ALABAMA A&M UNIVERSITY

DAY 2021

GATEWAY TO CUTTING EDGE SCIENCE AND TECHNOLOGY

BOEING

BASF
We create chemistry

HUDSONALPHA
INSTITUTE FOR BIOTECHNOLOGY

ROCKET Mortgage

COLLEGE OF Engineering, Technology & Physical Sciences
ALABAMA A&M UNIVERSITY

COLLEGE OF EDUCATION, HUMANITIES & BEHAVIORAL SCIENCES

COLLEGE OF AGRICULTURAL, LIFE AND NATURAL SCIENCES

CAREER DEVELOPMENT SERVICES
ALABAMA A&M UNIVERSITY

USDA United States Department of Agriculture

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ALABAMA A&M UNIVERSITY

OFFICE OF THE PRESIDENT

March 19, 2021

Greetings, STEM Day Participants!

I am pleased to welcome each of you to Alabama A&M University's Annual STEM Day event. The 2021 theme is "Gateway to Cutting Edge Science and Technology." This is an appropriate theme in that all of us are having to adapt to learning and interacting in new and sometimes challenging ways. Nonetheless, this is necessary to continue with our lives and the unbridled passions of the human spirit to live and learn.

Past STEM Day programs have been visual marvels. This holds true because many students showcase their exciting research on giant posters and easels and then wait anxiously to share their methodologies and findings with passersby and judges. The preparations and explanations are amazing and enlightening. Members of the campus community and beyond are invited to witness this celebration of Science, Technology, Engineering, and Mathematics and to gain an appreciation for the young minds and budding futures behind science.

As the preceding Black History Month demonstrates each year, there have been numerous inventions and accomplishments fueled by impassioned minds from every imaginable circumstance of life. This exciting event is a logical continuation of that celebration as embodied in the current time. Indeed, Alabama A&M University remains a leading producer of African American computer scientists, engineers, mathematicians, agriculturalists, and researchers.

We also celebrate the contributions to this occasion of our students, faculty, and staff, who continue each day to promote the importance and relevance of STEM disciplines. We are optimistic that the virtual transition will maintain the fervor of past events and encourage excitement for years to come.

Sincerely,

Andrew Hugine, Jr., Ph.D.
President

ALABAMA A&M UNIVERSITY

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

March 19, 2021

Dear STEM Day Participants:

It is with great pleasure that I extend my personal greetings and support to the participants of the 14th Annual Science, Technology, Engineering and Mathematics (STEM) Day at Alabama Agricultural and Mechanical University. 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.

Our 2021 STEM Day theme, "Gateway to Cutting Edge Science and Technology", reflects the noble and anticipated results of the intense labor that has been put forth by our best and brightest students and our valued faculty in the quest for new discoveries in STEM. Essential concepts and techniques learned in the classroom provide our students with an excellent skill set that can be applied toward addressing the 21st century scientific challenges.

It is our intent that STEM Day continues to cultivate initiatives, creates alliances, and encourages student participation in the science, technology, engineering and mathematics disciplines. I eagerly look forward to your participation and enjoyment of all that the event has to offer.

Again, welcome to STEM Day 2021 at Alabama Agricultural and Mechanical University, and best wishes in today's competitions.

Sincerely,

Provost and Vice-President for Academic Affairs and Research

March 19, 2021

Greetings!

Welcome to the 14th Annual Science, Technology, Engineering and Mathematics (STEM) Day at Alabama Agricultural and Mechanical University. Today is special in that it is set aside to recognize the hard work and outstanding achievements of our students engaged in STEM area research. Not only are we highly encouraged in our administrative capacities, but we also take great delight in each of our students who will present their undergraduate and graduate research results, senior projects and class projects. This occasion constitutes a clear indication of the hard work and aspirations of our students and their faculty mentors within the STEM disciplines.

A substantial number of today's presenters are preparing to graduate, leave the University, and, ultimately join an increasingly competitive workforce. We hope that the, analytical skills, STEM-specific knowledge and strong work ethic acquired at Alabama Agricultural and Mechanical University will serve them as solid milestones in their future professional careers. We hope and strongly believe that they will become outstanding researchers, entrepreneurs, inventors, and strong advocates for STEM disciplines in every region of our nation and even of the world.

As we remain committed to providing educational and inspirational content-rich programming and on-going curriculum development, I extend my best wishes to all who participate in the STEM competition. My ultimate desire is that each of you will be dogged in your efforts to become the best among your presenting peers. Your research is the core work which will be visited and celebrated at our University 14th Annual STEM Day poster exhibition. While I am aware that only relatively few students will be awarded top prizes, all are winners to us.

Sincerely,

John D. Jones, Ph.D.
Dean of Graduate Studies

March 19, 2021

Dear Participants:

Alabama A&M University's (AAMU) 14th Annual STEM Day events showcase the talents of our students in science, technology, engineering and mathematics programs. Several of these students are currently recognized as budding scientists, technologists, engineers, mathematicians, and educators while others are in the very early stages of their academic journey. Nonetheless, their STEM Day exhibits (posters and presentations) are *culminations* of their efforts under the guidance of their academic advisors and mentors. This type of synergy is necessary to give definition to the direction chartered by these and other young professionals.

In light of the projected 2050 World population (9.1 billion) and the associated challenges envisaged with this expected surge in populace it is imperative that we continue to push this global imitative to grow in the STEM disciplines. The human existence then will depend on the foundation that we are currently in the process of establishing. The need for revolutionary research and technologies to overcome chronic diseases, improve data processing, provide adequate food, shelter, and clothing, while preserving our natural environment cannot be overemphasized. In preparation, Alabama A&M University continues to take bold steps in STEM education by putting efforts in place to prepare students and faculty for this future.

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 a stimulating day and we thank you for your participation.

Sincerely,

Lloyd T. Walker, Ph.D.
Dean and 1890 Research Director,
College of Agricultural, Life
& Natural Sciences

Zhengtao Deng, Ph.D.
Interim Dean, College of
Engineering, Technology
& Physical Sciences

Lena Walton, Ph. D.
Dean, College of and
Education, Humanities
& Behavioral Sciences

Alabama A&M UNIVERSITY

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March 1, 2021

Theme: A Gateway to Cutting Edge Science and Technology

Dear STEM Day Participants:

As the founder of STEM Day at Alabama A&M University, I am delighted to welcome you to STEM Day 2021. With this correspondence, I wish to take a moment to address this year's theme, ***A Gateway to Cutting Edge Science and Technology.*** A Gateway to Cutting Edge Science and Technology suggests that implementing a proper entrance into a discipline with a continuous, sustained progression provides students and faculty with a scholarly path to success, which I believe exemplifies AAMU STEM Day. During the many activities of this day, STEM students are able to showcase their research and other investigations. On the other hand, faculty members, especially junior faculty members, are given a forum to achieve faculty development while assuming leadership roles in organizing this conference. Collectively, STEM Day provides a reflective quality, which can allow students and faculty members to expand their appreciation for the entire STEM enterprises—from its early educational components to career application and employment.

