

Mentor: Dr. Nahid Sistani

Department of Family and Consumer Sciences

The Internet today is a big player in our daily life, and its impact cannot be ignored on how it influences young adults' dietary choices and other nutritional behaviors. An exploratory study was conducted at Alabama A & M University to determine the impact of dietary-related social media content on college students and their openness to newer foods and recipes. The students completed a questionnaire via email, Blackboard, Facebook, and Instagram. A random sample (n=221), including males (n=51) and females (n=169), were surveyed on how social media affected their diet. The results showed that 33% of the students spent 6 hours or more per day checking social media sites, 30% spent more than 4-5 hours, 29% spent 2-3 hours, and only nine percent spent less than one hour. The study showed a positive correlation between the amount of time spent on social media and college students' influence to try new foods/recipes. Twenty-three percent of females and thirteen percent of males reported significant impacts on trying new foods/recipes. The study demonstrated that social media is a significant source of information for college students in deciding their healthy dietary practices.

## FOOD AND ANIMAL SCIENCES

### Undergraduate

**Abstract # 133**

**The antimicrobial ability of acetic acid and a surfactant to control *Salmonella* on poultry**

Alencia Lamb, A. Jackson-Davis, A. Dudley

Mentors: Dr. Armitra Jackson-Davis, and Aaron Dudley

Department of Food and Animal Sciences

Organic acids are commonly used to control pathogens in foods and are commonly diluted in water to facilitate their application at various concentrations. Because water is a poor wetting agent for hydrophobic surfaces, other aides must be used to ensure that the antimicrobial is able to make contact with the food product. Therefore, the objective of this study was to investigate the ability of acetic acid alone and combined with a surfactant to control Salmonella in vitro. The antimicrobial efficacy of a concentration of acetic acid was evaluated against a five-

serotype mixture of S. enterica (~ 7.0 CFU/mL) using the Bioscreen C. Water and 20 ppm sodium hypochlorite without an organic acid served as controls. Treatments were evaluated at various time points. Serial dilutions of targeted concentrations were serial diluted and plated.

**Abstract # 134**

**Development of an interactive hands-on activity in the area of sanitation for underrepresented and underserved farmers**

Alexander Hall, A. Jackson-Davis, B. Cooper, D. Bailey, A. Howell, M. Wright, D. Davis, E.

Chaverest, D. Chembezi, B. Omontese

Mentors: Dr. Armitra Jackson-Davis, Bria Cooper, and Dalais Bailey

Department of Food and Animal Sciences

Under the Food Safety Modernization Act, the Produce Safety Rule (Rule) mandates training of individuals in farming operations that must adhere to the requirements of the Rule. As a result of this, many farmers have participated in the Produce Safety Alliance (PSA) Grower Training. Even with this, it is important for farmers to understand the application of content learned during the PSA Training. Therefore, the objective of this study was to develop an interactive hands-on activity related to sanitation in farming operations. To accomplish this, an activity was determined and a protocol was developed. Using produce and surfaces that are of interest to the participants, product and surfaces were artificially inoculated with non-pathogenic microorganisms to demonstrate the effectiveness of sanitizers on produce. The activity will be presented to the Advisory Team for feedback. A one-page instructional document will be developed and used in workshops where the target audience will be underrepresented farmers located in the southern region of the US. The development of this activity aligns with Module 6 (Postharvest Handling and Sanitation) of the PSAGrower Training.

**Abstract # 135**

**Evaluating the association between age, hemogram and rectal temperature of beef cattle at the Winfred Thomas Agricultural Research Station**

Alondrah N. Santana, K. Prim, Z. Allen, F. Samuel, N. Ogunkunle, F. Zakari, B. Omontese

Mentor: Dr. Bobwealth Omontese

Department of Food and Animal Sciences

Hematology and rectal temperature are not only relevant for diagnosing disorders of the circulatory system but also helpful in the diagnosis of many systemic diseases. Although the diagnosis of a disease can only occasionally be based solely on a complete blood cell count, the hemogram and rectal temperature may contribute valuable information in the welfare,

diagnosis, recovery, and formulation of a prognosis regarding the future progression of a disease. The objective of this study was to evaluate the association between of age, hemogram and rectal temperature of beef cattle. A subset of Angus cattle (n = 70) managed at the Winfred Thomas Agricultural Research Station were enrolled in the study. Animals ranged in age from 1 mo. to 5-yr-old and grazed a 350-ha mixed grass pasture. Animals were grouped into three age classes (Calf; 1 mo. old, Yearling; 1-1.6 yr. old, and Adult; 3 - 6 yr. old), and were provided free-choice access mineral blocks and water ad libitum. Blood sample and rectal temperature data was collected biweekly for 3 months and analyzed using Stata 14.1. Mean white blood cell (WBC), red blood cell (RBC), hemoglobin (HGB) and platelets (PLT) concentrations differed ($P < 0.05$) between different age groups. Compared with calves, WBC and PLT smaller ($P < 0.05$) in adult cows (7.17 and 220.76 vs 11.37 and 416.33 x 109 cells per liter, respectively). Adult cows had a greater HGB concentration compared with yearlings (11.9 vs 10.5 g/dl, respectively). Calves had a lower rectal temperature compared with yearlings and adult cows (102.2 vs 103.6 and 102.9 $^{o}$F, respectively). We concluded that age is important health factor that influenced hemogram and rectal temperature of cattle.

**Abstract # 136**

**Development of a gourmet (decadent) functional single-serve trifle**

Alton B. Chambers IV, M. Verghese, and R. Kaur

Mentors: Dr. Martha Verghese, and Dr. Rajwinder Kaur

Department of Food and Animal Sciences

The trifle originated in 18th century England and was considered a food for royalty before becoming a country-wide staple during holidays and celebrations. Trifle traditionally consists of several layers including sponge cake, fresh fruit, custard, and jam, ingredients which contain little to no functional benefits. An issue concerning traditional trifles is that the final product is designed to feed 8-10 individuals, which leads to an issue as individuals want the experience of enjoying a trifle without an excess of leftovers and the excessive caloric intake without any functional benefits. The objective was to develop a functional single-serve trifle product using functional (health) ingredients, with a clean label, determine shelf stability (shelf-life testing), and determine overall acceptability. The biscotti layer was prepared using a pre-ground flaxseed powder at a level of 15%. Jam layer was prepared with fresh strawberries, blueberries, raspberries, and blackberries. The sponge layer was prepared using poppy seeds at a level of 15%. Further studies including physiochemical, shelf life and other consumer acceptance tests will be conducted as well as phytochemical and antioxidant benefits. Consumer acceptability will be determined using 5-point Hedonic scale and JAR (just about right) scale. With an increase in consumers' want for indulgent and novel desserts, the multi-layered gourmet trifle

is a single-serve decadent dessert, that is delicious, healthy, and portable, with a diverse blend of berries, which are great sources of flavonoids, anthocyanins, phenolics, fiber, and vitamins.

**Abstract # 137**

**Development of interactive hands-on activity in the area of the microbiological safety of agricultural water for underrepresented and underserved farmers**

Arielle C. Howell, A. Jackson-Davis, B. Cooper, D. Bailey, A. Hall, M. Wright, D. Davis, E.Chaverest, D. Chembezi, B. Omontese

Mentors: Dr. Armitra Jackson-Davis, Bria Cooper, and Dalais Bailey

Department of Food and Animal Sciences

The Produce Safety Rule now requires covered farming operations to ensure training of workers. Although many farmers have participated in the Produce Safety Alliance (PSA) Training, experiencing hands-on activities will allow farmers to better understand the application of what has been learned. Therefore, the objective of this study was to develop an interactive hands-on activity related to agricultural water in farming operations. To accomplish this, an activity idea and protocol was developed. Different water sources from a farming operation were sampled to observe the presence/absence of microorganisms. The activity will be presented to the Advisory Team for feedback. A one-page instructional document will be developed and used by workshop participants. The target audience for this effort is underrepresented farmers with farming operations in the south. The development of this activity aligns with Module 5 (Agricultural Water: Production Water and Postharvest Water) of the Produce Safety Alliance Grower Training.

**Abstract # 138**

**Morphometric and behavioral changes of Anotolian Pyrenees puppies during the 1st month of life**

Daivon Allen, A. Reid, F. Samuel, F. Zakari, B. Omontese

Mentor: Dr. Bobwealth Omontese

Department of Food and Animal Sciences

Growth and development involve changes in morphometric and behavioral characteristics in all domestic animals. This study examined the morphometric and behavioral changes of Anotolian Pyrenees Puppies during the 1st month of life. Five puppies, from the same litter (two females and three males) were video recorded and assessed weekly for morphometric parameters

±including body weight, length, girth and height. for the length of sleep, suckling and playing performed by recordings with a laptop with an extended webcam with a microphone for three hours per day. Pups body length, girth, temperature and height were measured twice weekly for one month. Suckling (141.57± 20.67, 139.86 ± 28.35, 142.19± 19.12 and 24.90± 31.78 mins for week 1, 2,3 and 4 respectively), playing (45.24± 38.70, 61.67 ± 42.61, 74.29±29.71and 90.14±13.04 min for week 1,2,3 and 4 respectively) and sleeping (410±40.2, 387.22± 24.54, 365.08 ± 18.08 and 338.645 ± 20.7 min for week 1,2,3 and 4 respectively) duration did not differ significantly (P>0.05) between the weeks. However, the weekly weight gain (3.03± 0.11, 4.48±0 .35, 7.7± 1.65 and 11.38± 2.19 lbs for weeks 1,2,3 and 4, respectively), body length (12.33± 1.26, 17.33± 1.77, 20.67±1.46 and 24.67±1.37 cm for week 1,2,3 and 4 respectively), Girth (10.71 ±2, 13.25 ± 0 .11, 15.5± 0 .71 and 17.02± 1.34 cm for week 1,2,3 and 4 respectively) and height (2.48±0.78, 7.22±0.84, 11.083±0 .52 and 13.15±0 .64 cm for week 1,2,3 and 4 respectively) increases significantly with increasing weeks (P<0.05). We concluded that although Anotolian Pyrenees pups show rapid morphometeric changes withing the first one month of life, suckling, playing and sleeping do not differ significantly.

**Abstract # 139**

**Effect of chronic melatonin supplementation during mid to late gestation on stress biomarkers, hemogram, performance and behavioral response of cows exposed to summer heat stress**

Daraja Maye, D. Maye, A. Santana-Rodriguez, F. Samuel, N. Ogunkunle, F. Zakari, B. Omontese

Mentor: Dr. Bobwealth Omontese

Department of Food and Animal Sciences

Melatonin is a highly effective antioxidant and free radical scavenger, it also modulates immune response and has anti-inflammatory effect in domestic animals. This study examined the effect of supplemental melatonin during mid to late gestation on serum cortisol, heat shock protein 90 and glucose levels, performance, behavior and hemogram of cows and their offspring during summer heat. Multiparous beef cow and were randomly assigned to 1 of 2 groups supplemented with melatonin® implants 24 mg (MEL, n=13) or without (CON, n=12) at day 190, 218, and 246 of gestation. Also, offspring performance (24 calves) was evaluated. Body weight, rectal temperature, blood, behavioral responses (chute score, vocalization and exit score) were visually scored biweekly over 16 weeks period. The average daily gain, rectal temperature, glucose concentration and hemogram of cows and calves showed no significant difference (P>0.05) between treatments. Cortisol levels were significantly lower (P<0.05) in MEL cows compare to CON from day 14 (1437 ± 2.54 and 2028 ± 3.23 pg/ml respectively) to the end of the experiment. Heat shock protein 90 (HSP90) serum concentration were also significantly

lower (P<0.05) from day 14 to the end of the study period (0 ng/ml and 0.73 ng/ml respectively). Chute and exit score did not differ significant between groups. We concluded that chronic melatonin supplementation during mid to late gestation reduced serum serum cortisol and HSP90 in cows exposed to summer heat stress.

**Abstract # 140**

**Effect of atmospheric pressure plasma (APP) exposure on the germination efficacy of mustard greens seeds**

Fanta M. Sowe, Fanta M. Sowe, Gabe Xu, Judith Boateng and S.R. Mentreddy

Mentors: Dr. Judith Boateng, and Dr. Srinivasa Rao Mentreddy

Department of Food and Animal Sciences

As humans continue exploration far from Earth, it is now critical to provide astronauts with foods that not only meet the nutritional requirements but also promote their psychological and physiological health. Implementing innovative ideas for growing sustainable and climate-resistant vegetables must be a priority. The mustard greens are mild-flavored Ethiopian kale and are flavorful and provide essential nutrients, and antioxidants, which contribute to overall health. A preliminary study was carried out to assess the effects of atmospheric pressure plasma (APP) exposure on mustard greens var. Amara's germination, germination rate, and growth under drought stress conditions. 'Amara' mustard green seeds were exposed to APP generated by two different gases, Helium and Argon at different exposure times of 0, 30, 60, 90, 120, 240, 360, and 480 seconds. The treated seeds were observed for days to germination and the germination rate. All treatments except exposure times 120 s and 360 s in Ar and 240, 360, and 480 s in He germinated on day three after the treatment. In Ar treatment, seeds exposed to 90 s were the earliest (21%) to germinate, whereas, in the He treatment, seeds exposed to 30 s were the earliest (16%). However, the germination rate was faster in He treatments than Ar. By Day 7, the percentage germination ranged from 69 (120 s) to 94 (30 s) in Ar and from 80% (Con) to 86 (240 s) in He gas treatment. In both gas treatments, the seeds exposed to APP germinated earlier and faster than the Control treatment. The percentage difference between Control and treated seeds was higher in He than in Ar treatment. Thus, the study showed that exposing the seed of mustard greens var 'Amara' to APP enables early germination and faster germination rates. This has implications for drought tolerance and avoidance in mustard greens.

**Abstract # 141**

## Dietary intake assessment of African American adolescents (18-22) with a family history of chronic diseases

Katelyn Boyle, C. Jackson, S. Willis, L.T. Walker, R. Kaur, and M. Verghese

Mentor: Dr. Martha Verghese and Dr. Rajwinder Kaur

Department of Food and Animal Sciences

Approximately 6 in 10 individuals have one or more chronic diseases in the U.S., with obesity and diabetes as dominant illnesses. Shifting diets and lifestyles have contributed to the observed rise in obesity and Type 2 diabetes rates, primarily among adolescents. Prevention often includes dietary intervention. Furthermore, studies have suggested products that incorporate plants, such as spices, contain phytochemicals that may possess health-benefitting properties. Objective of this study was to assess dietary intake patterns of African American adolescents, with a family history of chronic diseases. Data was collected from adolescents at various middle and high schools, and universities, with written consent. Study participants completed questions pertaining to demographics, dietary intake patterns, physical wellness, and functional foods. All protocols were approved by Alabama A&M University's Institutional Review Board (Human Subjects Committee). Fifty-two percent of participants stated they almost never or never consumed reduced sugar diets or sugar-free beverages (n= 100), whereas 34% never consumed soda or pop (n =32). Conversely, 21% almost always or always consumed reduced sugar diets or sugar-free beverages, and 29% of participants consumed soda or pop at least one time per week. Approximately 75% of participants realize when they reach satiety and stop eating (n= 102). However, 14% continue eating after feeling satiated. Fifty-six-percent of participants indicated that they consume spices at least 3 or more times per week; of that, garlic, pepper, ginger, and turmeric were predominant. Approximately 13% of participants consume more than 6g of spices, while the majority of participants consume 4g of spices in each use. Results suggest that dietary intervention is necessary to mitigate and reduce disease risk within adolescent communities. Results from this study will be used to develop functional food products targeting adolescents, with the overall goal of increasing antioxidant intake and positively influencing dietary patterns.

**Abstract # 142**

**Optimization of quality and quantity of DNA recovery from an Agarose gel**

Kevon Seay, V. Anche and S. Fakas

Mentor(s): Dr. Stylianos Fakas

Department of Food and Animal Sciences

Gel purification is a procedure used to isolate and purify linear DNA fragments from an agarose gel. These DNA fragments are produced either by PCR or restriction digestion reactions and can be further used for restriction enzyme-based cloning. The efficiency of a gel DNA purification method depends on several factors, including the initial DNA concentration, the agarose content of the gels, weight of the excised agarose gel with DNA sample, sample incubation time and temperature with dissolution buffer, volume, and temperature of the buffer and type of kit utilized for extraction process. Although gel DNA recovery is a widely used procedure, there is a need to optimize the protocol for a maximized DNA yield. The main objective of this study was to optimize the protocol for improved yield of DNA from agarose gels. Gels containing 0.8-1% agarose gel were used to separate the linear fragments by electrophoresis Following electrophoresis, the DNA bands on the agarose gel were visualized under UV light and the desired DNA fragment was excised from the gel. The excised gel was processed with Zymoclean™ Gel DNA Recovery kit and QIAquick Gel Extraction Kit DNA recovery kits using the manufacturer's protocol. The quality and quantity of the eluted DNA from the two kits was assessed using Nanodrop and the efficiency of the gel extraction procedure was estimated by comparing the quantity of the DNA analyzed by gel electrophoresis and the quantity of the DNA extracted from the agarose. From the preliminary results, 90ng of DNA was recovered out of the 1000ng of DNA loaded on the gel using the Qiagen Kit, indicating that there was only 10% recovery of the DNA loaded on the agarose gel.

**Abstract # 143**

**Development of interactive hands-on activity in the area of general microbiology for underrepresented and underserved farmers**

Madison Wright, A. Jackson-Davis, B. Cooper, D. Bailey, Alexander Hall, A. Howell, D. Davis, E. Chaverest, D. Chembezi, B. Omontese

Mentors: Dr. Armitra Jackson-Davis, Bria Cooper, and Dalais Bailey

Department of Food and Animal Sciences

The Produce Safety Rule represents the use of science to determine practices to prevent contamination of produce. Although farmers have participated in the Produce Safety (PSA) Alliance Grower Training, understanding basic microbiology is crucial to fully how pathogens

can contaminate produce. Therefore, the objective of this study was to develop an interactive hands-on activity related to general microbiology in farming operations. To accomplish this, an activity was determined and a protocol was developed. Participants will be given Rodac plates containing microbiological media to sample different surfaces of interest to farmers (shoes, clothes, soil, tools, equipment, doorknobs, keys, research farm, etc.). Those same surfaces were sanitized and sampled again to demonstrate the effectiveness of sanitizers. The activity was performed to ensure that the protocol was clear and understandable. The activity will be presented to the Advisory Team for feedback. A one-page instructional document that will be used by workshop participants to train underrepresented and underserved farmers in the southern region will be developed and used in hands-on workshops.

**Abstract # 144**

**Evaluating the Potential for Small Ruminant Production in Silvopasture in North Alabama - Phase V**

Makayla A. Rushing, and G. Abdelrahim

Mentor: Dr. Gamal Abdelrahim

Department of Food and Animal Sciences

The long-term goal of the study is to investigate the potential for grazing small ruminants in silvopasture system. Silvopasture is an agroforestry system that integrates crops and/or livestock with trees and shrubs. The goal of the project was evaluating silvopasture systems for sustainable production of small ruminants in a loblolly pine plantation in order to increase productivity and profitability on small and medium sized limited resource farms. Animal performance in two grazing trials was evaluated. In 2018 grazing season (single-species grazing), eighteen (18) Kiko-crossbred goats (kids) (17.9 ± 1.1 kg initial BW, and 5 to 6 months of age) were divided into three groups based on their live body weight and randomly allocated to three pastures based on weight (6 goats/pasture). Each pasture was divided into three eight acre- paddock for rotational stocking management. Animals in each paddock were housed in a shed located inside the grazing area. In 2019 trial (multi-species - mixed) grazing), fourteen (14) Gulf Coast weather lambs (31.27 ± 1.2 kg initial BW, and 5 to 6 months of age), and 10 Kiko-crossbred goats (kids) (25.5 ± 1.1 kg initial BW, and 5 to 6 months of age) were divided into three groups based on their live body weight and randomly allocated to three treatments (pastures). Based on the results, the following has been found: (i) No significant difference ($p < 0.05$) in the percent weight gain in sheep; (ii) No significant difference ($p < 0.05$) was found in the percent weight gain in goats. We concluded that the project will provide an economically attractive livestock/ forage/timber production method.

**Abstract # 145**

**Effects of melatonin on behavioral and physiological responses of weaned beef calves**

Micah R. Kimbrough, L. Swanson, D. Maye, F. Zakari, B. Omontese

Mentor: Dr. Bobwealth Omontese

Department of Food and Animal Sciences

Weaning is one of the most stressful event that beef calves experience. In addition to increased restlessness, stress associated with the weaning may predispose calves to diseases. This study was designed to evaluate the effects on melatonin on behavior and physiological responses of beef calves. Angus beef calves (n=36) at 7-mo of age were stratified by dam parity, body weight, calf sex and randomly allocated to receive either melatonin implants (MEL) or physiological saline (CON). A subset of calves were fitted with accelerometers on the hind leg to monitor activity levels for 7 days. Blood samples, rectal temperature, chute score and body weight measurements were collected on d 0, 7 and 14. After weaning, MEL calves had lower activity compared with MEL ($P < 0.05$) whereas there was no difference in lying duration. The MEL calves had a lower chute score on d 7 and 14 ($P < 0.05$). Compared with CON, there was no marked effect of melatonin hematological parameters except for neutrophil/lymphocyte ratio and mean platelet volume ($P < 0.05$) which were higher and lower in MEL, respectively. Similarly, there was no difference in rectal temperature between CON and MEL ($P > 0.05$). Although not significantly different, average daily gain (ADG) calculated 21 post weaning, was 1.67 and 2.35kg/d in CON and MEL, respectively. We concluded that melatonin modulated the increased activity characteristic of weaned beef calves without any significant impact on hematological characteristics. Also, our data suggests that melatonin may improve welfare of weaned beef calves by minimizing the stress behavioral response associated with weaning.

**Abstract # 146**

**Effects of backgrounding systems on growth performance, chute score and inflammatory markers of weaned beef calves**

O. Persaud, O. Persaud, A. Santana-Rodriguez, F. Samuel, N. Ogunkunle and B. Omontese

Mentor: Dr. Bobwealth Omontese

Department of Food and Animal Sciences

Backgrounding (BKG) allows cattle producers utilize a variety of feedstuff to support growth and development of calves before they enter the feedlot. However, information on the impacts of BKG systems on average daily gain (ADG), and the assessment of activity patterns as an indicator of health and welfare impairment in beef calves in different BKG systems is limited. At

weaning (d 0), Black Angus calves (n = 66) were stratified by dam parity, body weight and sex into one of three groups for 40 days; DL; a high roughage diet within a dry lot and CC; annual cover crop within a strip and PP, while a third group, PP: remained on perennial pasture vegetation within rotational paddocks, just as before weaning. Blood samples, body weight (BW) and hip height (HH) measurements were collected on d 0, 28, 40, and 54. Data were analyzed using ANOVA with repeated measures. Our results showed that BKG systems influenced ADG ($P = 0.001$), frame score ($P = 0.002$) and BW/HT ratio ($P < 0.01$). Calves backgrounded with CC had the smallest ADG compared with DL and PP ($P < 0.04$). Although there was no effect of BKG on chute score and serum haptoglobin concentration, there was a BKG, time and BKG treatment interaction on serum cortisol ($P = 0.03$). Our study suggests that backgrounding systems influence ADG and serum cortisol concentration, thus by implication the growth and health status of weaned calves.

**Abstract # 147**

**Effects of Prevail ® on average daily gain, behavioural and physiological indicators of pain in lambs following tail docking and castration**

Terrance Bell, M. Rushing, F. Samuel and B. Omentese

Mentor: Dr. Bobwealth Omentese

Department of Food and Animal Sciences

Tail docking and castration though painful procedures are routine management practices in sheep production systems. Prevail® contains flunixin meglumine, a potent non-steroidal, analgesic agent with anti-inflammatory and anti-pyretic activity. It has been used safely in pain management in many domestic animals. This study examined the effects of Prevail® on average daily gain, behavioral and physiological responses of lambs following tail docking and castration. Apparently healthy three months old Gulf Coast Native lambs (n=27) were randomly allocated to one of two groups; CON and PRE. PRE received Prevail® at 0.5 mg/lb I.M five minutes before the procedures, and CON served as control. Docking was performed using a hot knife whereas ram-lambs were castrated by application of a constricting rubber band around the scrotal sac. Average daily gain, rectal temperature and behavioral responses indicative or pain including arching of back, vocalization and activity were recorded. Average daily gain and rectal temperature did not differ between groups. The proportion of lambs that arched their back and vocalized after the procedure was greater in CON than PRE (77% vs 22%, and 64.2% vs 35.7%, respectively). Also, a greater proportion of PRE had an activity score of 3 compared with CON (75% vs 25%). We concluded that a single injection of Prevail® 5 minutes before procedures reduced arched back, vocalization, and increased activity of lambs following tail docking and castration.

**Abstract # 148**

**In-vitro Evaluation of Hemp Hurd Antioxidant Properties**

Travion Miles-Jones, A. Dudley, L. Kassama, A. Jackson-Davis, X. Kuang, and E. Cebert

Mentors: Dr. Lamin Kassama, and Aaron Dudley

Department of Food and Animal Sciences

Hemp (Cannabis sativa L) is an annual herbaceous plant that is utilized in consumer products such in textiles, medicine and most recently in food production. However, Hemp Hurd or the inner stalk of the hemp plant has been discarded as waste material but can be utilized in consumer products to promote health. There is desire for consumer food and beverages to contain natural products that promote health and up-cycling of Hemp Hurd's for its bioactive properties provides the opportunity to meet this desire. Hemp Hurd's contains phytochemicals which include cannabinoids, terpenes, flavonoids, and phenolic acids which imparts antioxidative activity. However, little is known about Hemp Hurd's bioactive implications in human health and food protection. The purpose of this study was to evaluate the antioxidant activity of HH macerated in five different solvents of methanol, ethanol, petroleum ether, acetone, and deionized water. In this experiment HH grown at the Alabama A&M University, Winfred Thomas Agricultural Research Station, Hazel Green Alabama was used, HH was macerated in solvents of acetone (AE), deionized water (DIW), 96% ethanol (E), methanol (M), and petroleum ether (PE). HH extracts were evaluated for antioxidative activity by determination of the total phenolic content (TPC) and DPPH free radical scavenging activity (2, 2-diphenyl-1- picrylhydrazyl). All treatments were analyzed in triplicate and a one-way ANOVA was conducted. The statistical significance was based $P \leq 0.05$. The antioxidant results indicated significant differences ($p \leq 0.05$) in extraction solvent with total phenolic contents ranging from 16.29±1.15mg/100g GAE (HHPE) to 203.13mg/100g GAE (HHAE). The DPPH results ranged from 64.05±13.99% (HHE) to 69.58±3.31% (HHM). Upcycling of Hemp Hurd could have positive implications in the food safety and nutraceutical industries.

**Abstract # 149**

**The influence of age and time of day on chute behavior and vital signs of beef cattle**

Zoe Allen, K. Jones, D.H. Ayala, A. Santana-Rodriguez, F. Samuel and B. Omontese

Mentor: Dr. Bobwealth Omontese

Department of Food and Animal Sciences

Cattle wellbeing can be assessed by monitoring behavior and vital signs. The purpose of the study was to evaluate the influence of age on physiological (respiratory rate, RR; rectal temperature, RT) and behavioral (chute score, CS; exit score, ES) responses of beef cattle.

Apparently healthy cattle of different age groups (calves, n=24, yearlings, n=20 and adult, n=25) were used in the study. A clinical thermometer was used to record RT while RR was observed according to costo-abdominal movements. Individual chute and exit scores were recorded. Data was analyzed using Stata 14.1. Calves had a higher ($P<0.05$) RT compared with yearlings and adult cattle (103.8±0.09 vs 102.8 vs 102.9 F, respectively). Similarly, calves had a higher RR compared with yearlings and adult cattle (72 vs 64 vs 56 cycle/min, respectively). According to age group, a greater proportion of calves (55%) were calm in the chute compared with yearlings (7.7%) and adults (36.6%). A greater proportion of Adult cattle 48.5%) walked while exiting the chute compared with calves (38.4 5%) and yearling (13.1%). Overall, RR and RT was greater in the afternoon than in the morning. We concluded that age and time of day influenced RT and RR and modulated behavioral responses of cattle restrained in the chute.

## Graduate

**Abstract # 150**

**Evaluation of anti-nutrient and anti-oxidative properties of three sorghum accessions, two tigernut varieties (black and yellow) and two cowpea varieties (red ripper and iron clay cowpeas)**

Ama Adadzewa Eshun, and J. Boateng

Mentor: Dr Judith Boateng

Department of Food and Animal Sciences

Consumption of cereals and legumes have been widely documented as sources of important nutrients such as protein, fat, and essential micronutrients to support human growth. However, the presence of antinutrients which decreases and interfere with the body's ability to absorb certain nutrients has been a major concern with its utilization. This study therefore seeks to evaluate the antinutrient content as well as antioxidative properties of some underutilized cereals and legumes such as sorghum, tigernuts and cowpeas. Three accessions of sorghum (onyx with tannins, high tannin, and lemon yellow) were sourced from Texas A&M University, two varieties of tigernuts (black and yellow) and two varieties of cowpeas (iron clay and red ripper) were screened for antinutrients (tannins, saponins and lectins) and antioxidant properties (total phenolics (TPC), total flavonoid (TFC), DPPH radical scavenging activity (DPPH) and ferric reducing antioxidant power (FRAP)). The data was analyzed using a one-way ANOVA ($p<0.05$) to determine the differences between the various samples. All samples showed varied composition in their antinutrients and antioxidant composition. Saponin content was highest in the onyx with tannin sorghum (624.20±0.10) with the lowest seen in lemon yellow sorghum

(34.21±0.04). Tannin content was also highest in onyx with tannin sorghum (72.93±0.73), however both varieties of tigernuts shown undetectable tannin content. All samples saw agglutination of the red blood cell. Antioxidative properties, TFC ranged from 20.13 to 1.68. TPC ranged from 6.04 to 0.48. The FRAP values ranged from 12.82 to 9.88 whilst the DPPH ranged between 86.15 to 40.21. Results from this study revealed varied concentrations in the anti-nutritional and antioxidative potential. This profiling is important as it will inform and provide strategies to help reduce the anti-nutritional content and leverage on the antioxidant properties for functional and sustainable food products with nutraceuticals benefits for the food industry.

**Abstract # 151**

**Anti-oxidative benefits and physiochemical properties of *Murraya Koenigii***

Karthik Medabalimi, R. Kaur, J. Hinton, M. Shomope, M. Verghese

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

*Murraya koenigii* commonly called curry leaves belong to the Rutaceae family. Curry leaves are rich in vitamin A, antioxidants, and phenolic compounds. Antioxidants are associated with health benefits such as anti-cancer, anti-diabetic, reducing the risk of cardiovascular diseases, and so on. The objective of this study was to determine the effect of processing on the moisture loss, color changes, phytochemical and anti-oxidative content of Curry Leaves. A preliminary study was conducted to evaluate the effects of three different temperatures on total phenolic content (TPC), total flavonoid content (TFC), and anti-oxidative properties of curry leaves which were assessed by utilizing in-vitro methods. Anti-oxidative properties were determined through 2,2' diphenyl picryl hydrazyl (DPPH), and ferric reducing antioxidant potential (FRAP). The curry leaves were dried in an oven at 50 $^{o}$C, 60 $^{o}$C, & 70 $^{o}$C followed by preparation of extracts using ethanol and water as solvents. The moisture content of Curry leaves was 52% which is very critical to increase the shelf- life of the curry leaves. The total phenolic and flavonoid content of Curry Leaf extracts (CLE) was 541.11±12.41 GAE/100 g CLE and 192.22±2.75 CE/100 g CLE. FRAP of CLE was found to be 702.81 µmol Fe+2/g. DPPH scavenging ability was represented as 50% Inhibition of DPPH. The IC50 of CLE was 63.85 mg mL–1 for 0.5 mM of DPPH. Percent inhibitions of DPPH radical for 25, 50, 75, 100, 125, 150, 200 and 250 mg mL of CLE were 29.67, 43.30, 51.93, 62.81, 64.67, 68.87, 72.26 and 88.61, respectively. The results from this study indicate that curry leaf may be effective in the prevention of cardiovascular diseases, as a potent antioxidant and drying may be a viable option for enhancing shelf-life.

**Abstract # 152**

**Development of a Functional Non-Dairy Dessert**

Mallori Odum, B. Cooper, R. Alhazaimah, M. Shomope, H. Singleton, R. Kaur, M. Verghese

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

The health benefits associated with increased consumption of functional foods has resulted in a trend which points towards the medicalization of the food supply. A non-dairy frozen dessert has the potential to act as a vehicle for adaptogens which contain a variety of biologically active phytochemicals. These phytochemicals contribute to the increased functionality in foods. The objective of this study was to conduct research by developing a nutrient dense frozen dessert using high functional ingredients and “ugly” fruit that are rich in antioxidants. A popsicle containing a mixture of berries and non-dairy milk was prepared. The physiochemical properties such as color, pH, and water activity were measured. Preliminary data suggested potential consumer acceptance. A focus group was conducted resulting in an overall acceptability of 83%. Results from the focus group suggest that the appropriate demographic for this product were consumers between the ages of 17-25, with 57.14% of these panelists stating that they consume dairy free frozen desserts once a week. The appearance, aroma, mouthfeel, sweetness, and aftertaste were desirable to 71% of our panelist. The flavor score and product attributes were described as sweet, fruity, colorful, and smooth. Future studies will be conducted including shelf life with the application of use & abuse methods as it relates to packaging and transportation. A sensory study using young health-conscious adults will be selected, along with antioxidant assays to determine total flavonoid and phenolic content. Marketing, packaging, and nutrition labels will be developed to complement the frozen dessert.

**Abstract # 153**

**Development of Functional Food product using Hemp and selected Spices with Health Benefit**

Maryam A. Shomope, R. Kaur, S. Willis, M. Odum, J. Herring, L.T. Walker, J. Vizcara and M. Verghese

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

Regular consumption of functional food products made with alternative protein powders has been advocated as a way to improve nutrients and manage weight in adolescents. Hence, utilization of selected protein powders to develop a variety pack functional snack is beneficial

since they are underutilized. The objectives are to determine the antioxidant potential of selected protein powders, develop a variety pack functional snack, determine the antioxidant potential [Ferric reducing antioxidant capacity (FRAP), Trolox equivalent antioxidant capacity (TEAC), Nitric oxide radical scavenging (NORS)] of pre-bake and post-bake developed snacks and determine the effects of the snacks on carbohydrate (α-amylase and α-glucosidase) and lipid (lipase) metabolizing enzyme inhibition. Hemp, Ashwagandha, Barley grass powder, and gluten free all-purpose flour were extracted with 80% ethanol and water. Highest 2,2- diphenyl-1-picrylhydrazyl (DPPH) inhibition was observed by Barley grass powder (82.27%), compared to Gluten free all-purpose flour (66.77%), Ashwagandha (66.63%) and Hemp (60.42%). A preliminary sensory analysis was performed using a focus group to test the acceptability of functional snack developed utilizing alternative flours. Control sample with Gluten free all-purpose flour was the most preferred (60%), followed by Barley and Hemp (20%), combination of (gluten-free flour, hemp, gluten-free flour, and flaxseed) had an acceptance rate of (10%). Since consumer acceptance is a key factor to successfully negotiate functional food market opportunities, adjustments are being made to formulations to achieve a more acceptable functional snack attribute. Future work will focus on conducting physiochemical analysis (Aw, color, pH, and texture), accelerated shelf-life and sensory evaluation for consumer acceptance.