Additionally, this year's theme is important and extremely timely to help galvanize our energies in a focused manner to tackle existing problems of science, engineering, and technology. 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 disabled, and immigrants, can participate in the scientific enterprise to the level of their abilities and talents without judgment, penalties or restrictions. With this broader level of participation, we will encounter no problem that is beyond our ability to solve successfully.

It is this level of participation that is available for you at STEM Day 2021. To that end, I wish you success in today's competitions, continued enjoyment throughout the day's activities, and deepening involvement in the STEM disciplines.

Best regards,

Matthew E. Edwards

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

Alabama A&M UNIVERSITY

Pyroelectric & Dielectric Materials Laboratory
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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

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 several summer-faculty-research positions at 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 in (1) Density Functional theory/Finite Element Methods, (2) solitons wave theory, (3) the materials of electrooptics, (4) pyroelectric, resistivity, and dielectric properties of crystals and nano-particles doped organic thin films, and (5) STEM Education. Dr. Edwards has more than 40-refereed papers and journal proceedings and has made greater than 55 professional and administrative presentations. He has guided five students to advanced degrees: three to the Ph.D., and two to the Master's degree, has served on more than 16 dissertation and thesis committees, and has peer-reviewed greater than 18 research manuscripts. Currently, he is guiding two Ph.D. degree students. 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, and certificate studies at MIT, Boston, Massachusetts, in 2009.

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

Dr. Edwards' Mottos: *"The Possession of Gratitude, Courage, Knowledge, and Reasonably Good Health, With Appropriate Hygiene Can Enable To Occur Great Successes and Enduring Happiness." And "In Life, Do Not Let A Setback Develop In To A Sit Back; Keep It Moving."*

Welcome and Greetings!

We are very pleased that you are joining us for Alabama A&M University's (AAMU) 14th 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 especially special for us and our entire university. Because of the innovation that is happening in the area of STEM, our theme, "Gateway to Cutting Edge Science and Technology" is most appropriate. AAMU is committed to serving the community and the global society at large 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 we included a graduate oral presentation session to give conference experience to our graduate students. The STEM Day event will be virtual this year 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 being prepared to meet the challenges that await them as they pursue different careers in science. Therefore, events such as STEM Day are extremely important for our students.

The 2021 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, Dean of the College of Engineering Technology and Physical Sciences, Dean of the College of Education, Humanities and Behavioral Sciences, Boeing, Hudson Alpha, Rocket Mortgage and Dr. Matthew Edwards (Physics Professor, AAMU) for their sponsorship of this event. We would also like to acknowledge the support and sponsorship 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. Andrew Hugine Jr., our Vice-Presidents, our University's Administration, and the various departments and faculty members who play a role in mentoring our students.

The 2021 STEM Day Committee is honored that you have chosen to spend the occasion with us. We sincerely hope that you enjoy listening to our students present the research that they have conducted.

Sincerely,

Salam Khan, Ph.D.
Chair, STEM Day 2021
Physics, Chemistry, and Mathematics
College of Engineering, Technology,
and Physcial Sciences

Laricca London-Thomas, Ph.D.
Co-Chair, STEM Day 2021
Food & Animal Sciences
College of Agricultural, Life
and Natural Sciences

Anjan Biswas, Ph.D.
Co-Chair, STEM Day 2021
Physics, Chemistry, and Mathematics
College of Engineering, Technology,
and Physcial Sciences

STEM DAY 2021
Mission Statement

The President's Council of Advisors on Science and Technology (PCAST), in 2012, reported that the number of STEM graduates would fall short by more than one million by the next decade. The STEM knowledge and the development of a logical thinking workforce are critical to innovation, economic competitiveness, and national security. The numerous challenges facing our world, such as energy efficiency, food production, climate change, water management, management of natural resources, terrorism and terrorist threats, will be answered by students with science, technology, engineering, and math (STEM) degrees as they design and build new homes with sustainable materials while utilizing less water, advanced computer technology, and geographic information systems to grow more nutritious and efficient foods. The acquired skills under the STEM programs apply to a wide variety of fields and, hence, are of paramount importance to the entire US workforce. The advancement in technology, increase in global competition and population dynamics requires ways to present STEM topics in a more experiential learning format. A highly diversified skilled workforce trained in Science, Technology, Engineering, and Mathematics (STEM) is the key to maintaining America's economic prosperity and standard of living.

Huntsville, Alabama, demonstrates the economic impact of STEM innovation by being the home of many significantly, viable biotechnology and engineering companies of the world. It is also home to the second-largest industrial research park in the US and the fourth largest in the world. Huntsville boasts that approximately 20,000 of its residents hold engineering degrees and 38 percent of residents have at least a four-year degree; compared to an average of 22 percent in Alabama and the national average of 28 percent. Alabama Agricultural and Mechanical University (AAMU) boasts of four doctoral programs, a multi-million dollar sponsored research office, along with collaborations with numerous government agencies. Thus, our students gain significant hands-on experience, owing to their professors' energy and sought-after research expertise.

The 14th Annual STEM Day at AAMU highlights the cutting-edge scientific and novel research endeavors of the undergraduate and graduate students to the scientific community. This year's theme is "*Gateway to Cutting Edge Science and Technology.*" Students are exposed to STEM technical presentations from renowned STEM researchers, a STEM Poster, and Oral Presentation Competition in which they compete amongst their peers. These students are being prepared - and are eagerly awaiting the opportunity - to join and excel in the 21st century STEM community.

WELCOME!

ALABAMA A&M UNIVERSITY STEM DAY 2021

~PROGRAM~

8:00 am – 8:55 am	Welcome	**Salam Khan, Ph.D.** Chair, STEM Day 2021
		Andrew Hugine, Ph.D. President, Alabama A&M University
		Lloyd Walker, Ph.D. Dean, College of Agricultural, Life, and Natural Sciences
		Zhengtao Deng, Ph.D. Dean, College of Engineering, Technology, and Physical Sciences
		Lena Walton, Ph.D. Dean, College of Education, Humanities, and Behavioral Sciences
		Matthew Edwards, Ph.D. Founder, STEM Day
	Introduction of Speaker	**Japhe Jelks** SGA President Senior, Biology
	STEM Day 2021 Speaker	**Patrick W. Burden** The Boeing Company Director, Army and Special Operations Forces, Field Marketing, Global Sales and Marketing Defense, Space & Security
	Special Presentation	**Salam Khan, Ph.D.**
9:00 am – 12:00 pm	Graduate Oral Presentations / STEM Poster Viewing / Judging	Whova
12:00 pm – 1:00 pm	Lunch/Musical	Whova
1:00 pm – 2:00 pm	STEM Day Awards Ceremony	Whova

STEM Day 2019 Speaker

BOEING

Biography

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PATRICK W. (PAT) BURDEN
Director, Army and Special Operations Forces Field Marketing
Global Sales and Marketing
Defense, Space & Security

Patrick W. (Pat) Burden is Director, Army and Special Operations Forces Field Marketing, Global Sales and Marketing, Defense, Space and Security, where he leads personnel in six field offices throughout the United States that serve as an essential link between Boeing and its customers.

Burden began his Boeing career in Oct. 2020 after a 34-year active duty career in the U.S. Army, retiring as a major general with more than 25 years of acquisition experience. In his final command, he was deputy commanding general, Acquisition and Systems Management, U.S. Army Futures Command.

A combat veteran who participated in Operations Desert Shield/Storm, Operation Iraqi Freedom, and Operation Resolute Support, his tactical and operational experience includes assignments in the United States, Germany, Southwest Asia, and Afghanistan. Key acquisition achievements include: launching a suite of human resources, logistics, and financial management systems that save the Army more than $100 million annually; streamlining the delivery of $4.5 billion of military equipment to the Afghan National Defense and Security Force, and the standup of the U.S. Army Futures Command charged with leading a $31 billion annual effort to deliver modernized capabilities to the U.S. Army.

Burden holds a Bachelor of Science in computer science, Alabama Agriculture and Mechanical University; a Master of Science in management information systems, Florida Institute of Technology; and completed the U.S. Army War College Fellowship at the University of Texas Austin. He's been recognized with the National Defense Industrial Association Firepower Award (2016), the Federal Computer Week Federal 100 Award for Information Technology (2014), and the Armed Forces Communications & Electronics Association Award for Excellence in Information Technology (2014).

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November 2020

Alabama A&M University
"Service is Sovereignty"

STEM DAY 2021

ABSTRACTS

ALABAMA A&M UNIVERSITY
STEM DAY 2021

ABSTRACT CATEGORIES

POSTERS	
Undergraduate	**Graduate**
Food and Animal Sciences	Food and Animal Sciences
Biological and Environmental Sciences	Family and Consumer Sciences
Community and Regional Planning	Biological and Environmental Sciences
Family and Consumer Sciences	Physics, Chemistry and Mathematics
Reading, Elementary/Early Childhood & Special Education	
Electrical Engineering and Computer Science	
Mechanical and Civil Engineering	
Physics, Chemistry and Mathematics	
ORAL PRESENTATIONS	
Food and Animal Sciences	
Biological and Environmental Sciences	
Community and Regional Planning	
Family and Consumer Sciences	
Health Sciences, Human Performance, and Communicative Disorders	
Marketing, Management & Logistics	
Physics, Chemistry and Mathematics	

ABSTRACTS

POSTERS

Undergraduate

FOOD AND ANIMAL SCIENCES

Abstract # 101

Investigating the ability of Peroxyacetic Acid to control *Salmonella enterica* in vitro

Alencia Lamb, A. Jackson-Davis, B. Cooper

Mentors: Dr. Armitra Jackson-Davis and Bria Cooper

Department of Food and Animal Sciences

Salmonella is a Gram-negative bacterium that passes through the stomach and colonizes in the small and large intestine of the body. This pathogen is responsible for an estimated 1.2 million cases, 19,000 hospitalizations, 380 deaths, and $365 million in medical expenses per year. One strain that is commonly found in the produce industry is *Salmonella enterica*. Although chlorine is a common sanitizer used in the produce industry, the compound's inorganic nature and ability to generate critical residual halogens has caused a decrease in popularity among consumers. Therefore, the objective of this study was to evaluate the inhibitory activities alternate sanitizers to control *Salmonella enterica*. For this study, bacterial suspensions were pipetted into 100 microtiter plates and evaluated against various sanitizers. The study included both positive and negative controls. Measurements were taken every 15 min. Samples were subjected to shaking for 10 s before each measurement. The minimum inhibitory concentration (MIC) was taken as the lowest concentration to inhibit the growth of *Salmonella* enterica after 24 h. The experiment was performed in triplicates. This study demonstrated the potential of various sanitizers to control microbial growth of *Salmonella enterica*.

Abstract # 102

Independent Detection and Recognition Thresholds (IDT and RT) of Selected Flavors Using a Food Model

Alexander Hall, A. Nesbitt, L. Vaughner, S. Willis, A. Chambers, and M. Verghese

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

In the food industry, thresholds may be used to determine defects, acceptable levels and identify flavors. Flavors are widely used; enhancing products or replicating flavor of popular

food items. Orange, peach and pomegranate flavors are trending in food industry, and can be found in candies, beverages and baked goods. Understanding independent detection (IDT) and recognition thresholds (RT) is critical in successfully launching flavored products. Objectives of this study were to develop cookies (using a common sugar cookie base) utilizing 3 flavors, incorporated at various percentages (1 and 2% orange, 2 and 4% peach, 2 and 4% pomegranate) of total formulation, determine consumer acceptability/preference, determine thresholds (IDT and RT) for each flavor and estimate shelf-life of six cookies developed. Shelf life was conducted on following parameters: color (L*a*b*), pH, texture, A_w (water activity) over a two-week duration. Consumer acceptability/preference of various attributes of products was determined using a 5-point Hedonic scale (1- dislike very much, 2- dislike a little, 3- neither like nor dislike, 4- like a little, and 5- like very much) and IDT and RT of flavors were determined. While 6% of sensory panelists (n=31) were able to identify pomegranate flavor at 4% level, 23% were able to identify pomegranate at 2% level. Among treatments, orange flavor was most easily detected, with over 50% of panelists correctly identifying this flavor at 1 and 2% levels. All flavors were preferred by panelists at the 2% levels. A_w and pH of the cookies were 0.42, 5.07 (2% orange); 0.35, 5.12 (2% peach); 0.51,5.35 (2% pomegranate), respectively on day zero. Understanding the level at which consumers recognize flavors will aid in developing additional novel products. Utilization of flavor extracts is a cost-effective way to impart flavor without using the whole food ingredients.