**Abstract # 154**

**The Fecal Microbiome Composition In Beef Cattle Responds To Different Backgrounding Systems**

Nathaniel Ogunkunle, F. Samuel, A. Gomez, and B. Omontese

Mentor(s): Dr. Bobwealth Omontese

Department of Food and Animal Sciences

Backgrounding (BKG) impacts growth and rumen microbiome of beef cattle. The study of rumen microbiome changes requires a cannulated cow or use of an oropharyngeal tube to harvest rumen fluid which can be expensive and requires specialized skill. In this longitudinal study, we explored whether the fecal microbiome may be used to assess the response of beef calves (n=36) to different BKG systems. At weaning, calves were randomly assigned into three groups: DL; a high roughage diet, CC; annual cover crop and PP: remained on perennial pasture vegetation, just as before weaning. After BKG, calves were placed in a feedlot for 14 d and finished with a high energy ration. Fecal bacterial communities were profiled by collecting fecal samples from the rectum, and sequencing the V4 region of the 16S rRNA bacterial gene, at weaning (d 0, during backgrounding (d 28) and finishing (d 54). For calves moved to DL, bacterial composition diverged drastically, including sharp decrease in bacterial diversity ($P < 0.001$), while PP claves conserved more stable diversity patterns. During BKG, CC calves showed

the smallest ADG ($P < 0.05$) the smallest compensatory ADG during finishing, compared with calves on DL and PP ($P = 0.02$). These results indicate that fecal microbiome dynamics were associated with different BKG systems and ADG. Also, changes in fecal microbiome patterns may not only contribute to identification of animals under different backgrounding systems, but also improve our understanding of the potential animal performance resulting from different BKG systems.

**Abstract # 155**

**Anti-obesity and Hepatoprotective Effects of Mixed Fruits and Berries on Cafeteria Style (Western) Diet-Induced Obesity in Rats**

Rawan Al Hazaimeh, and J. Boateng

Mentor: Rawan Al Hazaimeh

Department of Food and Animal Sciences

Obesity is recognized as a disease and is considered one of the leading causes for several comorbidities including diabetes type 2, hyperlipidemia, and several types of cancer. Obesity according to the Centers for Disease Control and Prevention, 21.2% of 12- to 19-year-olds are obese or overweight. In this age group, the consumption of junk food is on the rise where their fruits consumption is lower than their age recommended daily intake. The impact of consuming a chow diet supplemented with mixed fruits and berries (MFB) at two distinct concentrations (3 % or 6%) was evaluated in this study. Adolescent Sprague Dawley rats were randomly distributed into eight groups (n=6 for each treatment) for a 6-week study as follows: negative control (chow only), positive control (chow with cafeteria diet (CAF)), two control treatment groups (3 % and 6 % MFB), treatment 1 and 2 groups (3 % and 6% MFB with CAF diet), and treatment 3 and 4 groups (CAF with chow). The caloric intake in the negative control group (79.8±0.73 kcal/day), while the positive control and treatment 1 groups consumed 90% and 24% respectively more calories than the negative control, whereas other groups caloric intake were comparable to the negative control. Notably, body mass index (BMI) was significantly higher in the positive control group (0.84± 0.04 g/cm2) versus in the negative control group (0.62± 0.03 g/cm2 ), while BMI in treatment 2 was comparable with the negative control. Abdomen circumference (AC) in the positive control was 16% higher than the negative control, while all other groups were comparable with negative control. Data suggested CAF diet was able to induce obesity by increasing caloric intake, while 6% of mixed fruits and berries were able to inhibit obesity and maintain weight comparable to the control group. Body mass index and abdominal circumference combined could be used as indicators of obesity.

**Abstract # 156**

**Citric acid cycle metabolites regulate phosphatidate phosphatase activity from the oleaginous yeast *Yarrowia lipolytica***

Sagar Pasham, and S. Fakas

Mentor: Dr. Stylianos Fakas

Department of Food and Animal Sciences

Phosphatidate phosphatase (PAP) catalyzes the conversion of phosphatidate (PA) to diacylglycerol (DAG) in a reaction that depends on Mg2+. This reaction is critical for de novo lipid accumulation because it provides the DAG needed for the biosynthesis of triacylglycerol (TAG). Lipid accumulation is triggered by the downregulation of the citric acid cycle, which results in the exit of citrate from the mitochondria to the cytosol. In the cytosol, citrate is converted to oxaloacetate and acetyl-CoA which is channeled to fatty acid biosynthesis. Oxaloacetate is converted to malate by malate dehydrogenase and malate to pyruvate by malic enzyme. Also, citrate stimulates the activity of acetyl-CoA carboxylase, which catalyzes the rate-limiting step in fatty acid biosynthesis. In this work, we examined the effect of citric acid cycle metabolites on PAP activity in cell extracts prepared from wild type cells and cells that lack PAH1 (i.e., pah1Δ). The cells were grown for 96 h on high glycerol media that induce lipid accumulation, and cell extracts were prepared. Control PAP assays done in the presence of Mg2+ showed that the pah1Δ mutation resulted in a 95% decrease in PAP activity, indicating that PAH1 encoded for almost all PAP activity. The effects of citrate, malate, and pyruvate were examined at concentrations ranging from 0.1 mM to 5 mM. In wild type cell extracts, citrate (1 mM), malate (0.1 mM), and pyruvate (2.5 mM) caused a 220%, 217%, and 154% increase in PAP activity, respectively. In contrast, the addition of these acids to cell extracts prepared from pah1Δ cells did not affect PAP activity. The stimulatory effect of these organic acids on PAP activity could provide a direct link between fatty acid biosynthesis and DAG synthesis by Pah1. The buildup of citrate and its metabolites in the cytosol could induce PAP activity to direct the lipid biosynthetic pathway towards the synthesis of DAG. This regulation, combined with the stimulation of acetyl-CoA carboxylase by citrate, could contribute to the induction in TAG synthesis typically observed during lipogenesis.

**Abstract # 157**

## The effect of acid types and pasteurization methods on the physical properties of sweet cheese

Sai Vinay Kumar Madala, A. Ul Alam, A. Dudley, E. Ochieng, and L. Kassama

Mentor: Dr. Lamin Kassama

Department of Food and Animal Sciences

The spongy Indian sweet cheese dessert (Rasagolla), made with lactic acid by using the conventional heating method, leads to a longer coagulation time in the manufacturing process. Thus, the use of other organic acids and the emergent heating processes could presumably provide better product quality and reduce the coagulation time, which presents an opportunity to discover new Indian sweet cheese dessert products. The aim of this study was to assess the change in apparent coagulation viscosity and the textural properties of sweet cheese by varying acid types and pasteurization methods. Sweet cheese was made using citric and tartaric acids with concentrations ranging from 1%, 2%, and 3%. Conventional and microwave pasteurization were performed at 60°C for 30 minutes and 70°C for 2 minutes respectively. The apparent coagulating viscosity was determined with a Brookfield viscometer. While the texture was measured using a Warner-Bratzler Shear device. In addition, total soluble solids, a sensory attribute, diameter, and color were measured by a Fisher scientific refractometer, a caliper, and a calorimeter. Data analyses were conducted with SPSS software and expressed as means ± standard deviation. Means were compared using one-way analysis of variance (ANOVA) Statistical significance was established at $p < 0.05$. The apparent coagulation viscosity was observed to decrease from 30 to 250 s-1. However, pasteurization and organic acid treatments do not significantly ($p > 0.05$) influence the color and appearance of the sweet cheese. The total soluble solids content slightly decreased with the concentration of organic acids. In addition, microwave pasteurization led to a slight decrease of the color L values compared to conventionally pasteurized. The texture analysis of the sweet cheese showed that pasteurization and acid treatments significantly ($p < 0.05$) affect the hardness, while the concentration of acid does not show any significant difference ($p > 0.05$). This study demonstrated that citric and tartaric acids coupled to microwave pasteurization could be a promising alternative in the manufacturing process of sweet cheese.

**Abstract # 158**

**The antimicrobial ability of citric acid and a surfactant to control *Salmonella* on poultry**

Sowjanya Reddy Tamatamu, and A. Jackson-Davis

Mentor: Dr. Armitra Jackson- Davis

Department of Food and Animal Sciences

Organic acids such as citric acid are used to control undesirable microbes in foods and are commonly diluted in water to facilitate their application. However, water is a poor wetting agent for hydrophobic food surfaces where pathogens may be located. This problem can be circumvented by use of surfactants to aid better wetting. The objective of this study is to investigate the antibacterial efficacy of citric acid solutions alone and combined with a surfactant against Salmonella enterica. Citric acid with a surfactant will be evaluated individually and combined against a five-serotype mixture of S. enterica (~ 7.0 CFU/mL) by using the Bioscreen C. Water and 20 ppm sodium hypochlorite without organic acid will serve as the control samples. Treatments will be evaluated at different time points over a 24-hour period. The results will be quantified by serial diluting the sample, plating on selective media and incubation at 35oC for 24 h. Appropriate concentrations will be evaluated on poultry.

**Abstract # 159**

**Study on regulation of ATP-Citrate lyase during lipogenesis in the oleaginous *yeast Yarrowia lipolytica***

Varsha C. Anche, and S. Fakas

Mentor: Dr. Stylianos Fakas

Department of Food and Animal Sciences

ATP citrate lyase (ACL) catalyzes the ATP-dependent conversion of citrate to the fatty acid precursor, acetyl-CoA. ACL presence in yeasts has been associated with their ability to accumulate lipids (i.e., oleaginous phenotype), but little is known about the regulation of this enzyme in oleaginous yeasts. In the model oleaginous yeast *Yarrowia lipolytica*, ACL is a heterodimer comprised of a catalytic and a regulatory subunit, encoded by the ACL1 and ACL2 genes, respectively. From the earlier studies, it was shown that the loss of ACL1 resulted in lower lipid levels and altered fatty acid profiles. However, the regulation of ACL expression and activity during lipogenesis has not been studied. To better understand the role, ACL plays during lipogenesis in *Y.lipolytica*, we generated antibodies against its two subunits (i.e., Acl1 and Acl2). We also constructed strains that lack Acl1, Acl2 (i.e., acl1Δ; acl2Δ) and strains that overexpress Acl1 and Acl2 either alone or in combination. Preliminary experiments showed that

the overexpression of Acl1 increased the protein levels of Acl2. We are currently analyzing the effects of acl1Δ, acl2Δ and, Acl1 and Acl2 overexpression on the growth, lipid content, ACL activity and, the time-dependent regulation of Acl1 and Acl2.

## ACCOUNTING AND LOGISTICS

### Undergraduate

**Abstract # 160**

**Optimizing efficiency and effectiveness of logistic supply chain using blockchain**

Bayyan Israahmadewi, and K. Rana

Mentor: Dr. Krishan Rana

Department of Accounting and Logistics

Supply chain growth is increasingly complex with many players involved in its supply chain flow which requires a large number of contracts, payment, tracking, and communication. Longer and complex supply chains face challenges in industries in terms of their efficiency, effectiveness, and execution. Technology and information system is one of major external forces that play a significant role in transforming the supply chain with its execution tools, bringing efficiency and effectiveness to the many disjointed elements and specified supply chains. A promising emerging technology for the increasing complexity of the supply chain is blockchain. The most significant impact of blockchain is to help speed up supply chain processes, reduce transaction costs, and provide more reliable data exchange and highly secure yet transparent information pathways within the industry and its customers. Blockchain is a highly secure platform for transaction contracts with numerous applications across many industries. It serves as a general ledger, keeping the track of all the transactions that happen in the industries and their network. In logistics, blockchain has been recently employed as a distributed ledger which could provide a better transparency pathway throughout the lifetime of the shipment that would follow a shipment from the origin to the end destination. Blockchain data is decentralized, which means there is a small chance that the system can be disrupted due to a localized failure or attack. Blockchain is an efficient and effective solution for the major supply chains within many industries that rely on transaction contracts and logistics. Over the next several years any industry that heavily employs logistics and contract tracking will likely adopt blockchain and its application for an important number of processes within the industry.

**Graduate**

**Abstract # 161**

**Cargo Transportation Systems in Europe**

Gjorgji Popovski, and K. Rana

Mentor: Dr. Krishan Rana

Department of Accounting and Logistics

For several decades, the topic of transportation has been widely studied due to its importance in meeting customer needs and human existence. In this era of globalization, supply and demand points exist in different countries or even different continents. Therefore, products and services must be transported from their source of production to the end-users or customers. This paper is a study of different ways and strategies that Europe uses compared to the United States to import and export products. The data for the research is collected from academic journals, articles, and quantitative research to show the contribution of effective supply chain channels connecting the European countries internally and externally with the United States. The paper summarizes the benefits gained from the effective supply chain networks in Europe and its effects it on the GDP of the European countries. The research provides an investigation of the strategy behind the location of the seaports in Europe, as well as the strengths and weaknesses compared to the seaports in the United States. This paper examines the importance of transportation systems and their role in supply chain management. The research concludes a strategy and recommendation to improve the transportation systems in Europe and the United States, and it will also help improve sustainability by reducing pollution.

## ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

### Undergraduate

**Abstract # 162**

**Design, Fabrication and Characterization of the Multilayer Thin Film Solid State Batteries**

Abdulrahman Altheeb, C. Johnson, M. Alim, and S. Budak

Mentors: Dr. Mohammad Alim, and Dr. Satilmis Budak

Department of Electrical Engineering and Computer Science

The senior design project is to fabricate the thin film solid state Li-ion batteries using DC/RF Magnetron Sputtering system. Thermal annealing will be introduced to improve the efficiency of the fabricated thin film solid state batteries. Lithium ion batteries are devices that can convert chemical energy to electrical energy and vice versa reversibly. Lithium ion batteries consist of a positive cathode and a negative anode separated by an electrolyte that is ionically conducting to lithium ions but insulating to electrons. Thin film solid state rechargeable lithium batteries are ideal micro power sources for many applications requiring high energy and power densities, good capacity retention for thousands of discharge/charge cycles, and an extremely low self-discharge rate. For many thin film batteries, the cathode is usually made of a lithium-oxide complex such as LiCoO2, LiMn2O4 and LiFePO4. The anode material is commonly made of a carbon-based material such as graphite, although lithium and other metals can be used. Thin film batteries are commercially available and can be used for many applications, including in renewable energy storage devices, smart cards, and radio frequency identification (RFID) tags, portable electronics, defibrillators, neural stimulators, pacemakers and wireless sensors. Students will use SiO2 as a substrate, LiCoO2 as a cathode, Li3PO4 (LIPON) as buffer layer, multilayer thin films as anodes, and Cu or Au or Cu+Al as current collectors for cathode and anode metals. Experimental characterizing techniques will be Seebeck coefficient, van der Pauw four probe resistivity, mobility, charge carrier concentration, charge density, Hall Effect, type of carrier concentration, thermal conductivity, open and loaded circuit measurement, magnetoresistance measurement, I-V and C-V measurements, Scanning Electron Microscopy with EDS. Final deliverables should be fabricated and characterized thin film solid state batteries.

**Abstract # 163**

**Characterization instrumentation for semiconductor nuclear detectors**

Bobby Carter, J. Adams, R. Arana, B. Carter, J. Lucy and S. Egarievwe

Mentor: Dr. Stephen U. Egarievwe

Department of Electrical Engineering and Computer Science

In this study, we will design and characterize new CdTe-based detectors that can operate at room temperature without cryogenic cooling and test the activation energy of a detector material. The properties to be studied include detector resistivity, defects, energy resolution, and the mobility/lifetime of the charge carriers. Nuclear instrumentation that includes the use of sample holders, high-voltage power supply, preamplifier, shaping amplifier, multichannel analyzer (MCA), oscilloscope, and BNC connectors. Figure 1 shows the radiation characteristics of Cs-137 radiation source. The intensity of the radiation was significantly reduced by a tungsten plate shield. The energy resolution for this detector, calculated as full-width-at-half-maximum (FWHM), is 0.81% for the 662-keV gamma peak of Cs-137.

**Abstract # 164**

**Infrared Camera Based Surveillance**

Cedric Eason, D. Brogdon, J. McCoy, M. Watkins, R. Yaqub, A. Scott, and K. Heidary

Mentors: Dr. Raziq Yaqub, Dr. Andrew Scott, and Dr. Kaveh Heidary

Department of Electrical Engineering and Computer Science

The Security Guards secure certain premises and personnel by patrolling or watching the property and monitoring surveillance equipment. Since this job requires 24/7 attentiveness, vigilance, and observation that may become tedious for a human guard, we plan to device an equipment that may replace the human. The project will use day and thermal camera(s) and will find an algorithm to capture still images from these cameras (independently) and compare these images for pixel changes that identify linear patterns, emergence of geometries of interest (human, vehicle, etc.). Once a change of interest occurs, the algorithm will export a packet to pause the motion of the RWS (Receive Window Size), place a bounding box around the pixel change, and notify an operator for further evaluation. Notification may be an on-screen message, activation of a light, aural notification, text or image message to a Bluetooth or cellular device, or all of the above (as limited by complexity, funding, and time for the project).