Abstract # 103

Development of a Functional Protein Fruit-Filled Pastry (Pro-Tart)

Alton Chambers, L. Vaughner, S. Willis, and M. Verghese

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

Childhood obesity has more than tripled since 1970. One of the ways to address this chronic disease is via implementation of protein rich diets. Studies show that meals/snacks higher in protein increase satiety (decreasing appetite). Plant proteins continue to increase in popularity and some studies show that plant-based diets may aid in weight management. Berries such as blackberries and raspberries are great sources of fiber, vitamins and flavonoids such as anthocyanins. Traditional on-the-go pastries are highly processed, low in protein and high in sugar. Objective of this study was to develop a clean-label, protein-rich Pop Tart™ alternative, determine product shelf stability and consumer acceptability. Dough for pastry was prepared using a commercial plant-based protein powder (Washington, Utah) at levels of 17.5% and 35% of the formulation. Filling was prepared with strawberries, blueberries, raspberries, and blackberries. Shelf life was conducted for 5 weeks; the following parameters were measured: water activity (A_w), color (L*a*b*), texture, and pH. Nutrition label was developed using Recipal software. Consumer acceptability was determined using 5-point Hedonic and JAR (just about right) scales. The majority (80%) of panelists (n=30), indicated that they observe a flexitarian diet and 93.3 % were interested in consuming a fruit filled pastry with health benefits. Over 80% of panelists indicated that various aspects of the two products (amount of filling, amount

of frosting, number of sprinkles) were JAR. Most panelists found both pastries (17.5% and 35% protein) acceptable (rank of 4 or higher), with 87% of panelists liking the 17.5% product and 83% liking the pastry with 35% protein. There were no significant ($p \leq 0.05$) changes in shelf-life parameters over the 5-week period. With childhood and adolescent obesity increasing, the fruit-filled Pro-Tart is a viable, convenient breakfast alternative with a diverse blend of berries, which are great sources of beneficial phytochemicals.

Abstract # 104

Determination of Acceptability and Flavor Threshold of Flavored Sugar Cookies

Amiya Nesbitt, L. Vaughner, S. Willis, A. Chambers and M. Verghese

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

In the food industry, thresholds may be used to determine defects, acceptable levels and identify flavors. Coconut and key lime flavors are commonly used in ice cream and baked goods. Though associated with non-food products, lavender may be used in baked goods and gives off a sweet, floral flavor that has a calming effect. Understanding independent detection (IDT) and recognition thresholds (RT) is critical in successfully launching flavored products. Objectives of this study were to develop cookies (using a common sugar cookie base) utilizing 3 flavors, incorporated at various percentages (2% and 4% coconut, key lime, lavender) of total formulation, determine consumer acceptability/preference, determine thresholds (IDT and RT) for each flavor and estimate shelf stability of 6 cookies developed. Shelf life was conducted on the following parameters: color(L*a*b*), pH, texture, A_w (water activity) over a two-week duration. Consumer acceptability/preference of various attributes of the products was determined using a 5-point Hedonic scale (1- dislike very much, 2- dislike a little, 3- neither like nor dislike, 4- like a little, and 5- like very much) and IDT and RT of flavors were determined. While the majority (95%) of sensory panelists (n=31) were unable to identify key lime flavor at 2% level, 63% were able to identify key lime at 4% level. Among treatments, cookies flavored with lavender had the highest overall acceptability, but less than 40% of panelists correctly identified the flavor at the 2 and 4% levels. The coconut flavor had the highest RT with 80% of panelists identifying at 4% level. All flavors were preferred by panelists at the 2% levels; therefore, shelf life was conducted on those treatments. Researching and identifying the threshold at which consumers recognize trending flavors will aid in developing novel products, and imparting flavor in cost effective ways.

Abstract # 105

Dietary Intake Assessment of African American Adolescents (13-19) with a Family History of Chronic Diseases

Cydney Jackson, S. Willis, L. T. Walker, and M. Verghese

Mentor: Dr. Martha Verghese

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 6 g of spices, while the majority of participants consume 4 g 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 # 106

Enhancing beef cattle research at the Winfred Thomas Agricultural Research Station, Alabama A&M University

Logan Swanson, I. Morris, H. Tutchtone, S. Lopez, and B. O. Omontese

Mentor: Dr. Bobwealth Oakina Omontese

Department of Food and Animal Sciences

In Alabama, beef cattle play a very important economic role in the wellbeing of rural households including as source of food supply, source of income, asset saving, source of employment, soil fertility, livelihoods, transport, agricultural traction and agricultural

diversification. Beef cattle research at Alabama A&M will provide an opportunity for both animal bio-health science students and faculty to better understand animal welfare, health, growth and reproductive performance. However, several constraints to conducting research at the Winfred Thomas Agricultural Research Station (WTARS) needed to be addressed. Therefore, our objectives were to 1) improve beef cattle identification; 2) enhance cattle welfare monitoring; 3) vaccinate all eligible animals; and 4) establish an electronic beef cattle data recording system at the WTARS. All cattle (n = 62) comprising 10 heifer calves, 40 multiparous cows and 12 primiparous cows were restrained in a chute and ear tagged for easier identification using USDA Alflex radiofrequency ear tags (Allflex USA, Inc. Dallas/Fort Worth Airport, TX). Ear tags were placed on the left ear. A subset of animals (n = 40) received activity monitoring devices IceQubes (Icrobotics, UK) attached to the left hind leg of each animal using Velcro straps. Daily recording of lying time, lying bouts, steps frequency and standing duration is currently being recorded and uploaded to cloud based retrieval system for further analysis. All animals received clostridial vaccination (Ultra 8, Zoetis, Parsippany-Troy Hills, NJ) for protection against Clostridium infections. Furthermore, cattle received antihelminthic (Safeguard (Merck Animal Health, Baton Rouge, LA) for management of endo parasites. Individual cattle biometric data was transferred from a paper sheets to an Excel spreadsheet for optimal storage and faster data retrieval. Overall, these preliminary management efforts are critical for development of a beef cattle research program at the WTARS. Furthermore, the daily cattle behavioral data collected may be useful in shaping research on cattle welfare, health, performance and inform reproductive management decisions.

Abstract # 107

Evaluation of Antibacterial and Antioxidative Activity of *Cannabis sativa L*.

Tiffany Swinton, Aaron Dudley

Mentors: Dr. Lamin Kassama and Aaron Dudley

Department of Food and Animal Sciences

Low THC varieties of Hemp (*Cannabis sativa L*) are now being explored as a food ingredient due to their well-known benefit on human health as it relates to its antioxidative and antimicrobial properties. Although Hemp has known antimicrobial and antioxidative properties, there is little known information on its performance. The objective of this study was to evaluate the antibacterial and antioxidative activities of two Northern Alabama hemp varieties. In this study, the botanical part (Bud-B) of two northern Alabama hemp varieties (Jinma (J1), and Cherry Wine (CW)) were used. The extraction solvents used were ethanol (96%) (E) and deionized water (DIW). The antioxidant potential of the extracts was determined by total phenolic content and DPPH (2,2-diphenyl-1-picrylhydrazyl). The antibacterial activity against cocktails of enteric pathogens *E. coli* O157:H7 was determined using BioScreen-C microtiter assays. All values conducted in triplicate (n=3) and expressed in mean ±standard deviation. Results showed the total phenolic content in hemp varieties between 1.96±0.23 mg GAE/g dw for extract (J1-B-DIW) to 4.44±0.40 mg GAE/g dw extract (CW-B-E). Total inhibition of DPPH ranged from 27.35% for the CW-B-E extract to 52.34% for the J1-B-E extract. The BioScreen-C results

showed a bacteriostatic effect of hemp varieties on *E. coli* 0157:H7. Against *E. coli*, the percent inhibition ranged from 12.84% for the J1-B-DIW to 35.99% CW-B-E extracts.

Abstract # 108

Utilization of Plant Protein Powders (Pea, Hemp and Brown Rice) in Food Product Development

Tynashia Moseley, S. Brown, A. Muhammad, and M. Verghese

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

Approximately 13.7 million children and adolescents suffer from obesity; this has led to an increase in demand for foods that may help prevent or treat this condition. There has been a steady increase in sales of products featuring protein as a functional ingredient, which may enhance satiety. Plant-based protein powders such as hemp, pea and brown rice are gaining prominence in food product development. Objectives of this study were to develop a shortbread cookie, incorporating protein powders (hemp, pea and rice) at various concentrations (0 (control), 20,40,60%), and to determine consumer preference of the four cookies developed. Shelf life was conducted on the following parameters: color, pH, texture, and A_w (water activity) over a three-week duration. A nutrition label was generated using Recipal software. Consumer preference of the products was determined utilizing a sensory preference test. Initial water activity of the cookies was 0.61, 0.45, 0.59, 0.59, respectively with protein powders incorporated at 0, 20, 40 and 60%. Initial L* color values ranged from 33.52 (20%) – 37.72 (60%). Initial a* color values ranged from 12.91 (60%) -17.66 (control); an increase in protein powder increased the greenness of the product. Day zero b* color values ranged from 20.75 (20%) – 24.53 (control). Initial pH of shortbreads was 5.74, 5.61, 6.12, 6.01, respectively with protein powders incorporated at 0, 20, 40, 60%. While 56 percent of panelists (n=30) preferred the control cookie, 27% preferred 40% protein cookie, 10% preferred 60% protein cookie and 7% of panelists preferred cookie with protein incorporated at 20% level. Plant-based protein shortbread cookies may be used as a healthy, functional snack for adolescents, which may result in increased satiety and therefore reduce food consumption. The protein-packed product contains antioxidants and may have health benefits in the prevention of chronic diseases.

BIOLOGICAL AND ENVIRONMENTAL SCIENCES

Abstract # 109

Analysis of GEDI & ICESat-2 spaceborne LiDAR datasets for Environmental Conservation and Biomass Estimation

Evan Tenorio and E. Cherrington

Mentor: Dr. Emil Cherrington

Department of Biological and Environmental Sciences

The introduction of spaceborne LiDAR systems has enabled us to gain new insights into vegetation structure in remote regions of the world. Examining data from the recent NASA Global Ecosystem Dynamics Investigation (GEDI) and Ice, Cloud and land Elevation Satellite-2 (ICESat-2) missions over Ecuador's Amazonian rain forest is the focus of this project. Vegetation canopy height data acquired over Ecuador by GEDI and ICESat-2 were analyzed along with other remotely sensed data, including elevation, slope, land cover, precipitation, and temperature, to conduct exploratory analysis to look at which factors might be correlated with forest height and to provide data the will assist in biomass estimation. In total, 1,085,439 samples from GEDI and 393,572 samples from ICESat-2 were analyzed. While the coverage of data from both ongoing missions did not completely overlap, they were comparable. When analyzed, they showed little discrepancies in overall height estimates, with GEDI estimating average vegetation heights over Ecuador to be 20.81 meters, and ICESat-2 estimating that height to be 22.44meters. Likewise, GEDI estimated that the average height of Ecuador's forests to be 23.27, while ICESat-2 estimated that average height to be 25.27m. Also, GEDI estimated on average Ecuador's protected forests to be 4.81m taller than unprotected forest. Similarly, IceSat-2 estimated on average Ecuador's protected forest to be 4.62m taller than unprotected forest. The discrepancies between these two data sets may be due to the lack of overlap and warrant additional analysis. Nevertheless, this research also shows that spaceborne LiDAR estimates have the potential for providing inputs for biomass estimation and improving national policies and regulations in Ecuador.

Abstract # 110

The Influence of pH on Bacterial Community Composition of Soils from the Winfred Thomas Agricultural Research Station

Jayla Pettway and E. Moss

Mentor: Dr. Elica Moss

Department of Biological and Environmental Sciences

There is considerable variability in the abundance of different phyla in soils, however it is not clear to what extent variations are in response to conditions in soil environments.

Proteobacteria, Acidobacteria, and Actinobacteria are most abundant in soils as Bacteroidetes, Firmicutes, and Planctomycetes are generally less abundant. The factors that may influence the abundance of these bacterial phylum could be large. Research suggests the abundance of Verrucomicrobia is influenced by soil moisture and Acidobacteria by soil pH. The Winfred Thomas Agricultural Research Station at Alabama A&M University contains a variety of agricultural soils used for the growth of Industrial Hemp, switchgrass, sweetgum, soybean, biochar infused soil and pasture soils. For this study samples were collected to assess the influence of soil pH on differences in bacterial community composition using metagenomic approaches. DNA was extracted using the ZymoBIOMICS®-96 MagBead DNA Kit and sequenced on Illumina MiSeqTM. Results identified the abundance of bacteria phylum such as Proteobacteria, Actinobacteria, Acidobacteria, patterns of their distribution within each soil community and the overall diversity among the soils. Biochar soil, the most acidic, pH 4.5, seemed to contribute to the abundance of Actinobacteria (62.78 %) whereas Actinobacteria in Industrial Hemp, pH 7.84, comprised only 27.75 % of the community. Consequently, Acidobacteria was least abundant (5.7%) in biochar and greater (17.35%) in Hemp. Additionally, Industrial Hemp soil was more diverse than any other soil community. Further research will aid in identifying other factors that may contribute to the variability in soil bacterial community composition.