**Abstract # 165**

**16-bit Dual-Slope Analog-to-Digital Converter**

Jakorey Stephens-Heard, J. Daley II, F. Hamilton, L. Jean, and Z. Xiao

Mentor: Dr. Zhigang Xiao

Department of Electrical Engineering and Computer Science

In this project, a CMOS-based application specific integrated circuit (ASIC) will be designed and simulated for the application of sensor interface circuit in this project. The ASIC will consist of a voltage follower, low-pass filter, and a 12-bit dual slope analog-to-digital converter (ADC). The Tanner software (L-Edit and T-Spice) will be used for the layout and the simulation of the ASIC. The ASIC will be implemented on a 1 mm × 1 mm silicon chip die and fabricated using the TSMC service. The performance of fabricated ASIC chip will be tested.

**Abstract # 166**

**Using iOS Mobile Application for CTF Environment**

Jamal Irby, E. Pearson, and T. Miller

Mentors: Dr. Ed Pearson and Terry Miller

Department of Electrical Engineering and Computer Science

SQL injection attacks are one of the most common ways for hackers to attack databases. Several researchers say with the development of B/S mode application development, more and more programmers use this mode to write applications. There are many inexperienced programmers who don’t have a clue to the severity of programming, which makes the application security risks. Users can input a database query code and get some data they want to know according to the results of the program. SQL injection attack falls under the category of a database security attack. It can be effectively protected by database security protection technology. This paper introduces the principle of SQL injection, the main form of SQL injection attack, the types of injection attack, and how to prevent SQL injection.

**Abstract # 167**

**Analysis of Resource Allocation Policies and Security Threats for Data Centers**

Jerry Latham, A. Williams, and X. Zhao

Mentor: Dr. Xiang Zhao

Department of Electrical Engineering and Computer Science

Cloud Computing is the delivery of computing services such as servers, storage, databases, networking, and software to individual users or enterprises. Cloud computing aims to cut costs and help users focus on their core objectives instead of overcoming IT obstacles due to hardware, software or time constraints. The main enabling technology for cloud computing is virtualization. Virtualization software separates a physical computing device into more separate computing devices virtually accessible and operational to meet users' requirements. The host computer is the physical hardware and provides the virtual machines (VMs). The VM, or guest, is capable of emulating different operating systems and hardware platforms via software tools. VM resource allocation is crucial to the quality of service (QoS) of cloud providers and also imposes numerous challenges, especially when cyberattacks frequently occur nowadays. In this project, various VM resource allocation policies for data centers in cloud settings are studied using modeling and simulation tools. In addition, the cyber threats in clouds related to the possible misconfiguration of the cloud and inadequate VM allocation policies are analyzed and quantified with security metrics. As a result, optimized VM allocation policies are recommended for performance improvement and security attack mitigation in clouds. Future study will focus on the scalability of the VM resource allocation policies in large data center settings.

**Abstract # 168**

**Design and simulation of microwave subsystems**

Joshua Cleveland, A. C. Brassfield, D. Daniel, J. Savage, and S. Yang

Mentor: Dr. Shujun Yang

Department of Electrical Engineering and Computer Science

The goal of our senior design project is to design, and to simulate several microwave subsystems. Microwave/RF works differently from low frequency AC. At low frequencies, since signal wavelength is much larger than circuit conductor size, a single wire is enough to carry the signal. Voltage and current do not change along the wire. At microwave frequencies (such as above 1 GHz), signal wavelength is comparable to, or even smaller than conductor size. In such cases, signals must be treated as traveling waves and must be transmitted with transmission lines (such as coaxial cable, and microstrips). Microwave/RF circuits have different working mechanisms and structures compared with low frequency AC circuits. In this project,

microwave subsystems including microstrip, coplanar waveguide, and microstrip band stop filters are designed and simulated. **References:** 1-Pozar, David M. Microwave Engineering. 4th ed., Wiley, 2012. 2-NA5230A Microwave Network Analyzer Manual, from Agilent/HP.

**Abstract # 169**

**Defending unethical-unplugging of EV-charging cable (DUEC)**

Mphande N. Phiri, and Dr. R. Yaqub

Mentor: Dr. Raziq Yaqub

Department of Electrical Engineering and Computer Science

Statistics show how the increase in production of Electric Vehicles (EVs) increases the need for EV-charging stations. Simultaneously the need for the security and assurance of charging cables at the EV-charging stations is in jeopardy. This research project addresses the problem of unethical unplugging of the EV-charging cables. It gives a possible solution to defend EV users by introducing simple electronic-based charger locks. The user-friendly lock/unlock mechanism will be derived using a machine like the “Automated Parking Pay Stations.” The EV-charging cable should include an in-built lock/unlock mechanism that, through either a ticket or an electronic barcode/QR code, will enable a specific user to lock/unlock the charging cable from the car. The machine will be programmed with all the features to prevent unethical unplugging of the cables.

**Abstract # 170**

**Fault detection in electronic-vehicles using sound and vibration sensors**

Kamsiyochukwu Arinze, O. Olanipekun, and R. Yaqub

Mentor: Dr. Raziq Yaqub

Department of Electrical Engineering and Computer Science

Whenever there is a fault in an electric vehicle, it is usually associated with sound and vibration. In this research we use sound and vibration sensors to collect data of abnormal sound and vibration, we then feed in this data to the AI algorithm. This AI algorithm then classifies the types of faults associated with the sound and vibration of the electric vehicle which can be used for predictive and preventive maintenance of the electric vehicle. The emergence of Electric Vehicles has been prominent since 2008 and according to the Edison Electric Institute, the number of EVs on U.S. roads is projected to reach 18.7 million in 2030, up from 1 million at the end of 2018. This is about 7 percent of the 259 million vehicles (cars and light trucks) expected to be on U.S. roads in 2030. Although there might not be major concerns on the fault detection system of electric vehicles right now, in the nearer future there will be a significant rise of electric vehicles detection systems. After vigorous research into to the industry of fault

detection system for electric vehicles we found that there was little to no research done in this area. The closest we found focused only on vibrational sounds which is why we have decided to focus on developing a fault detection system that focuses on both sound and vibrational faults. This research is divided into two main stages: 1. Data Collection and 2. Data Processing. In this stage of our research, we make use of Arduino microcontroller board, vibration sensors, and sound sensors. We then use these devices to collect sound and vibrational data from the prototype electric vehicle. In the data processing stage, the data collected in the previous stage is then analyzed in an AI algorithm. The result of this analysis is then used to provide information concerning the current condition of the electric vehicle. We are working towards generating a relationship between faults in EVs and the sound and vibration coming from a specific unit of the vehicle. The project is currently in the data collection stage and continues to project a successful result.

**Abstract # 171**

**Fabrication of CZTS nuclear radiation detection devices and study of their electrical properties**

Peyton McDonald, P. Clark, P. McDonald, P. Clark, and S. Egarievwe

Mentor: Dr. Stephen U. Egarievwe

Department of Electrical Engineering and Computer Science

This project is aimed at fabricating cadmium zinc telluride selenide (CZTS) radiation detection devices that can operate at room temperature without cryogenic cooling and study their electrical properties and stability over time. It will include designing a portable nuclear radiation detection device using CZTS semiconductor material. We will fabricate the CZTS nuclear radiation detector device with gold contacts. The electrical characterization experiments will involve measurement of leakage current (consisting of the bulk leakage current and contributions from the surface leakage current) at different applied voltage using a Keithley Pico-ammeter/Voltage Source. The resistivity of the detector wafter will be computed from the current-voltage curve. The detector response to gamma-rays will be characterized by calculating the energy resolution as full-width-at-half-maximum (FWHM). Sealed $^{241}$Am and $^{137}$Cs nuclear radiation sources will be used. We will also study charge transport properties by determining the electron mobility-lifetime product of the detector.

**Abstract # 172**

**How to be safe in our cyber world**

Shania D. Edwards, K. Berkley, C. Oliver, D. Reed, A. Reedy, V. Sanders, K. Warner, and V. Atluri

Mentor: Dr. Venkata Atluri

Department of Electrical Engineering and Computer Science,

Have you ever been a victim of a cyber-attack? Every 11 seconds, a cyber-attack occurs. Unethical hackers are preying on information systems of government, corporate, public, and private organizations with the sole purpose of exploiting their vulnerabilities. We, as consumers, are unknowingly interacting with hackers daily. Those interactions come in many different forms. Just the click of a mouse may cause detrimental effects that are long-lasting. In the current work, we experimented with three other social engineering tactics, viz., spoofing, malvertizing, and drive-by download, that hackers use to exploit the vulnerabilities and steal personal information. The results showed that hackers would be 100% successful in stealing personal information when users fall for these social engineering tactics. We also presented and discussed possible solutions to avoid falling for these hackers' tactics, hoping to create awareness that will minimize the threat of future cybercrime.

**Abstract # 173**

**Identification of engine faults using Python in machine learning**

Shemaiah Mbetwa, and R. Yaqub

Mentor: Dr. Raziq Yaqub

Department of Electrical Engineering and Computer Science

As technologies change, automobile engine systems become increasingly complex and thus the need for efficient fault detection systems has increased as well. Machine learning is one of the powerful tools that can identify fault features and even predict the faults with little need for human interaction and is being used in various scenarios and engineering systems. In cases such as a gearbox or turbocharger with several parts, having a system that checks for faults depending on various sensor readings is a beneficial tool to increase the system's overall reliability. In this paper, we used knowledge of Python (an interpreted programming language) to design a machine learning model in Google Colaboratory that identifies engine faults depending on sensor readings. Google Colaboratory is well suited to machine learning and data analysis, and our model was trained to identify various faults based on the sensor reading data provided. Our research was promising and would significantly assist in cases where automobile parts have several readings. We found that using machine learning models can substantially reduce the time that would have been taken to identify faults. We were able to train our model to identify engine faults depending on provided readings and sensor data. It would be interesting to look at ways machine learning can be combined with other fault detection methods to produce the best possible system in future research.

## MECHANICAL AND CIVIL ENGINEERING

### Undergraduate

**Abstract # 174**

**Building the future: Benefits of green building**

Angel Morrow, and T. Chowdhury

Mentor: Prof. Tamara Chowdhury

Department of Mechanical and Civil Engineering

The adverse effect of climate change will become irreparable if the design of the buildings are not changed now. Buildings create about 40% of the world's carbon emissions. To reduce carbon emissions, usage of fossil fuel energy reduction is vital. Fossil fuel emissions are also the main source of global warming, one of the most persistent observational issues facing humanity today. There are enormous amount of environmental benefits of green building or sustainable building, such as: Enhance and protect biodiversity and ecosystems; Improving air and water quality; Reduce waste streams; Conserve and restoring natural resources. Green buildings are a global solution for cities, communities, and neighborhoods. Through sustainable design, construction and operations, green buildings are reducing carbon emissions, energy and waste, conserving water, prioritizing safer materials, and lowering exposure to toxins. Enhancing the energy efficiency of structures has been a staple of energy policies. The key goal is to slash electricity usage in order to minimize the footprint of houses. A sustainable building or green building is an outcome of a design idea which focuses on increasing the efficiency of resource use: energy, water, and materials, while reducing building impacts on human health and the environment. The design, construction, operation, maintenance of buildings normally require enormous amounts of energy, water and raw materials, generating large quantities of waste causing air and water pollution. Whereas green buildings is the only answer through creating healthier and more resource-efficient models of construction, renovation, operation and maintenance. Green buildings may incorporate sustainable materials in the construction for example: reused, recycled-content, or made from renewable resources; create healthy indoor environments with minimal pollutants, and/or feature landscaping that reduces water usage. The use of fossil fuel energy should be replaced with sustainable green energy. This study explores the wide field of sustainable building or green building.

**Abstract: 175**

**Design of a magnetic coupling tester prototype**

Antoine Arrington, Q. Abdullah, B. Davis, R. Ford, S. Rutledge, A. Williams, and A. Adams

Mentor: Dr. Aaron Adams

Department of Mechanical and Civil Engineering

Cryogenic rocket propulsion is the ideal option for space travel. Within cryogenic processing of rocket propulsion systems, fluids must be maintained at a constant temperature to reduce the risk of vapors created by ambient heat input within a pressure vessel. Cases of submersible pumps that reside within a tank structure have led to costly failures of NASA projects, due to unwanted heat load. An alternative theory is to replace the conventional submerged pump with that of a Tesla-turbine pump. This would utilize an electric motor located on the exterior of a propellant tank. Using this pump, the overall simplicity and reliability of the system would decrease the overall disadvantages brought by a conventional pump. With this given theory, segregating the frictional components from that of the tank would help to reduce the introduction of heat loads to the system. It must be determined if the torque generated by the electric motor will transfer through the propellant tank material, as well as the design to produce the maximum power transfer to evaluate this theory. This report describes the design revision and analytical process of a Magnetic Coupling Tester (MCT). The MCT simulates the torque and power transfer between an array of neodymium magnets attached to a rotor, separated by a wall material. The wall material represents the component(s) used for the tank proving the non-contact transfer. The system's primary function is to measure the power and torque transferred from the driving magnetic array to the driven magnetic array, as well as provide empirical correlations to non-dimensional parameters. Variations have been presented and are currently being evaluated.

**Abstract # 176**

**Electric vehicle lithium-ion battery**

Jalan Salter, C. Pointer, K. Williams, B. Austin, and A. Adams

Mentor: Dr. Aaron Adams

Department of Mechanical and Civil Engineering

As society advances, one major challenge is to develop innovative ways to a cleaner future. Top scientist, engineers and creative minds alike are devoted to the task of producing cleaner energy and reduce greenhouse gas emissions. New developments of alternate energy storage systems are being created today, with the lithium-ion battery being at the top of this list. A great source of cleaner energy, but much less energy dense than gasolines we use today.

Majority of the malfunctions in the batteries today evolve from internal temperature spikes or drops. By designing a multifunctional temperature control system that stabilizes the core temperature and increasing the charge voltage of each individual cell, we can double the life cycle from 3,000 cycles/10 years to 10,000 cycles/25 years in the electric vehicle lithium batteries today.

**Abstract # 177**

**Characterization instrumentation for semiconductor nuclear detectors**

Emily Smith, D. Roop, J. Hogue, A. Gray, M. Harris, I. Parker, and A. Adams

Mentor: Dr. Aaron Adams

Department of Mechanical and Civil Engineering

Cadmium telluride (CdTe)-based detectors can operate at room temperature without cryogenic cooling. These materials have been found useful in the development of x-ray and gamma-ray detectors used in medical imaging and in the detection of radiological and nuclear threats. Typical CdTe ternary compound semiconductors include cadmium zinc telluride (CdZnTe) and cadmium manganese telluride (CdMnTe). Cadmium Zinc Telluride Selenite (CdZnTeSe or CZTS) is a CdTe quaternary compound that has proven promising in lowering the high-cost yield of CdTe-based detector-grade crystals. The detector properties to be studied include resistivity, activation energy, defects, and the mobility/lifetime of the charge carriers. Nuclear instrumentation, including sample holders, high-voltage power supply, preamplifier, shaping amplifier, multichannel analyzer (MCA), oscilloscope, and BNC connectors—are used. Hardware and experiments designed to help with the characterization of these materials include the design and construction of a sample holder with temperature variation capabilities, computation of electrical resistivity from current-voltage (I-V) curve, and detector response and energy resolution using 137 Cs.

**Abstract # 178**

**Polymer electrolyte membrane fuel cell generator**

Jimmy McClendon, J. Kiyah Washington, D. Foster, L. Kimbrough, and A. Adams

Mentor: Dr. Aaron Adams

Department of Mechanical and Civil Engineering

Hydrogen fuels and other sources of fuels have always been utilized to cleanly and efficiently produce electricity. Fuel cells have many different applications, ranging from transportation systems to long-term energy storage in the grid of reversible systems. These fuel cells operate

at a higher efficiency than combustion engines and can also convert chemical energy into electrical energy at a fast rate without a major drop in efficiency. The anticipated outcome will be the empirical study that produces evidence of the superiority of fuel cell operation for the generation of electricity based on the parameters of climate change, portability, and use of efficiency. Data will be presented in terms of three variables: polymer electrolyte membrane fuel cell generator, internal combustion (gasoline) generator, and electrical powered generator. The results of this report will provide a clear-cut foundation of why fuel cells should be researched more, so it can be used in different types of applications. The design and fabrication of a hydrogen fuel cell generator has the ability to provide a clean and efficient option in the electrical field.

**Abstract # 179**

**Human powered space exploration rover**

Isaiah Thompson, J. Muhammad, J. Fain, C. Nnadozie, A. Jones, K. Booker, and W. Chan

Mentor: Dr. Wing Chan

Department of Mechanical and Civil Engineering

Our aim with this presentation was to encourage the next generation of scientists and engineers to engage in the design process and how it relates to human space exploration by providing innovative designs and unique perspectives. We analyzed competition constraints, courses, and requirements to design, develop, build, and test human-powered rovers capable of traversing challenging terrain and task tools to complete various mission tasks. Numerous constraints were identified, such as 5 x 5 x 5 volume constraints, the total weight with mission tools must be under 200 pounds, folding capabilities, mission tasks tool, and various course obstacles to navigate. The challenge's weight and time requirements encourage the rover's compactness, lightweight, high performance, and efficiency. We found that creating a rover with an 85 x 9 x 22.6 inches dimension, symmetric about the folding point, and outer tire diameter of 25 inches will satisfy the minimum design requirements and volume constraints. We discussed ways to complete the various course tasks and obstacles within the time limit for course completion. In conclusion, a multi-use mission tool was created to extract the necessary samples for swift task completion. The final design was put through various simulations to perform structural and stress analysis that ensures our design can endure the loads acting upon the vehicle and its subsystems as the drivers navigate the course and complete various obstacles.

**Abstract # 180**

**Vehicle dynamics of a formula one race car**

Jibrail Muhammad, L. Page, C. Nnadozie. M. Pratt, and W. Chan

Mentor: Dr. Wing Chan

Department of Mechanical and Civil Engineering

This presentation addresses the preparation and participation of a collegiate design series "Formula SAE" under the society of automotive engineers. The research exposes students to the design process and its relation to the mobility industry by providing innovative designs and unique perspectives. These participation processes of FSAE require various engineering knowledge and practical skills in terms of design, engineering, vehicle dynamics, and education in university. The design consists of an open-wheel, single-seat, internal combustion race car. The design requirements of FSAE emphasize powertrain innovation and fuel efficiency. Also, the several competition, design, cost, and sale presentation processes require team management and teamwork amongst university students. Students utilize the software of computer-aided design in order to design chassis and suspension and various subsystems. Structural Equivalency analysis is performed on tubing used for the chassis to ensure chassis and frame designs meet competition rules. Tests will be performed on a final design part and a frame that analyzes stress distribution of each part and flow visualization of intake and exhaust.

**Abstract # 181**

**Design of an ASIC miner heating ventilation and air conditioning system**

Larell Robbins, M. Dortch, G. Quarles, R. Kirksey, and A. Adams

Mentor: Dr. Aaron Adams

Department of Mechanical and Civil Engineering

Due to the high cost of heating homes, an ingenious solution has been achieved by mining Bitcoins and recovering their waste heat. Bitcoin miners use CPUs that run a complex algorithm that operates the CPU for extreme duty cycles and efficiencies of 90%, which produce large amounts of heat. Our goal is to recover the heat generated by the mining process and provide heat to the user while making a monthly profit. This will be accomplished using the Application-Specific Integrated Circuit (ASIC), Miner Heating Ventilation and Air Conditioning (HVAC) system. The factors that will be considered are financing, computations, sensory programming, and operating temperatures. This system will utilize mechanical advantages with the ability to operate using multiple power sources. The ASIC Miner HVAC unit is a 30" L x 25" W x 35" H unit made with 309s stainless steel, and for optimal performance, each miner needs to mine Bitcoin 24 hours a day. The overall objective is to justify that the cost of using an ASIC Miner HVAC system is more cost-efficient and more effective than the average HVAC system's market.

**Abstract # 182**

**Assessing rapid fluctuations in nitrates throughout different landcovers**

Madison B. Johns, and P. Preetha

Mentor: Dr. Pooja Preetha

Department of Mechanical and Civil Engineering

This study aims to evaluate the connectivity of the concentration of nitrates in five different landcover such as forest, water bodies, hays, open spaces, and agricultural lands from 2015 to 2020 in the city of Huntsville, Alabama, United States. Nitrates are composed of nitrogen and oxygen, which are vital to soil and water balance. However, the excess of nitrates in soil and water systems can become detrimental to ecosystems. This study employed hydrogeological data using four methods: field sampling of data from monitoring stations of United States Geological Survey (USGS), Soil and Water Assessment Tool (SWAT), Soil and Water Assessment Tool – Calibration Uncertainty Program (SWAT CUP), and statistical data analysis to determine the nitrate concentrations in the diverse land covers in the Huntsville region. The results reveal an unusual decrease in nitrate concentrations in 2020. The highest nitrate concentrations stem from agricultural lands and the lowest from the areas in which hay is grown. Hence further investigation and analysis are essential to determine whether the nitrate fluctuations will cause any excess environmental impacts for generations to come. Data gathered can also be utilized to develop nitrate-based water quality models to enhance the sustainability of ecosystems and safe drinking water throughout the United States.

**Abstract # 183**

**Solar PV system with tracking**

Miahri Merrell, and S. Chowdhury

Mentor: Dr. Showkat Chowdhury

Department of Mechanical and Civil Engineering

The primary source of energy of the world is fossil fuels, such as petroleum, coal, and natural gas. But fossil fuels are formed over million years from decaying plants and animal products, and hence will soon deplete. In addition, the combustion of fossil fuels produces carbon dioxide, a greenhouse gas that causes global warming. Alternatively, energy can be produced from renewable sources like solar energy, wind energy, etc. These energies are continuously produced, infinite source, environment friendly, and are known as clean energy. But they have to be made economically competitive with fossil fuels. Solar energy is the energy that the earth receives from the sun as radiation, and is harnessed using technologies, such as solar heating and photovoltaic. Photovoltaic (PV) cells convert the radiation energy received from the sun

directly into electrical energy. The photovoltaic cells are put together to form PV panels. The objective of this project is to design, construct and test a solar power system using PV panels with a tracking mechanism. The system consists of a PV panel, charge controller, storage batteries, inverter, and tracking mechanism. The purpose of tracking is to move the solar collector and minimize the angle of incidence of beam radiation and thus maximize the performance of the solar collector. The characteristic parameters of the PV panels, the relation between generated power and solar radiation, solar panel's efficiency, and influence of single or double axis tracking on the solar panel's performance are evaluated. Finally, the performances of the system with or without the storage battery are analyzed and the results presented. The designed solar energy system will provide 120 Watt of clean power for household appliances, battery chargers, etc. The project is built on a movable cart for demonstration and to generate awareness among the engineering and technology students.

## PHYSICS, CHEMISTRY AND MATHEMATICS

### Undergraduate

**Abstract # 184**

**The Application of Machine Learning Techniques to Music Apps**

Brandon D. Watts, and K. Sartor

Mentor: Dr. Kenneth Sartor

Department of Physics, Chemistry and Mathematics

This research is going to focus on the clustering, classification, and regression methodologies which are part of machine learning. There will be an investigation on the application of machine learning to music apps such as Pandora, Spotify, and Apple Music. There will also be an investigation on utilization of mathematical concepts, such as dot product and distance, in the context of the machine learning process.

**Abstract # 185**

**Machine learning for data tracking applications**

Cameryn A. Johnson, and K. Sartor

Mentor: Dr. Kenneth Sartor

Department of Physics, Chemistry and Mathematics

This research effort will investigate the dynamics of data tracking and analysis through the use of Machine Learning. Machine Learning can improve the performance of computer algorithms that perform data analysis. Data Analysis can be any process of inspecting data. Artificial intelligence can improve this data analysis process in relation to decision-making and drawing conclusions. In this effort, the application of machine learning to web tracking (which is a specific type of data tracking) will be focused on. With web tracking, websites passively store and share a user's online activity through a variety of methods. This project will explore how the mathematics related to machine learning has helped pioneer this web tracking technology.

**Abstract # 186**

**Diproton decay of proton-rich heavy nuclei**

Cornelius B. Salonis, and T. Zhang

Mentor: Tianxi Zhang

Department of Physics, Chemistry and Mathematics

Nuclear decay is an important atomic process found in the nature and hence an active topic of research both in theoretically and experimentally. It is responsible for the radioactive decay of unstable or excited heavy nuclei or elements into stable, lighter, and less energetic ones. There are seven categories of known decay modes that facilitate this atomic process, each with its own distinct decay or emissions. The seven known decay modes include the alpha decay, positron (or beta plus) emission, beta minus decay, nuclear fission, proton emission, diproton (or double proton) emission, and exotic cluster decay. In this study, we are focusing on the diproton decay of some proton-rich or neutron-poor (thus very unstable) heavy nuclei such as the isotope of iron (45)Fe, whose atomic number is 26 and mass number is only 45, and the isotope of Krypton (67)Kr, whose atomic number is 36 and mass number is only 67. The method used to conduct this research is based on Zhang's recent study on the Gamow model for transmission and decay of unbound diprotons. We apply the Gamow theory for decays of radionuclides to analytically investigate and calculate the transmission probability and lifetime for the transmission and decay of diprotons from proton-rich or neutron-poor isotopes of iron and Krypton. The results obtained from this study will be quantitatively compared with recent measurements in laboratory experiments. This presentation will show the details of scientific

background or entries on the topic, model analyses conducted and results obtained, and consistency of comparison with measurements.

**Abstract # 187**

**Statistical analysis of mathematics testing scores for 4th grade students in the United States**

Denisha C. Reed, and S. Khan

Mentor: Dr. Salam Khan

Department of Physics, Chemistry and Mathematics

This study is about the average Mathematics scores of standardized testing for 4th graders in Alabama and eight other states. Statistical descriptive analysis and regression analysis is used to analyze the Mathematics Score data. We also predict future average Mathematics scores of 4th grade students.

**Abstract # 188**

**Synthesis and characterization of β-enaminoesters as precursors for Zn complexes for the fabrication of ZnO films for application in the microelectronic industry**

Gabriella J. Farris, and K. Johnson

Mentor: Dr. Keneshia Johnson

Department of Physics, Chemistry and Mathematics

A series of β-enaminoesters (free ligand) were synthesized and characterized as precursors for Zn complexes. The free ligands were prepared via a one-pot synthesis reacting the appropriate alkyl acetoacetate with the desired amine. The isolated free ligands were characterized using FT-IR, $^{1}$H-NMR, $^{13}$C-NMR and GC-MS. The Zn complexes will be synthesized via the reaction of the free ligands with diethylzinc. The ZnO thin films will be grown utilizing Liquid injection metal organic chemical vapor deposition (LI-MOCVD) for application in the microelectronic industry.

**Abstract # 189**

**Analysis of methodologies for creating mars topography classifier**

Michael Porter, and K. Sartor

Mentor: Dr. Kenneth Sartor

Department of Physics, Chemistry and Mathematics

The purpose of this research effort is to investigate mathematical techniques that can be related to creating a Mars topography classifier. There are many different methodologies to choose between when creating a process that can be used to classify Mars topography. For example, numerical regression techniques excel at fitting data trends while matrix similarity heuristics can be used to classify more complex objects based on their features. Machine learning uses structures such as neural networks or decision trees to create the most flexible classification method. Since machine learning methods can be complex and can require large amounts of data, this methodology is generally reserved for applications where standard modeling methods are not well-suited.

**Abstract # 190**

**Statistical analysis of historical obesity data in the United States**

Nyah Coleman, and S. Khan

Mentor: Dr. Salam Khan

Department of Physics, Chemistry and Mathematics

In this study we analyzed historical obesity data in the United States from 1999 - 2018. Statistical descriptive analysis and regression analysis is used to analyze the obesity data. We also predict the obesity trends and conducted the comparison and analysis between men and women obesity data.

**Abstract # 191**

**Shallow water waves with dispersion triplet**

Nyah Coleman, and A. Biswas

Mentor: Dr. Anjan Biswas

Department of Physics, Chemistry and Mathematics

This work is about retrieving the solitary wave solutions for shallow water waves that are visible along lake shores and sea beaches. The dispersive effect stems from three sources, namely

triply—spatial, spatio—temporal and dual spatio—temporal effects. The two models are the Korteweg-de Vries (KdV) equation that comes with a single nonlinear effect and the Gardner's equation which has a dual—form of nonlinear structure. The traveling wave hypothesis is employed to recover the solitary wave solutions. The velocity of the wave is obtained from the first principles. The parameter constraints are also identified, based on the solution structure of the waves, that guarantee the existence of such waves.

**Abstract # 192**

**Highly dispersive optical soliton perturbation with complex—ginzburg Landau Model by semi—inverse variation**

Trevor Berkemeyer, and A. Biswas

Mentor: Dr. Anjan Biswas

Department of Physics, Chemistry and Mathematics

The dynamics of perturbed highly dispersive optical solitons are studied in this work. The governing model is the complex Ginzburg—Landau equation with six dispersion terms. The perturbation effects appear with maximum allowable intensity or full nonlinearity. Three forms of self—phase modulation are considered. They stem from Kerr effect, parabolic law and finally the polynomial form. The semi—inverse variational principle is implemented to recover bright 1—soliton solutions to the model which is otherwise non—integrable with any of the known integration schemes. The applied principle retrieves analytical, but not exact, bright 1—soliton solutions to the model. The parameter constraints, that guarantee the existence of such solitons, are also identified and presented.

**Graduate**

**Abstract # 193**

**X-Ray Photoelectron Spectroscopy (XPS) and Raman Spectroscopy characterization of the dehydration process of dihydrate calcium sulfate**

Alexander Egarievwe, M. Edwards, M. Drabo, and A. Kassu

Mentor(s): Dr. Matthew E. Edwards, Dr. Mebougna Drabo, and Dr. Aschalew Kassu.

Department of Physics, Chemistry, and Mathematics

Using X-ray Photoelectron Spectroscopy (XPS) and Raman Spectroscopy we monitored the transformation of dihydrate calcium sulfate $CaSO_4.2H_2O$, also known as gypsum, into

hemihydrate, $CaSO_4.½H_2O$. This change was observed to occur at relatively high temperatures. The results were recorded at various intervals, and the sample was allowed to oven-dry at 140 $^0$C. The Raman Spectroscopy detects the dehydration process of the compound, and the X-Ray Photoelectron Spectroscopy (XPS) showed the effect that the process has on each element present in the sample. The transformation to the hemihydrate condition and possibly the final anhydrate state from a dihydrate is a process that requires the gradual removal of water molecules at a higher temperature. The amount of time the $CaSO_4.2H_2O$ sample was subjected to the high temperatures determined its products. When this process continues over an extended time, $CaSO_4$.H2O is formed and later becomes $CaSO_4$, the anhydrous state. Therefore, as time passed, with the sample heated at 140 $^o$C or higher, we observed that calcium sulfate dihydrate becomes calcium sulfate hemihydrate, and finally, calcium sulfate anhydrate.

## ORAL PRESENTATIONS

## BIOLOGICAL AND ENVIRONMENTAL SCIENCES

**Abstract # 501**

**Enhancing seed quality in vegetables using low temperature plasma**

Sophia Madison, Sophia Madison, Rao Mentreddy, Leopold Nyochembeng, and Florence Okafor

Mentor: Dr. Rao Mentreddy

Department of Biological and Environmental Sciences

Low temperature plasma (LTP) is gaining more attention as an alternative to chemical disinfectants and due to its demonstrated applications in agriculture. The objective of this research was to assess the effectiveness of LTP in suppressing *Stemphylium botryosum*, a seedborne fungal plant pathogen infecting spinach seeds and plants. LTP was generated with Dielectric barrier discharge (DBD) and Air plasma jet method using helium (8kV, 6kH, pulse width - 1s) and applied directly on mycelia of *Stemphylium botryosum* strains. The fungal strains were exposed to LTP at 0, 30, 60, and 120 s at the University of Alabama, Huntsville. Both plasma-treated and non-treated mycelial cultures were incubated at 25 C under continuous white light and their growth determined. DBD and Air plasma jet methods resulted in more growth suppression of *Stemphylium botryosum*. DBD and Air jet plasma treatments were also more effective than the helium gas as sources of plasma for mycelial growth suppression in *S. botryosum*.

## COMMUNITY AND REGIONAL PLANNING

**Abstract # 502**

**An analysis of tourist spending by international visitors to the United States between 2019 and 2020**

Eyitayo Olaleye, and J. Oluwoye

Mentor: Dr. Jacob Oluwoye

Department of Community and Regional Planning

The United States received the third-highest number of international visitors worldwide in 2019, after France and Spain. The aim of this paper is to examine the spending of these tourists during their visit to the United States. It made use of data from the U.S. Department of Commerce, and determined if any, the relationship between their spending, their country's populations well as their GDP, among other variables. The analysis of these results revealed that there was a positive correlation between expenditure per person and country population on one hand, and expenditure per person and the country's GDP on the other hand ($r = .873$, $p < 0.000$ and $r = .614$, $p < 0.007$), while there was a negative correlation between the amount spent per person and number of visitors to the United States ($r = -.358$, $p < 0.145$). For example, while visitors to the United States from Canada were seven times more than visitors from China, the average Chinese visitor outspent their Canadian counterpart eleven times over. The study concludes that post-pandemic, the U.S. Government should continue to relax travel restrictions to enable more tourists to visit the United States while maintaining adequate public health protocols to prevent further transborder transmissions of the deadly COVID-19 virus.

## FAMILY AND CONSUMER SCIENCES

**Abstract # 503**

**Banana fibers: The new wave of sustainable fashion**

Courtnie Antoinette Ward, P. Gitimu, and C. Bobwealth-Omontese

Mentor(s): Mrs. Carmi Bobwealth-Omontese and Dr. Priscilla Gitimu

Department of Family and Consumer Sciences

As greenhouse gases continue to cause global warming, the fashion industry continues to be the second-largest polluter globally, contributing to the growing issue of sustainability here on Earth. Sustainable and Ethical practices in the fashion industry have become an essential topic due to the increasing rate of fast fashion, the waste produced behind it, and the ethical rules.

This study aims to identify the many uses of the banana tree, its fibers, and how it can be used to create a more sustainable fashion. The study also focuses on how banana fibers impact the environment by reducing the carbon footprint. Using exploratory research in Jamaica, the researchers acquired a better understanding of agricultural practices for cultivating the banana trees, their processing, and how they can be used to produce a more sustainable fashion. The adverse effects of fast fashion on developing countries, such as Jamaica that receive secondhand clothing is accurate, and banana fibers offer a creative substitute for making garments, rugs, and accessories. Banana fibers are a sustainable alternative to synthetic textiles fibers, and it is biodegradable. The researcher observed that cost of banana fibers and banana fabrics is still high. This has led to the oversaturation of secondhand clothes that are not often biodegradable and harmful to the environment. This study recognizes that the banana fiber has the possibility of welcoming a new wave of sustainable fashion. Although there are some details to be worked out concerning the production process, the care, and cost, the banana fibers have the potential of becoming the new sustainable fashion fabric.