Abstract # 111

Establishing a Laboratory Protocol to Detect Gamma-H2AX and RAD53 Expression in *Saccharomyces cerevisiae* Cells Exposed to Rapamycin and Methyl Methanesulfonate

Parion Alexander, T. Hatchett, and T.L. Farmer

Mentor: Dr. Tyesha Farmer

Department of Biological and Environmental Sciences

Saccharomyces cerevisiae is commonly used as a model organism to identify conserved proteins and clarify their roles in higher eukaryotes. This system has been extensively used to evaluate Target of Rapamycin (TOR) signaling and DNA damage response pathways. Inhibition of TOR signaling by rapamycin increases the cellular response to DNA damaging agents such as methyl methanesulfonate, as evidenced by major disruptions in cell cycle progression and higher level activation of DNA damage repair and response proteins. The primary objective of this research is to improve a standard lab western blot assay to assess expression of gamma-H2Ax and Rad53, two conserved proteins involved in the DNA damage response. Yeast cells from overnight cultures were diluted to an optical density (595 nm) of 0.3 in 100 mL of YPD media. The culture was split over 4 flasks and allowed to grow at 30^{o}C with agitation under the following drug treatment conditions: DMSO control, 200 ng/ml rapamycin, 0.05% methyl methanesulfonate, and 200 ng/ml rapamycin +0.05% methyl-methanesulfonate. Sample aliquots were taken at 0, 90, 180, and 270 minutes for optical density, spot tests, and protein extraction. As expected, optical density and spot test data showed an enhanced effect of methyl methanesulfonate cytotoxicity when rapamycin is present. Western Blot for gamma-H2Ax and Rad53 did not produce reliable results and the protocol is currently being optimized

using Invitrogen iBolt and iBind systems. Developing a laboratory assay for detection of gamma-H2Ax and Rad53 will provide a standard protocol for assessing expression of these proteins in future analyses where the effects of TOR inhibition in combination with other DNA damaging agents and natural plant products will be assessed.

COMMUNITY AND REGIONAL PLANNING

Abstract # 112

An Analysis of Poverty in Small Town America: A Case Study of Tanner, Alabama

Luis Balderrama, Jacob Oluwoye

Mentor: Dr. Jacob Oluwoye

Department of Community and Regional Planning

As the United States becomes a more urban country centralized around large cities, small towns fall behind more and more with the passing of time. Small towns in the United States are facing socio-economic problems are they lose population and jobs to larger cities in the country. Poverty is one of the largest factors facing small towns with populations of 10,000 and less. The absence of good paying jobs that continues the cycle of poverty affecting all racial groups and ethnicities. In this case study the small town of Tanner, Alabama is show cases to show the effects of the absence of good paying jobs on minorities in the area and compare them to the other racial groups. This case study will use Census data from the U.S. Census Bureau to show case differences in education, employment and poverty data to come up with results. The significance of this study is to find way to help planners understand the needs of small towns better.

FAMILY AND CONSUMER SCIENCES

Abstract # 113

Perception of Madison County Residents on the Barriers and Benefits of Consuming a Vegetarian Diet

Celina R. Bowman and Rhona Miller-Cebert

Mentor: Dr. Rhona Miller-Cebert

Department of Family and Consumer Sciences

The interest in the vegetarian lifestyle has been growing steadily over the years and studies indicate that approximately 5% of the American population has adopted a plant-based diet. The

aim of this study was to investigate the perception of Madison county Alabama, residence on the health benefits and barriers of consuming a vegetarian diet. The administered questionnaire was divided into two general areas. One area explored the health benefits of consuming a vegetarian diet and the other looked at the socioeconomic and perceived nutritional barriers of consuming a vegetarian diet. A total of five hundred and fifty individuals participated in the study, including students from Alabama A&M University, and two other Colleges in Huntsville, Alabama, in addition to surrounding community groups. Statistical analysis was carried using SAS 9.4 Proc Surveymeans. In response to the benefits of consuming a vegetarian diet, 25% strongly agreed that a vegetarian diet may be effective in preventing diseases in general. Regarding the barriers, 52% of the participants indicated that they need additional information about a plant-based diet. The findings of this study suggest that many individuals do not have a clear understanding of the health benefits of consuming a vegetarian diet and, therefore, educating the public should be a public health priority in our community.

READING, ELEMENTARY/EARLY CHILDHOOD & SPECIAL EDUCATION

Abstract # 114

A Study on the Learners' Attitude toward the Effectiveness of Instructional Apps for Learning Science

Takhera Sanders, I. Minor, J. Cleark, and N. Coleman

Mentor: Dr. Sha Li

Department of Reading, Elementary/Early Childhood & Special Education

In our science education programs, students are using online apps to enhance their effectiveness in classrooms. The apps can provide flexible learning approaches, access learning resources anytime and anywhere at ease, and conduct assessments and evaluations at the click of a finger. This study uses qualitative and quantitative methods to collect data. It found that science learners are empowered when they use apps to learn. They are interested in using emerging apps in content area studies.

ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Abstract # 115

Fabrication and Characterization of CMOS Devices and Circuits with high-κ Dielectric HfO2 Gate Oxide

Arron McClenton, J. Emetulu, T. Gipson, A. Jones, and A. MaClenton

Mentor: Dr. Zhigang Xiao

Department of Electrical Engineering and Computer Science

The complementary metal-oxide-semiconductor (CMOS) ring oscillators were designed, simulated, fabricated, and characterized for the application of high-speed and low-power clock circuits. The CMOS ring oscillator was designed and simulated using the Tanner software. The CMOS ring oscillator chip was fabricated using the clean room-based microfabrication techniques such as UV lithography. High-κ dielectric HfO2 was grown as the gate oxide in the fabrication of CMOS devices using the plasma-enhanced atomic layer deposition, resulting in better electrical performance and higher operation speed. The experimental results measured from the fabricated devices were comparable with the simulation results.

Abstract # 116

Design and development of deep learning models for image classification

Ayana K. Rengiil, S. Corey, J. Gray, and C. Ross

Mentors: Dr. Andrew Scott and Dr. Kaveh Heidary

Department of Electrical Engineering and Computer Science

Image classification using artificial intelligence (AI) techniques, such as deep learning, has become a significant field of research that is implemented in various applications ranging from reading handwritten checks to identifying enemy vehicles and buildings. This project is centered around two goals: (1) the design of a feedforward neural network for maximum classification accuracy and (2) the classification of images of handwritten digits by utilizing the 70,000 images in the Modified National Institute of Standards and Technology (MNIST) database to train and test an optimized neural network (NN). Although tens of thousands of images are ready to be used for this project, it is unrealistic to expect such a generous amount of training and testing resources for any other situation. In preparation for conditions where fewer training images are available, this study aims to create synthesized images and record the effects of this new combination of synthesized and original MNIST images on the image classifier's overall accuracy.

Abstract # 117

Piezoelectric Generator in Electric Vehicle Tires

Faisal Almarri, C. McIntosh, S. Turner, Jr., and N. Hunter

Mentor: Dr. Raziq Yaqub

Department of Electrical Engineering and Computer Science

The main goal of this project is to solve two issues that Electric Vehicles (EV) drivers encounter. The first is the EV driving range extension to solve EV driver's range anxiety issue, especially when he is driving in rural areas where there is a lack of charging infrastructure. The second issue is that EV tires deteriorate 30% faster than the traditional tires [1], thus need a mechanism for tires health assessment. This project proposes embedding piezoelectric material inside the tires of the Electric Vehicle's (EV) to harvest and charge EV battery, to enhance driving range. The project also proposes to exploit the same piezoelectric material to monitor the health of the tires and display it on the dashboard. The results show that the proposed system piezoelectric generation in the tires enhances the driving range by 40%. Also, the same piezoelectric material that is used for piezoelectricity generation, provides a simple and economical mechanism for tires health assessment, thus killing to birds with one stone.