## FOOD AND ANIMAL SCIENCES

**Abstract # 504**

**In-vitro assessment of the physicochemical and antibacterial properties of two northern alabama grown hemp (*Cannabis sativa* L) Cultivars.**

Aaron Dudley, L.Kassama, A. Jackson-Davis, X.Kuang, E.Cebert, B.Bamba

Mentor: Dr. Lamin Kassama

Department of Food and Animal Sciences

Plants are an excellent source of bioactive components. Specifically, medicinal plants are gaining significant attention globally due to their natural antimicrobial and antioxidant benefits to human health. Hemp (Cannabis sativa L) is a plant also endowed with antibacterial and antioxidative properties because of their bioactive compounds. However, the potential of cultivars grown in Northern Alabama for food safety and quality is understudied. Thus, this study aimed to investigate the antibacterial and antioxidative potential of ethanolic extracts of two Northern Alabama hemp cultivars CBD 5 and 17. In this study, the inflorescences of cultivars CBD 5 and CDB 17 were used. Whole samples were ground to a particle size range of <0.075mm-4mm and those defatted were by Soxhlet extraction; whole and defatted samples were macerated in 96% ethanol. The obtained extracts were submitted to proximate analysis, particle size distribution, color determination, DPPH free radical scavenging antioxidant activity. Antibacterial activity was evaluated against cocktails of enteric pathogens (Listeria

monocytogenes (LM) and Salmonella enterica (SE) using a BioScreen-C microtiter. Data was expressed, as mean ± standard deviation of three replicates, and the significance level was set to P ≤0.05. Results revealed a significant difference (p≤0.05) of color index b*between both cultivars. Radical scavenging activity resulted in significant differences within cultivars (p=0.0085) and processed samples (p=0.001) with CBD 17. DF extract showed the highest RSA (70.51±4.24%) compared to Ascorbic acid (83.81±5.85%) as control. Antibacterial results indicated that hemp extracts had a significantly lower optical density at the end of the 24-hour observation period compared to the negative controls (p≤0.05) and significant interaction between cultivar and processing (p≤0.05). Due to their inhibition of foodborne pathogens, Northern Alabama cultivars of hemp extracts are suitable active agents for the enhancement of the safety and quality of food.

**Abstract # 505**

**The effects of processing on the antioxidative benefits of persimmon fruit and leaves**

Chynna Gross, D. Nash, V. Ward, S. Willis, M. Verghese

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

Research has shown that phytochemicals exhibit antioxidative and other health-promoting properties, which may offer protection against oxidative stress-related diseases such as cardiovascular diseases and cancer. Belonging to the botanical family Ebenaceae, persimmon (*Diospyros kaki*) is of Asian origin and is suggested to have antibiotic, antioxidant, and anti-inflammatory properties. There has been limited research conducted on the leaves of this plant, which may have beneficial effects as well. The objectives of this study were to determine the effects of processing on total phenolic content (TPC), total flavonoid content (TFC), total carotenoid content (TCC), antioxidant capacity [2,2' diphenyl picrylhydrazyl (DPPH) radical scavenging, ferric reducing antioxidant capacity (FRAP), and Trolox equivalent antioxidant capacity (TEAC). Persimmon fruit was sliced (3.15mm) and dried using three different drying methods: freeze-dried (control), oven-dried (121°C for 3hrs), and dried using a dehydrator (54°C for 14hrs). Leaves and processed fruits were extracted with water (AE) and 80% ethanol (EE). TPC was higher in persimmon fruit control samples for both ethanol (340 mg GAE/100g) and aqueous (216 mg GAE/100g) extracts compared to oven-dried (163 mg GAE/100g (AE) – 154 mg GAE/ 100g (EE)) and dehydrated (81mg GAE/ 100g (AE) – 173mg GAE/100g (EE)) samples. Total carotenoid content (TCC) was 1.31 to 4.22 folds higher in oven-dried samples compared to dehydrated samples. This research shows that both the fruit and leaves have antioxidant potential using various drying methods. Persimmon fruit and leaves could be further utilized as

a functional ingredient to improve consumers' antioxidant status and aid in preventing chronic diseases.

**Abstract # 506**

**The effect sodium octanoate on the concentrations of ghrelin and ketone bodies in male adult rabbits (*Oryctolagus Cuniculus*)**

Daija N. Thompson, N. Taofeek, L. Shackelford, M. Baker, M. Verghese, and J. Vizcarra

Mentor: Dr. Jorge Vizcarra

Department of Food and Animal Sciences

In its active form, ghrelin is an orexigenic hormone characterized by the incorporation of octanoic acid in the third serine residue. However, the possible effect of octanoic acid doses on the synthesis of active ghrelin in rabbits has not been evaluated. Nine-1.5-year-old male rabbits were stratified by their body weight and randomly assigned to three treatments. Rabbits in treatment group 1 received 0 mg/mL of sodium octanoate (Octanoate) in drinking water (control), while animals in treatment groups 2 and 3 were given 4 and 40 mg/mL of Octanoate in drinking water, respectively. Animals receive treatments for 33 consecutive days. Blood samples (3 mL) were obtained weekly from the central auricular artery. At the end of the experiment, a section of the stomach (fundus) was obtained. Total and active ghrelin concentrations were analyzed in blood and tissues samples using radioimmunoassays. Blood samples were analyzed for glucose and ketone body concentrations using colorimetric procedures. Data were analyzed as a complete randomized block design. A significant Octanoate dose-dependent increase was seen in total and active ghrelin concentrations in the fundus ($P < 0.01$). Concentrations of ketone bodies and total and active ghrelin in blood were higher in rabbits receiving the 40 mg/ml dose than those in the 0 and 4mg/mL doses ($P < 0.01$). However, glucose concentrations were not affected by Octanoate doses. We concluded that doses of Sodium octanoate increased active ghrelin concentrations. Thus, the potential to regulate the activity of the orexigenic hormone via fatty acid dietary supplementation.

**Abstract # 507**

## Effects of melatonin on physiological parameters, chute and exit scores of beef calves exposed to summer heat stress

Felix U. Samuel, F. Zakari, L. Swanson, N. Ogunkunle and B. Omontese

Mentor: Dr. Bobwealth Omontese

Department of Food and Animal Sciences

Melatonin has been shown to be a potent antioxidant, immune stimulating and anti-inflammatory compound with capacity to enhance health performance of domestic animals. Heat stress negatively impacts health and performance livestock. This study was designed to evaluate the effects of Melatonin on rectal temperature (RT), respiratory rate (RR), heat shock protein 70 (HSP 70), growth hormone (GH), chute (CS), exit scores (ES) and hematological parameters (HP) in beef calves exposed to heat stress during the summer. A total of twenty calves divided into 2 groups; Melatonin (MEL, n = 10) received 24mg of Melatonin, every 28 days, and Control (CON, n = 10) did not receive any subcutaneous Melatonin implant. The effect of melatonin on RT, RR, HSP 70, GH, CS, ES and HP were evaluated biweekly (D0, D14, D28, D42, D56, D70). The mean ambient temperature (AT) 24.00 ± 0.21°C, relative humidity (RH) 81.60 ± 0.76 % and temperature-humidity index (THI) 89.97 ± 0.70 recorded during the study were above the normal range reported for calves. The biweekly fluctuation of weight gain (WG) in MEL were higher than the CON. The mean RT (39.40 ± 0.06°C), RR (62.57 ± 1.15 cpm), CS (1.13 ± 0.04) and ES (1.5 ± 0.09) in the MEL group were lower (P < 0.05) than the corresponding values of 40.10 ± 0.06°C, 71.53 ± 1.59 cpm, 1.40 ± 0.07 and 1.80 ± 0.10 in the CON group. The biweekly variations in RT, RR, CS, ES, HSP 70 were lower (P < 0.05) in MEL than CON. Growth hormone were higher at D56 and 70 in MEL compared to CON. MEL ameliorates heat stress during the summer by lowering RT, RR, CS, and of beef heifers during the study period. Melatonin was also observed to influence the biweekly variation in WG, RT, RR, CS, ES, HSP 70 and GH of heifers during the study period.

**Abstract # 508**

**Use of hemp, alternative proteins, and spices in the development of functional food product**

Jabari Hinton, M. Verghese, R. Kaur, S. Willis, L. Walker, J. Herring, M. Odum, and J. Vizcarra

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

Alternative protein and spices are incorporated into a food product as functional ingredients for a targeted physiological function in the prevention of chronic diseases. Hemp protein and spices are gaining popularity in food products due to their functionality. The objectives were to determine the antioxidant potential (2,2-diphenyl-1-picryl-hydrazyl (DPPH) free radical scavenging) of selected flours (Hemp, Almond, Coconut, and All-purpose), develop a functional pastry (Camunas), determine effects of the pastry on metabolizing (α – amylase and α – glucosidase and lipase) enzyme, and determine the antioxidant potential of pastry (pre-baked and post-baked). Product was prepared using selected alternative flours with various spices. Alternative flours were extracted with 80% ethanol and water. Highest DPPH inhibition was observed in Hemp (91.18%), compared to Coconut (89.1%), Almond (64.01%), and All-purpose (25.36%) flours. Preliminary sensory testing was conducted using control (All-purpose flour pastry) and test groups (Hemp, Almond, Coconut flour pastries). Panelists rated the product acceptability on a scale of 1 to 5 (where 1-dislike very much, 2-dislike a little, 3-neither like nor dislike, 4-like a little, 5-like very much). Overall acceptability was scored 4 or better by 100% of panelists for almond flour pastries followed by All-purpose (90%), Coconut (70%), and Hemp (30%). Since consumer acceptance is a key factor to successfully negotiate functional food market opportunities, adjustments are being made to formulations to achieve more acceptable pastry attributes when combining alternative flours. Future work will focus on conducting physiochemical, proximate, sensory, and shelf-life analysis for consumer acceptance.

**Abstract # 509**

**Encapsulation system of ploylactic acid (pla) for the delivery of lycopene through in-vitro simulated human digestive system**

Mohammad Anwar Ul Alam, and Lamin Kassama

Mentor: Dr. Lamin Kassama

Department of Food and Animal Sciences

Currently, with the advancement of science and technology, the field of biomedicine has rapidly developed, especially with respect to biomedical materials. Low toxicity and good

biocompatibility have always been key targets in the development and application of biomedical materials for chronic diseases. Thus, biodegradable and environmentally friendly polymers are the most beneficial in incapsulating the bioactive compounds such as lycopene. They would give optimum physicochemical properties to nanoparticles that facilitate drugs delivery, implants and tissue engineering technology. Objectives: Therefore, the objective of this study is to investigate the controlled release kinetics of lycopene in simulated in-vitro human digestion after encapsulating it in. Emulsion evaporation technique incorporated with sonication was carried out to synthesize the polylactic acid (PLA)-lycopene nanoparticles. Methods: Physicochemical properties, encapsulation efficiency, control release kinetics and digestion effect were assessed by zeta sizer, spectrophotometric, dialysis and automated dynamic in-vitro digestive system, respectively. Results: The hydrodynamic diameter, polydispersity index and conductivity of PLA-lycopene nanoparticles were significantly increased ($P<0.05$) with the increase sonication time. While increased sonication time decreased the stability and mobility of the nanoparticles, and likewise the encapsulation efficiency of lycopene by 24.4% in a polymeric emulsion. In addition of that, quadratic model better explained the relationship between hydrodynamic diameter and surfactant concentration ($R2 = 0.424$, $P<0.05$). Moreover, in vitro digestion showed that 85% of lycopene activity was retained after invitro digestion and followed non-Fickian diffusion mechanism to be absorbed through the simulated intestinal lining. Significance: The study significantly contributes to the important knowledge and development of PLA in biomedical applications.

**Abstract # 510**

**Effects of Spent Hemp Biomass on behavior, health, gut function, microbiome dynamics, growth, carcass quality and reproductive performance of beef cattle**

Nathaniel Ogunkunle, F. Samuel, F. Zakari, E. Cebert and B. Omontese

Mentor: Dr. Bobwealth Omontese

Department of Food and Animal Sciences

With the passage of the Agricultural Act of 2014 (the 2014 Farm Bill), many farmers have started growing hemp for cannabidiol production. However, cannabidiol production creates high quantities of spent hemp biomass (SHB) byproduct comprising the plant's extracted leaf and stalk portions. The objective of this study is to evaluate the effects of including SHB in beef cattle diets on behavior, health, gut function and microbiome dynamics, growth, carcass quality and reproductive performance. Our hypothesis is that SHB would have a detrimental effect on the health and performance of beef heifers. Twenty heifer calves will be enrolled. The experiment will consist of three stages using a Latin square design: the adaptation period (two

weeks), feeding period (four weeks) and washout period (two weeks). The trial will consist of treatments: a control (CON), 5% (low SHB), 10% (moderate SHB) and 20% (high SHB). The CON will be fed only a commercially available concentrate diet comprised of grains (maize, barley and soybean meal) and hay whereas experimental diets will contain grains and hay. Feed intake and acceptability will be monitored. Animals will be weighed biweekly and fitted with activity monitoring systems to record lying time, steps frequency and rumination duration. Blood samples will be collected biweekly for hemogram. Serum will be harvested and stored for analysis of reproductive hormones, stress biomarkers and inflammatory mediators. Reproductive ultrasonography will be performed to monitor ovarian dynamics, estrus behavior and response to synchronization treatments. Rumen pH and temperature will be determined using a rumen bolus. Rumen fluid will be extracted using an esophageal probe and analyzed for metabolites, microbiome dynamics and volatile fatty acids. The presence of tetrahydrocannabinol and cannabidiol residuals in meat of heifers will be determined.

**Abstract # 511**

**The differential effect of dietary sodium octanoate on feed intake, body weight gain, ketone bodies and total ghrelin concentration in two Avian species**

Nurudeen O. Taofeek, D. Thompson, M. Rushing, K. McKee, S. Lopez, K. Blake, L. Shackelford, M. Baker, M. Verghese and J. Vizcarra

Mentor: Dr. Jorge Vizcarra

Department of Food and Animal Sciences

The active form of ghrelin (AG) is characterized by the incorporation of an octanoic acid at the third amino acid residue. We have previously reported that AG infusion in chickens decreased feed intake (FI). Therefore, we evaluated the effect of dietary sodium octanoate (Octanoate) on FI, water intake (WI), body weight (BW), ghrelin, ketone bodies (KB), growth hormone (GH) and glucose concentration in two avian species. Twenty-four (24) one-day-old birds (12 chickens: *Gallus gallus domesticus* and 12 turkeys: Meleagris gallopavo) were reared as recommended by the industry. At three (3) weeks of age (WOA), birds were blocked by weight and randomly assigned into a 2 X 3 factorial arrangement of treatments for 24 days. In factor 1 are the avian species (SPECIES) (chickens and turkeys), and in factor 2, birds were subjected to different doses (0, 4, and 8 mg/ml of sodium octanoate). Birds in the 0 mg/ml group received only water and were considered the control group. Feed and water intake were recorded daily, while body weight and blood samples were obtained weekly. Concentrations of total ghrelin and growth hormone were evaluated using ELISA kits, and concentrations of glucose and ketone bodies were measured using a colorimetric assay. Data obtained were analyzed as a

completely randomized blocked design with repeated measurements over time. Octanoate doses linearly increased ghrelin concentrations (P = 0.0344), which in turn resulted in a decreased in FI (P =0.0248) and average daily gain (P = 0.0169) in chickens but not in turkeys. As expected, concentrations of KB were also increased (P = 0. 0033). However, WI, GH, and glucose concentrations were not affected by Octanoate doses. We concluded that doses of Octanoate differentially regulate the concentrations of ghrelin and FI in poultry.

**Abstract # 512**

**Evaluating effects of different Drying conditions on phytochemical content and Antioxidant properties of Beets**

Terica Curtis, R. Kaur, and M. Verghese

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

Beet root (*Beta vulgaris*) is ranked among the ten most powerful vegetables in terms of antioxidant properties which are associated with a significant amount of phenols and nitrogenous pigments called betalains. Betalains are known to have potential antioxidant, anti-inflammatory, and chemo-preventive activities. The objective of this study is to evaluate the effects of different drying methods on the total phenolic content (TPC), total flavonoid content (TFC), and antioxidant properties. Anti-oxidative properties were assessed through various assays such as 2,2' diphenyl picrylhydrazyl (DPPH), ferric reducing antioxidant potential (FRAP), Nitric Oxide Radical Scavenging (NORS), and Trolox Equivalent Antioxidant Capacity (TEAC). The Beet fruit and the foliage were dried using different drying conditions to increase the shelf life. The samples were dried at a set temperature of 40 $^{o}$C using various methods such as oven drying, osmotic dehydration at low concentration saline (5% salt concentration), and using a dehydrator. Drying was followed by the preparation of extracts using 80% ethanol and water as solvents. The moisture content of the beet fruit was 88% and foliage is expected to range from 91% to 95% which is very critical to increasing the shelf-life of the Beet fruit and leaves. The TPC, TFC, and antioxidant properties of Beetroot are expected to vary based on the drying conditions. The significance of this study is to reduce food wastage (increase food sustainability) in the food industry. The results from this study indicate that Beetroot foliage can be used as a functional ingredient in food products. Beetroot and foliage may be effective in the prevention of Chronic diseases while causing minimal toxic effects to liver cells. Future work will also involve designing a food product utilizing Beetroot and foliage.

**Abstract # 513**

**Development of electrospun chitosan nanofibers for antimicrobial food packaging**

Edwin Ochieng, Lamin Kassama, Armitra-Jackson Davis, Joongmin Shin

Mentor: Dr. Lamin Kassama

Department of Food and Animal Sciences

Electrospinning (EN) process utilizes an electrically charged jet of a polymer solution that is atomized into a substrate of nanofiber. The polymer (chitosan) solution is influenced by its cationic structure which inversely affects the hydrodynamic and viscosity of the solution which are key parameters for the EN process. Hence, the objective was to investigate the effect of chemical hydrolysis of Chitosan (CS) polymer on the viscosity of chitosan solution's spinnability into functional antimicrobial packaging film. Medium molecular weight CS was hydrolyzed with NaOH at 90°C for 12, 24, 36, and 48 h. Fourier transform infrared (FTIR) was used to analyze the hydrolyzed samples. Brookfield rheometer was used to test the viscosity of hydrolyzed CS samples at a controlled temperature of 25°C. The electrospun fiber morphology was characterized using a scanning electron microscope (SEM). The antimicrobial properties of the film were tested against *E.coli* and Salmonella spp., using the disc diffusion method. The FTIR results showed that hydrolysis does not affect ($p > 0.05$) the molecular structure of chitosan. However, an increase of hydrolysis time (HT) significantly ($p < 0.05$) decreased the apparent viscosity of the CS solution. Hence, the consistency index of the unhydrolyzed CH solution was 55857±3.7 Pa.s compared to 35972 ± 6.83, 28657 ± 9.01, 2232 ± 8.41, and 2002 ± 6.17 Pa.s for solutions hydrolyzed for 12, 24, 36, and 48 h, respectively. Chitosan solution generally exhibited pseudo-plastic ($n<1$) behavior and the Power law equation was found to be the best fit ($R2=0.96$). An inverse correlation between the electrical conductivity with viscosity was also observed. The morphology on electrospun nanofiber was observed using SEM. The data shows that over 36 hr. of hydrolysis produced the most consistent and fine nanofiber, while no significant effect ($p > 0.05$) on the antibacterial properties were observed.

## MECHANICAL AND CIVIL ENGINEERING

**Abstract # 514**

**Evaluating the trends of groundwater recharge from 2001- 2014 in a river basin in Alabama**

Kayla Maclin, and P. Preetha

Mentor: Dr. Pooja Preetha

Department of Mechanical and Civil Engineering

Groundwater is an important resource of the environment for daily human activities. According to recent studies, groundwater provides over 97% of accessible fresh water on the planet. Hence, it is important to keep track of the amount of groundwater storage and groundwater retrieval. The amount of groundwater retrieved should not exceed the amount of groundwater stored because that will dry out the soil and cause cracks that can spread into the deeper layers of the earth. The balance of groundwater storage and retrieval is evaluated through a parameter, groundwater recharge that is essential to replenish the water needed in the soil. This study aims to estimate the amount of groundwater storage and groundwater recharge in the Tombigbee River basin in Alabama, United States. To conduct this research, Geographical Information System (GIS) was utilized to collect and map hydrological and geological data. The groundwater data were collected from the Tombigbee River basin in Alabama between 2001 and 2014. The results showed that the groundwater recharge fluctuates from the lowest point in 2001 of 0.516 mm to the highest point in 2008 of 886.788 mm. The mean of the temporal groundwater recharge from 2001 to 2014 is 488.149 mm. The inconsistency of the groundwater recharges portrays that further research should be done to understand why the numbers fluctuate the way they do.

## PHYSICS, CHEMISTRY AND MATHEMATICS

**Abstract # 515**

**Investigation of polystyrene doped nanocomposite thin films for microelectronics**

Mersaydes L. Goodson, and P. Guggilla

Mentor: Dr. Padmaja Guggilla

Department of Physics, Chemistry and Mathematics

In this study, composite films were investigated and evaluated for their dependence of doping concentrations over temperature. Our objective was to fabricate polystyrene (PS) thin films doped with metal nanocomposites for advanced sensor systems. PS films have good electrical properties, excellent gamma radiation resistance, but have poor chemical and UV (ultraviolet) resistance. Imploring metal-containing composites with applications ranging from optoelectronics, properties allowing for applications in Infrared sensors are explored. Metal nanocomposites are deposited into a PS matrix utilizing the solution casting method and characterized via UV-Visible (UV-vis) spectroscopy. UV-Vis light characterization techniques were performed. Several optical parameters, such as absorption coefficient (α), refractive index (n), energy band gap (Eg), transmittance (T), and absorption were investigated at room temperature in the wavelength range 300-700 nm. The absorption spectra were tuned with dopant nanoparticles (NPs). Transmittance decreases with the addition of dopants. Furthermore, Tauc's model is employed to elucidate optical behavior and calculate energy band gaps of the synthesized nanocomposite thin films. Optical band gap engineering is found to be possible upon introducing NPs into PS polymer thin films. The energy band gap of pure PS was measured at 4.23 eV, PS/$LiNbO_3$ at 4.35 eV, PS/$LiTaO_3$ at 4.27 eV, and PS/$KNbO_3$ at 4.54 eV, supporting that these nanocomposite films can be considered for insulating dielectrics. The refractive index, n, is found to slightly increase with the addition of these nanoparticles, exhibiting values between 1.0-1.6. Extinction coefficient, k in the spectral range 350 nm < λ< 700 nm continues to increase in films except $LiNbO_3$ and PZT.

~~~~
~~~~

## List of STEM DAY 2022 Presenting Authors by Last Name and Page Number

Alabama A&M University
"Service is Sovereignty"

## The Founder of STEM Day

Dr. Matthew E. Edwards, Professor of Physics

Fall Semester 2006

**Past STEM Chairpersons and Co-Chairpersons**

| Chairperson | Co-Chairperson(s) | Year |
|---|---|---|
| Dr. Matthew Edwards | Dr. Juarine Stewart | 2007 |
| Dr. Matthew Edwards | Dr. Martha Verghese | 2008 |
| Dr. Florence Okafor | Dr. Showkat Chowdhury | 2009 |
| Dr. Florence Okafor | Dr. Mezemir Wagaw | 2010 |
| Dr. Mezemir Wagaw | Dr. Vernessa Edwards | 2011 |
| Dr. Vernessa Edwards | Dr. Elica Moss | 2012 |
| Dr. Elica Moss | Dr. Malinda Gilmore | 2013 |
| Dr. Malinda Gilmore | Dr. Josh Herring | 2014 |
| Dr. Josh Herring | Dr. Kamala Bhat & Dr. Aschalew Kassu | 2015 |
| Dr. Kamala Bhat | Dr. Dedrick Davis Dr. Mebougna Drabo | 2016 |
| Dr. Dedrick Davis | Dr. Padmaja Guggilla Dr. Armitra Jackson-Davis | 2017 |
| Dr. Padmaja Guggilla | Dr. Armitra Jackson-Davis Ms. Terry Miller | 2018 |
| Dr. Armitra Jackson-Davis | Dr. Salam Khan Dr. Laricca London-Thomas | 2019 |
| | Cancelled due to Covid-19 | 2020 |
| Dr. Salam Khan | Dr. Laricca London-Thomas Dr. Anjan Biswas | 2021 |
| Dr. Sadguna Anasuri | Dr. Mamadou L. Kassama Dr. Satilmis Budak | 2022 |

**STEM Day 2022 – Committees: Chairs and Members**

| Committee | Chair | Members | |
|---|---|---|---|
| Abstracts | Dr. Atluri | Dr. Budak<br>Dr. Guggilla<br>Dr. Moss<br>Dr. Rana<br>Dr. Kassu | Dr. Khan<br>Ms. Miller<br>Dr. Anasuri<br>Dr. Varner<br>Dr. Ouf |
| Awards | Dr. Herring | Dr. Kassama<br>Dr. Davis, A.<br>Dr. Guggilla | Dr. Strachan<br>Ms. Clayton<br>Dr. Khan |
| Budget | Dr. Anasuri | Dr. Kassama<br>Dr. Khan<br>Ms. Clayton<br>Dr. Moss | |
| Facility | Dr. Budak | Dr. Kassu<br>Dr. Drabo<br>Dr. Bhat | Dr. Rana<br>Dr. London<br>Dr. Ouf |
| Graduate Presentations | Dr. Davis, D | Dr. Rana<br>Dr. Johnson<br>Dr. London | Dr. Kassama<br>Dr. Varner<br>Dr. Drabo |
| Hospitality | Dr. Massey | Dr. Moss<br>Dr. Davis, A<br>Dr. Bhat | Dr. Varner<br>Ms. Miller<br>Dr. London |
| Judges | Dr. Davis, A | Dr. Herring<br>Dr. Davis, D.<br>Dr. Johnson | Dr. Khan<br>Ms. Clayton |
| Media & Publicity | Ms. Clayton | Dr. Herring<br>Mr. Adkins | Dr. Khan<br>Dr. Anasuri |
| Program Committee | Dr. Kassama | Dr. Atluri<br>Dr. Moss<br>Dr. Guggilla | Dr. Davis, A.<br>Dr. Budak<br>Dr. Anasuri |
| Sponsorship | Dr. Khan | Ms. Clayton<br>Dr. Kassama | Dr. Kassu<br>Dr. Anasuri |
| Virtual *(if we go this route)* | Dr. Herring | Dr. Khan<br>Dr. Kassama<br>Mr. Adkins | Dr. Johnson<br>Dr. Moss<br>Ms. Clayton<br>Dr. Anasuri |
| Reserve Support Team | Everyone on STEM Day 2022 Team (as needed and available) | | |

# AAMU STEM – STUDENT ORGANIZATIONS

**American Chemical Society (ACS) Student Chapter**

**American Society of Civil Engineers American Society of Mechanical Engineers**

**American Society of Military Engineers**

**Animal Science Club Environmental Science Club**

**Association for Computing Machinery Student Chapter**

**Black Chemists and Chemical Engineers**

**Chemistry Club Future Physicians Club**

**Computer Science Club**

**Eta Kappa Tau Engineering and Technology Fraternity**

**Forestry Club Alpha Zeta**

**Institute of Electrical and Electronics Engineers (IEEE) Students Branch**

**International Society of Optical Engineering Student Chapter**

**Materials Research Society Student Chapter**

**Minorities in Agriculture, Natural Resources and Related Sciences**

**National Institute of Science Club Food Science Club**

**National Society of Black Engineers Society of Physics Students**

**Phi Tau Sigma (Food Science Honor Society) Graduate Students Association**

**Society of Photographic Instrumentation Engineers (SPIE)**

**Society of Women Engineers Computer Science Club**

**The National Organization for the Professional Advancement of**

**The Pre-Professional Club Beta Kappa Chi Honor Society**

# ACKNOWLEDGEMENTS

On behalf of STEM Day 2022 Planning Committee, the Chair and Co-Chairs would like to extend a big, heartfelt 'thank you' to all the sponsors, chairs and coordinators of the various units, for their dedication, support and encouragement to the faculty in the respective units without whom this event would be hard to visualize.

**Sponsors**

BULLDOG ELITE
College of Agricultural, Life and Natural Sciences
BULLDOG VISIONARY
The Boeing Company
College of Engineering, Technology and Physical Sciences
Constellium Muscle Shoals, LLC
HONDA
Information Technology Services
Office of the President
Office of the Provost and VP, Academic Affairs & Research
Office of the VP, Student Affairs
Torch Technologies
BULLDOG INNOVATOR
Career Development Services
College of Business and Public Affairs
College of Education, Humanities, and Behavioral Sciences
Macy's
Office of the VP, Business and Finance
Office of Residential Life and Housing
BULLDOG ADVOCATE
Alabama Cooperative Extension System
Caterpillar Financial Services
chime
FERGUSON
Office of Institutional Planning, Research, and Evaluation
J. F. Drake Memorial Learning Resources Center

**AAMU Offices and Programs**

**Office of the President**
Dr. Daniel K. Wims, President
**Academic Affairs**
Dr. Lena Walton, Provost and Vice President
**Alabama Cooperative Extension System**
Dr. Allen Malone, Administrator, 1890 Extension Programs
**College of Engineering, Technology and Physical Sciences**
Dr. Zhengtao Deng, Dean
**College of Agricultural, Life and Natural Sciences**
Dr. Lloyd Walker, Dean
**College of Business and Public Affairs**
Dr. Amin Sarkar, Dean
**College of Education, Humanities, and Behavioral Sciences**

Dr. Samantha Strachan, Dean
**College of Graduate Studies**
Dr. John Jones, Dean
**Office of Public Relations**
Jerome Saintjones, Director
**Facility Services Aramark, Inc.**
Mrs. Felicia Wilson, Director of Dining Services

**Chairs and Coordinators**

Dr. Padmaja Guggilla Chair, Physics, Chemistry, and Mathematics
Dr. Wubishet Tadesse, Chair Biological and Environmental Sciences
Dr. Martha Verghese, Chair, Food and Animal Sciences
Dr. Jorge Vizcarra Coordinator, Food Science
Dr. Josh Herring, Coordinator, Animal Biohealth Sciences
Dr. Nahid Sistani, Interim Chair Family & Consumer Sciences
Dr. Patricia Young, Coordinator, Apparel, Merchandising & Design
Dr. Sadguna Anasuri, Coordinator, Human Development & Family Studies
Dr. Nahid Sistani, Coordinator, Nutrition & Hospitality Management
Dr. Mohamed Seif, Chair, Mechanical & Civil Engineering, and Construction Management
Dr. Jian Fu, Chair, Electrical Engineering and Computer Science
Dr. Jamiu Odutola, Coordinator, Chemistry
Dr. Faqua Majid, Coordinator, Mathematics
Dr. Andrew Scott, Coordinator, Electrical Engineering
Dr. Yujian Fu, Coordinator, Computer Science
Mrs. Tamara Chowdhury, Coordinator, Construction Management
Dr. Deden Rukmana, Chair, Community and Regional Planning
Dr. Emily Erikson, Undergraduate Coordinator
Dr. Jordan Yin, Program Coordinator, Liberal and Interdisciplinary Studies

A special “thank you” is extended to all the sponsors of the
Alabama A&M University STEM Day 2022.

**An extra special “THANK YOU” to all**

**STEM Day 2022 Judges**
**for their time, effort, and overall commitment**
**to improving the research and lives of students!**


# Thanks to Our Sponsors!

# Bulldog Elite

# AAMU STEM DAY 2022

## AGRICULTURE MAKES THE WORLD GO 'ROUND


## AND THE
## COLLEGE OF AGRICULTURAL, LIFE AND NATURAL SCIENCES
## IS A GREAT PLACE TO START YOUR JOURNEY!!!

For More Information, contact 256-372-5783

http://www.aamu.edu/academics/alns

Facebook College of Agricultural Life and Natural Sciences-CALNS AAMU

Instagram AAMU_CALNS

# Bulldog Visionary

## College of Engineering, Technology and Physical Sciences


Information Technology Services

Bulldog Tech Bytes

Support Team

Services


STEM 15 YEARS
DAY 2022
ALABAMA A&M UNIVERSITY

CONGRATULATIONS TO THE STUDENTS, COMMITTEE MEMBERS AND FACULTY ADVISORS ON A JOB DONE WELL.

OFFICE OF THE PROVOST AND
VICE PRESIDENT FOR ACADEMIC AFFAIRS

# CONGRATULATIONS STEM DAY 2022!

**We applaud our students and their advisors, and thank the STEM Day committee members, sponsors, and volunteer judges for their dedication and commitment.**

**Lena Walton, PhD**
**Interim Provost and V.P. for Academic Affairs**

15 YEARS
STEM DAY 2022
ALABAMA A&M UNIVERSITY

ALABAMA A&M UNIVERSITY

# THE DIVISION OF STUDENT AFFAIRS

Congratulates all of the Bulldogs selected to participate in **STEM Day 2022!**

Thanks to the STEM Day committee members and advisors for their tireless dedication. We appreciate the judges, sponsors and employer panelists for their time and support.

**BRENDA WILLIAMS**
**Interim VP for Student Affairs**

**BRITTANY HOLLLOMAN, PhD**
**Interim AVP for Student Affairs and Judicial Appeals**

# Bulldog Innovator


**Congratulations to the STEM Day Committee for 15 years of excellence!**

**We are honored to support our talented Bulldogs and committed faculty.**


Start Here. Go Anywhere


## DEPARTMENTS & CENTERS

Department of Accounting & Finance

Department of Management, Marketing, & Logistics

Department of Social Sciences

Center for Entreprenurship, Innovation, & Economic Development (CEIED)

Disadvanataged Business Enterprise (DBE) Support Services

Experimental Learning Office (ELO)

## ACCREDITATION

The business programs (BS & MBA) are accredited by the top most business accrediting body of the world, AACSB International - The Association to Advance Collegiate Schools of Business.

We are the only HBCU in the state of Alabama among 901 business schools (5%) worldwide to have earned the AACSB International accredidation. Only about 25% U.S. business programs are AACSB accredited. The standards "are founded on diverse perspectives, a global mindset, and a commitment to making a difference."