Abstract # 118

Development and Programming of a Simple Computer

Kannon Campbell, D. Pruitt, and J. Edoki

Mentor: Dr. Andrew Scott

Department of Electrical Engineering and Computer Science

In this project the student design team would design, develop, implement, test, and verify A Simple Computer on the Nexys 4 FPGA project board by utilizing Xilinx Vivado software. The focus of the design will be to develop and implement hardware circuits via VHDL software. The approach will be a bottom-up design, including Input/output, instruction decoder, ALU, memory and peripheral bus, micro-programmed control unit, accumulator/registers, memory system and accompanying interface. Design will be tested by writing ASC assembler codes for execution in the FPGA environment. The fundamental concepts in digital design, synchronous circuits, and architectural techniques will be explored in this project. The result will be an 8 bit computer that can be programmed using the ASC Assembler language.

Abstract # 119

Distribution and Analysis of Pharmaceuticals in the Lower Tennessee River Basin

Mphande Phiri, P. Okweye, K. Garner, and K. Arinze

Mentors: Dr. Paul Okweye and K. Garner

Department of Electrical Engineering and Computer Science

The aim of this study was to determine the distribution of organic pollutants in the Lower Tennessee River Basin's soil/sediment matrix for the Flint Creek (FC) and Flint River (FR) watersheds. To detect all compounds, Gas Chromatography — Electron Capture Detection/Photoionization was used. During the winter season of 2011, a modest to a substantial amount of the compounds were detected in samples collected from both watersheds. Various depths and regions of the sites were used to extract samples for analysis. Both FR and FC were analyzed using three different areas, and these sites were in the FC while the other three sites were in the FR. In no particular order, the sites of analysis are Hobbs Road-Flint River HR-FR, Winchester Road-Flint River WR-FR, Brian Fork-Flint River BR-FR, and Red Bank-Flint Creek RB-FC, Mean Bridge-Flint Creek MB-FC, Vaughn Bridge-Flint Creek VB-FC. This study primarily analyzes the various pharmaceuticals in these rivers and their concentrations and, secondarily, how the pharmaceuticals get into the water. Results showed that there was an increasing trend of Pharmaceuticals and Personal Care Products in Flint Creek. Pharmaceuticals, gasoline products, SVOCs, and other organic chemicals, were all present in Flint River in large doses. Distribution of the industrial pollutants in the Flint River showed that it contained more Pharmaceuticals and Personal Care Products than Flint Creek. The discoveries from this study will fill an existing gap in knowledge and allow environmental agencies to improve management decisions and develop meaningful guidelines for protecting Alabama's water resources.

Abstract # 120

Capturing and Simulating Flight Mission Virtual Environments Utilizing the Immersive Simulation Engineering Environment (iSEE)

Peyton A McDonald

Mentors: Dr. Stephen U. Egarievwe and Deon T. Williams (NASA, Kennedy Space Center)

Department of Electrical Engineering and Computer Science

The Immersive Simulation Engineering Environment (iSEE) utilize off-the-shelf software, in combination with an array of cameras, in a virtual environment, as a tool during operation testing. One of the primary functions of this virtual system is used to assist Human Factors team in mission flight projects, in design verification and validation. The environment is calibrated to capture characters and objects for data streaming. Avatars of specific characters are created in the system, to integrate with proprietary virtual environments in a Computer Aided Design (CAD) format. With the virtual environment of the iSEE, both simulating and evaluating of different test operation, in different environments can be accomplish. Objects are

modeled using Blender 2.91 to be integrate into the iSEE virtual environment with augmented forms(mock-ups). Mock-up, in this case, can be defined as an element of augmented reality; implementing two of the five human senses (vision and touch), to a virtual environment. My goal in this project is to be able to use the iSEE as a tool; power-up the system, calibrate the environment, capture characters, and create avatars for each character, simulating a mission flight test operation.

Abstract # 121

Design and simulation of microwave subsystems

Quintin Puckett, J. Davison P. Jones

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 bandstop filters are designed and simulated.

Abstract # 122

Fabrication and Characterization of Efficient Thermoelectric Devices from Sb+Sb2Te3 Thin Films

Rodriquis Evans, S. Joseph, A. Rojas, A. Sellers

Mentors: Dr. Satilmis Budak and Dr. Mohammad Alim

Department of Electrical Engineering and Computer Science

Thermoelectric devices are used for power generation from waste of heat or cooling when current applied to the thermoelectric devices. They have the properties of reliability, long life, low maintenance, scalability, miniaturization, and absence of emissions. These devices are subject to the applications of heat transport caused by the generation of electricity based on the Peltier and Seebeck effects of the thermoelectric materials and devices via figure-of-merit, ZT=S2σT/K; where S is the Seebeck coefficient, σ is the electrical conductivity, T is the absolute temperature, and K is the thermal conductivity. The fabrication of the thermoelectric devices from the single layer of Sb+Sb2Te3 thin films were performed by DC/RF Magnetron Sputtering system. Thermoelectric devices were annealed at different temperatures to form

nanostructures to increase the Seebeck coefficients and electrical conductivity and decrease thermal conductivity. For characterization purposes, Seebeck coefficient, van der Pauw 4-probe resistivity, and thermal conductivity measurement systems were used. The surface morphology of the fabricated thermoelectric films will be characterized using Scanning Electron Microscope with Energy Dispersive X-ray Spectroscopy (SEM/EDS).

Abstract # 123

Improving Energy Efficiency in University Campus

Shemaiah Mbetwa

Mentor: Dr. Shujun Yang

Department of Electrical Engineering and Computer Science

The rise of electricity costs in recent years has led to more research on energy efficiency. Universities such as Alabama A&M University have integrated smart sensors as part of their lighting choices in residential halls and campus buildings. Research done by the University of Kent shows the challenges involved with improving energy efficiency in college campus settings. In this paper, surveys conducted showed that students had varying degrees of interest in improving their energy efficiency and reducing the school's carbon emissions. Still, they had little information regarding the actual amount of energy their respective dorm halls were producing or their costs. To combat this challenge, the researchers suggested and tested innovative solutions among students living in the halls of residence. These solutions included pilot testing an integrated system with technological feedback to assist real-time energy conservation and carbon reduction among students living in the residence halls. The researchers noted savings of 5%-15% of their previous usage in residence halls when students were given more information regarding their uses. Savings of this amount could be significant in improving the overall energy efficiency of the school. In light of this research, investigating more into our university community's usage and possible strategies to enhance the schools' energy efficiency would greatly benefit the Alabama A&M University community.