## UNDERGRADUATE PROGRAMS

Accounting

Business Adminstration, with concentrations in MIS & International Business

Criminal Justice

Entrepreneurship

Finance

Logistics & Supply Chain Management

Managment

Marketing

Political Science

Sociology

## GRADUATE PROGRAMS

Business Adminstration (MBA)

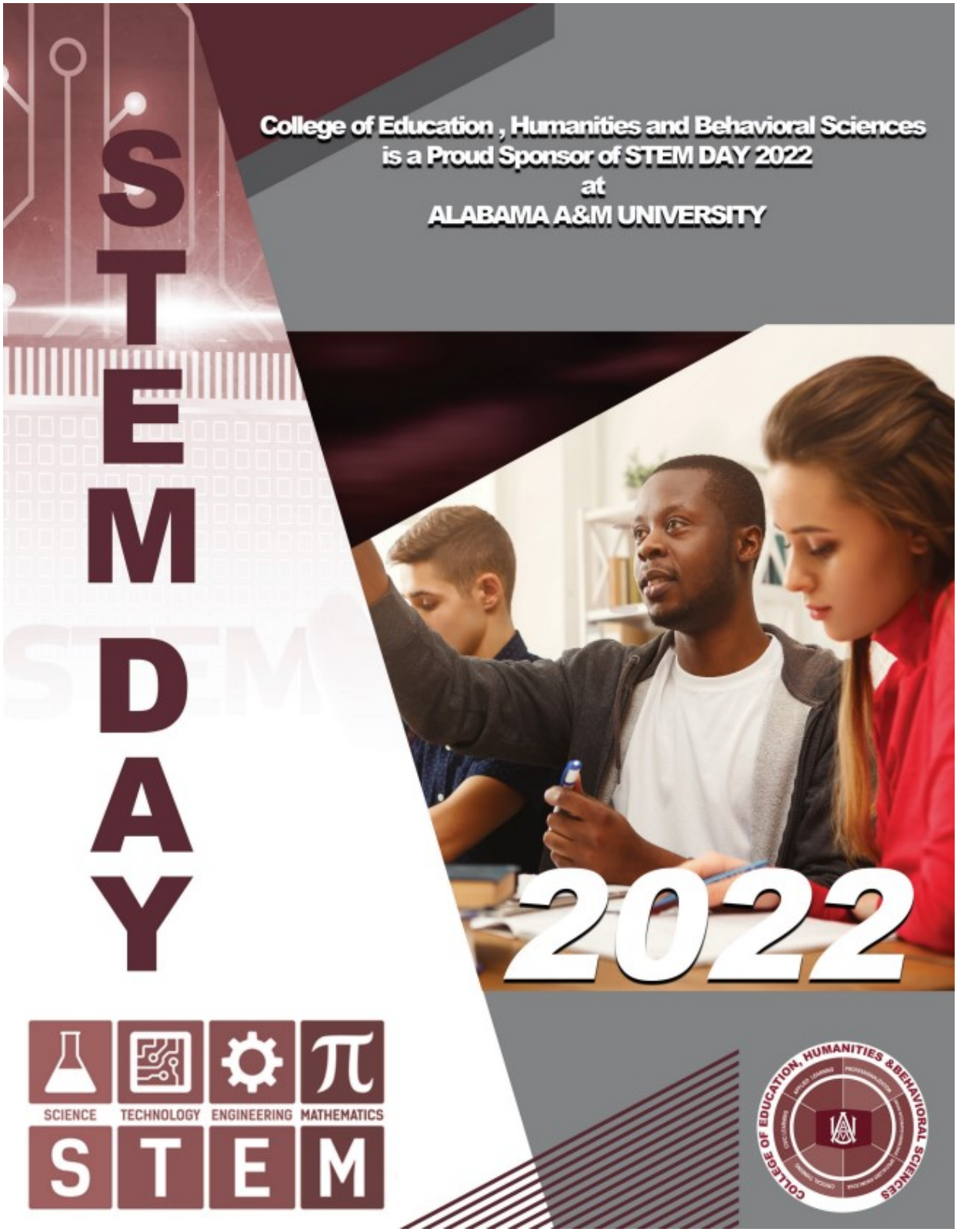
Public Affairs (MPA)

## OUR MISSION

Building on our heritage as an 1890 Land-Grant University, we are a college providing relevant business & social science education to emerging leaders ready to make a global impact.

**WWW.AAMU.EDU**

**(256)372-5092**


College of Education , Humanities and Behavioral Sciences
is a Proud Sponsor of STEM DAY 2022
at
ALABAMA A&M UNIVERSITY
STEM DAY
2022
SCIENCE TECHNOLOGY ENGINEERING MATHEMATICS
S T E M
COLLEGE OF EDUCATION, HUMANITIES & BEHAVIORAL SCIENCES


Your future starts here!
macy's
Join Macy's and earn more than just a paycheck...
A lot more!
Whether pursuing an after college career in technology, store management, or corporate operations, Macy's invests in talent just like you by offering amazing benefits to enhance both your work life and personal well-being.
Join Macy's and experience debt-free education with our new fully funded education benefit as well as enhanced, flexible time off to celebrate Holidays that are most important to you. That's the magic of Macy's!
Learn more about our after college Executive Development Program at macysJOBS.com
SCAN ME
Equal Opportunity Employer
macy's JOBS

# Happy STEM Day

## The Department of Business and Finance

*Dr. Lynda Batiste, Interim Vice President*
*Nakesha Burks*
*Courtney Davis-Comptroller's Office*
*Jeff Robinson- Purchasing/Property Management*
*Brian Shipp- Facilities*
*Marshall Chimwedzi-BTS*
*Dr. Jarret Walton-Human Resources*
*Gregory Jackson-Budget Office*

# Congratulations, STEM DAY 2022


ALABAMA A&M UNIVERSITY

Housing aamu.edu

# Bulldog Advocate

# 2021 Impact Snapshot

extension
ALABAMA A&M & AUBURN UNIVERSITIES

## We Grow Alabama

| Global Food Security and Hunger | Urban Agriculture and Gardening | Natural Resource and Environmental Sustainability | Human Nutrition, Well-being, Health, and Obesity | Community Development | Family, Home, and 4-H Youth Development | Active Competitive Grants |
|---|---|---|---|---|---|---|
| 28,036 contacts | 97,354 contacts | 154,054 contacts | 32,711 contacts | 19,893 contacts | 41,958 contacts | $1,190,805 awarded |

In 2021, we established 246 partnerships and signed 15 MOUs across the state to expand reach and impact.

## URBAN EXTENSION

Alabama Extension at Alabama A&M University

**The Alabama Cooperative Extension System at Alabama A&M University** develops programs that can be delivered where needed most, directly to our audiences on farms, in local schools, community centers, places of worship, and online. We have programs for everyone, including individuals, families, older adults, students, teachers, business owners, community members and leaders.

### Personalized Approach to Learning

Staff at nine Urban Centers across Alabama deliver **free training and activities**, including in-person and virtual classes and educational resources for youth and adults.

**Sample of Educational Topics**

- Career Readiness
- Urban Agriculture
- Health and Nutrition
- Successful Aging
- Urban Gardening
- Entrepreneurship
- Money Management
- 4-H and Youth Development
- Environmental Stewardship
- Animal Science






**Urban Products & Services**

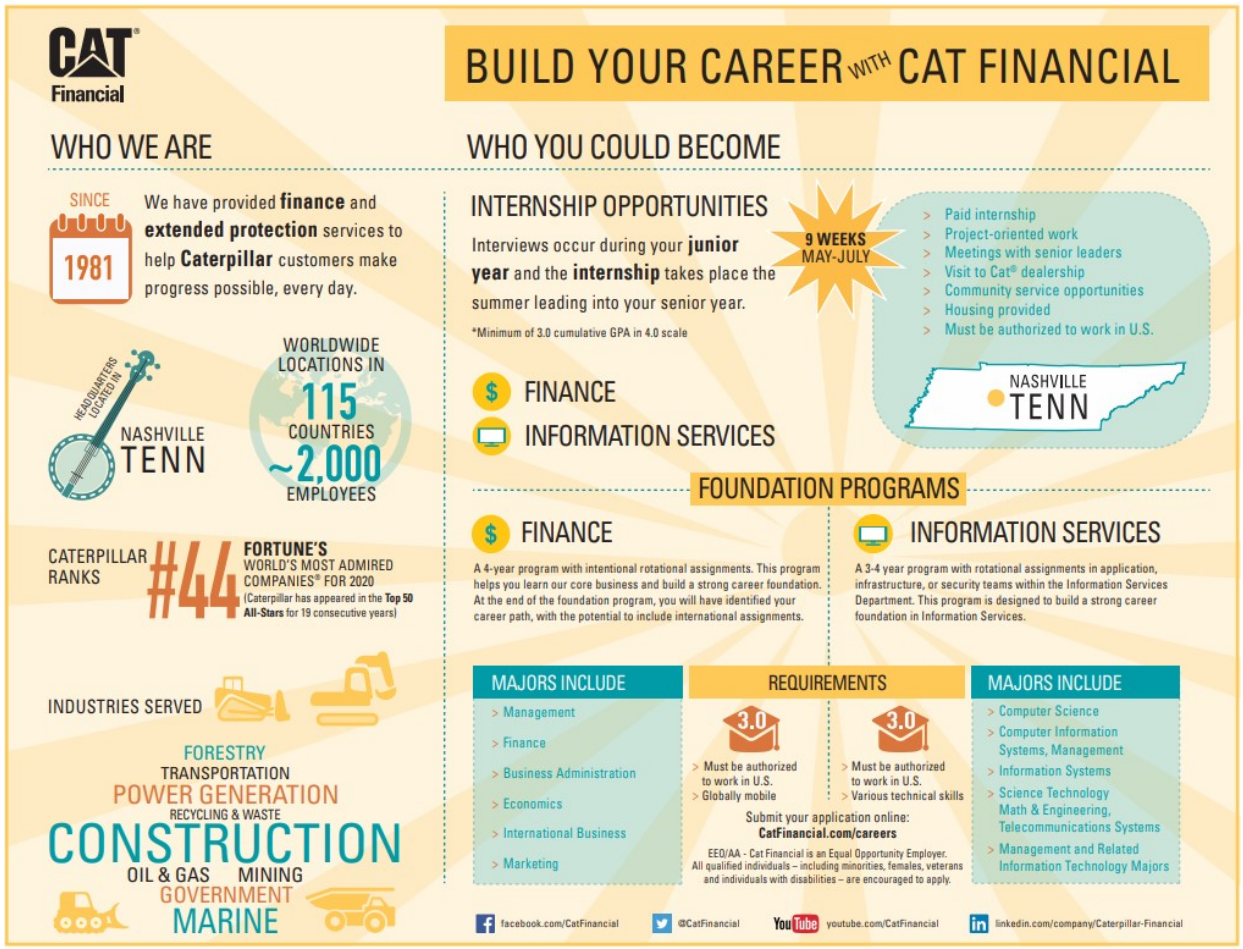
Follow the QR code for detailed products and services descriptions.

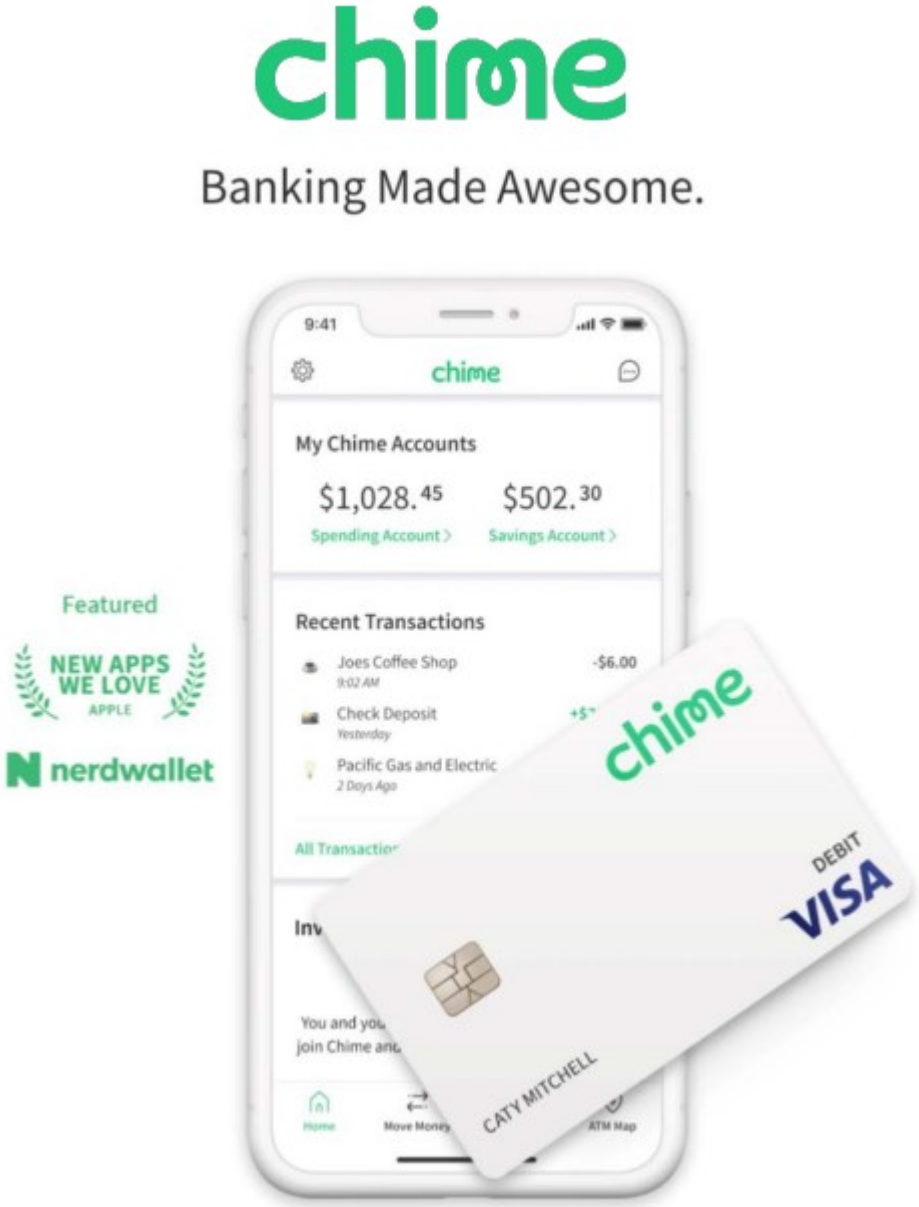
The Alabama Cooperative Extension System (Alabama A&M University and Auburn University) is an equal opportunity educator and employer. Everyone is welcome! Please let us know if you have accessibility needs.

Alabama A&M University | USDA

www.aces.edu/urban

**Call Us: (256) 690-4614**


CAT Financial
BUILD YOUR CAREER WITH CAT FINANCIAL
WHO WE ARE
SINCE 1981
We have provided finance and extended protection services to help Caterpillar customers make progress possible, every day.
HEADQUARTERS LOCATED IN NASHVILLE TENN
WORLDWIDE LOCATIONS IN 115 COUNTRIES ~2,000 EMPLOYEES
CATERPILLAR RANKS #44 FORTUNE'S WORLD'S MOST ADMIRED COMPANIES® FOR 2020
(Caterpillar has appeared in the Top 50 All-Stars for 19 consecutive years)
INDUSTRIES SERVED
FORESTRY
TRANSPORTATION
POWER GENERATION
RECYCLING & WASTE
CONSTRUCTION
OIL & GAS MINING
GOVERNMENT
MARINE
WHO YOU COULD BECOME
INTERNSHIP OPPORTUNITIES
Interviews occur during your junior year and the internship takes place the summer leading into your senior year.
*Minimum of 3.0 cumulative GPA in 4.0 scale
9 WEEKS MAY-JULY
> Paid internship
> Project-oriented work
> Meetings with senior leaders
> Visit to Cat® dealership
> Community service opportunities
> Housing provided
> Must be authorized to work in U.S.
NASHVILLE TENN
FINANCE
INFORMATION SERVICES
FOUNDATION PROGRAMS
FINANCE
A 4-year program with intentional rotational assignments. This program helps you learn our core business and build a strong career foundation. At the end of the foundation program, you will have identified your career path, with the potential to include international assignments.
INFORMATION SERVICES
A 3-4 year program with rotational assignments in application, infrastructure, or security teams within the Information Services Department. This program is designed to build a strong career foundation in Information Services.
MAJORS INCLUDE
> Management
> Finance
> Business Administration
> Economics
> International Business
> Marketing
REQUIREMENTS
3.0
> Must be authorized to work in U.S.
> Globally mobile
3.0
> Must be authorized to work in U.S.
> Various technical skills
Submit your application online:
CatFinancial.com/careers
EEO/AA - Cat Financial is an Equal Opportunity Employer. All qualified individuals – including minorities, females, veterans and individuals with disabilities – are encouraged to apply.
MAJORS INCLUDE
> Computer Science
> Computer Information Systems, Management
> Information Systems
> Science Technology Math & Engineering, Telecommunications Systems
> Management and Related Information Technology Majors
facebook.com/CatFinancial
@CatFinancial
YouTube youtube.com/CatFinancial
linkedin.com/company/Caterpillar-Financial


chime
Banking Made Awesome.
Featured
NEW APPS WE LOVE
APPLE
nerdwallet
9:41
chime
My Chime Accounts
$1,028.45
Spending Account
$502.30
Savings Account
Recent Transactions
Joes Coffee Shop
9:02 AM
-$6.00
Check Deposit
Yesterday
Pacific Gas and Electric
2 Days Ago
chime
DEBIT
VISA
CATY MITCHELL


# Ferguson's Early Career Programs offer:

**Foundational Training** - With our programs, each associate will discover what makes us an industry leader through foundational and rotational training. This style of training provides an understanding of how each role is impactful to Ferguson's success.

**Mentorship and Leadership-** Learn from our subject matter experts! They offer expertise, mentorship, and guidance through the duration of our early career programs. Mentorship opportunities also available in our Business Resource Groups.

**Transition: College to Career** – Teamwork is heightened when training focuses on shared experiences. Learn with peers; share best practices, grow understanding, and enhance your knowledge.

Learn more about our full-time early career opportunities and internships in Sales, Sales Leadership, Credit, Supply Chain, Operations and more!

Contact Rylee Wright (rylee.wright@ferguson.com) with questions!

# NEED HELP?

The LRC offers a variety of services that enhance student learning and faculty participation such as :

Interlibrary loan

Printing Services

E & print Journals

University Archives

IM CHATS

Never fear! The Drake LRC is here to help!

eBooks

Academic Databases

Leisure Reading

Research Assistance

Private Study Rooms

and much more!

**WE'RE OPEN DAILY!**

M-TH: 8am-8:30pm
F: 8am-5pm;
SAT: 11am-3pm; SU: 3pm-8pm

Location: We're right across from Patton Hall.

Call us at (256) 372-4712 or visit our Virtual Learning Center at https://libguides.aamu.edu/virtualcenter

See you soon!

LIBRARY