Abstract # 124

Study of CdTe-Based Room-Temperature Semiconductor Nuclear Detectors

Simeon Sykes, Q. Alsbrooks, S. Soto, and L. Fuller

Mentor: Dr. Stephen U. Egarievwe

Department of Electrical Engineering and Computer Science

Cadmium telluride (CdTe) and its ternary and quaternary compound have found applications in the development of X-ray and gamma-ray detectors used in medical imaging and in the detection of radiological and nuclear threats. Example of these detectors include CdZnTe, CdMnTe, and CdZnTeSe. These nuclear detectors can operate at room temperature without cryogenic cooling. The goal of this project is to study CdTe-based detectors and the effects of

defects and chemical treatments on their electrical properties and radiation detection performance. The properties to be studied include detector resistivity, defects, energy resolution, and the mobility/lifetime of the charge carriers. Surface treatment studies include passivation chemicals such as KOH and NH4F. X-ray photoelectron spectroscopy (XPS) studies showed increase in the quantity of TeO2 on surfaces of CdZnTe and CdMnTe wafers after passivation in KOH and NH4F. Improvement in the energy resolution of CdZnTeSe detector was recorded for the 59.6-keV gamma peak of 241Am after passivation in NH4F solution.

MECHANICAL AND CIVIL ENGINEERING

Abstract # 125

Effects of Drivers' Age and Gender on Highway Traffic Accidents in Alabama

Cyntonia Carroll, K. Powers, and W. Petway

Mentors: Dr. Aschalew Kassu and Dr. Mahbub Hasan

Department of Mechanical and Civil Engineering

According to the office of the National Highway Traffic Safety Administration (NHTSA), one of the leading causes of death is traffic accidents caused on major highways. It is believed that drivers' age and gender are critical elements to severe and non-severe crashes on highway segments and intersections. In this study, four different sets of crash data occurred in two, and four-lane rural and urban highways in Alabama are used. The four datasets include non-severe crashes on dry pavement surfaces, non-severe crashes on wet pavement surfaces, severe crashes on dry pavements, and severe crashes on wet pavements over the five years period ranging from 2010 - 2014. The results show that the crash involvement rate of younger drivers is higher than older drivers. In terms of gender, severe and non-severe crashes for younger and older female drivers are found to be higher on wet pavement surfaces than on dry pavements.

Abstract # 126

Analysis of Pavement Edge Drop-off causing Rural Roadway Crashes in Madison County Alabama

DeWayne Hill and T. Chowdhury

Mentor: Mrs. Tamara Chowdhury

Department of Mechanical and Civil Engineering

Pavement edge drop-off is a vertical elevation difference between two adjacent roadway surfaces, which has a significant contribution to fatal roadway crashes. Crashes on two-lane undivided highways result in nearly sixty percent of the total fatalities on our nation's highways.

Many run-off-road collisions are the result of pavement edge drop-offs which causes 4,000 fatalities and costs $40 Billion annually in the USA. A major concern for driver safety on these facilities is the interface of the paved roadway surface and the unpaved shoulder. One solution to this problem is to form a thirty-degree tapered transition at the edge of the paved surface called the “safety edge”. A safety edge provides an easily traversable transition for an errant vehicle to reenter the travel lane from the unpaved shoulder. The safety edge can be constructed with no impact on production and at less than one percent additional material costs. Rural roads are typically narrow, and counties typically don’t have the necessary funding to correct safety problems. 40% of all fatal crashes are caused by vehicles running off of the road. Rural roads comprise 42% of the total run-off road crashes. But detail actual edge drop-off data for roadway departure crashes are much not available. The Madison County, Alabama fatality is considerably high for rural roadways compared to other counties in Alabama. Fatality due to edge drop-off has been found to be significantly higher than any other crashes. This review research paper tries to identify the major cause of rural roadway crashes. The prevention of edge drop-off to avoid crashes should be considered with extreme importance. The project plans to analyze the number of edge drop-off crashes, edge drop-off fatalities, all rural crashes, and fatalities in Madison County for the State of Alabama. Some significant objectives of this project to be continued: (i) Build a low-cost Ultra-Sonic Measuring Device (ii) Provide an opportunity to build a low-cost sensor device for detecting pavement edge, (iii) Automate pavement edge drop-off data collection through the installation of ultrasonic measuring devices, (iv) Serve the society in a better way by prevention of fatal crashes and significant reduction of loss of human lives and property.

Abstract # 127

Fabrication of Integrated Thin-Film Thermoelectric Devices

Rebecca M Glenn and L. Williams

Mentor: Dr. Zhigang Xiao

Department of Mechanical and Civil Engineering

We report the growth of bismuth telluride thin films and the fabrication of integrated bismuth telluride thin-film thermoelectric devices for power generation. Bismuth telluride (Bi2Te3) thermoelectric thin-film material was grown using the high-vacuum e-beam evaporation. The Bismuth telluride (Bi2Te3) thin film was prepared to be about 2 micrometers thick. Integrated thin-film thermoelectric devices were fabricated with the bismuth telluride (Bi2Te3) thin films using clean room-based microfabrication techniques such as UV lithography and lift-off process. Plasma-enhanced atomic layer deposition (PE-ALD) was used to grow hafnium dioxide (HfO2) as the insulation layer in the device fabrication. The grown bismuth telluride (Bi2Te3) thin film and the fabricated thermoelectric devices were analyzed with a scanning electron microscope (SEM) and energy-dispersive X-ray spectroscopy (EDS). The output electrical current and voltage were measured from the fabricated thermoelectric thin-film device.

PHYSICS, CHEMISTRY AND MATHEMATICS

Abstract # 128

Statistical Analysis of Average Scores of Standardized Exams for 8th Grade Students in the State of Alabama

Amber McCarver and S. Khan

Mentor: Dr. Salam Khan

Department of Physics, Chemistry and Math

In this study, the average scores of standardized exams for mathematics, science, reading, and writing for 8th Grade Students in the State of Alabama are collected and analyzed by using statistical methods. Regression analysis is used to analyze the trend and predict the future average scores for 8th Grade students in the State of Alabama.

Abstract # 129

Statistical Analysis of National Earnings by Demographics and Education

Ashlei Craig and S. Khan

Mentor: Dr. Salam Khan

Department of Physics, Chemistry, and Math

In this study, the average national earnings historic data by different demographics and by education is collected and analyzed by using statistical techniques. Regression analysis is used to analyze the trend and predict the future average national earnings.

Abstract # 130

Materials, Systems, and Applications of Gamma Radiation Detectors

Carl Moore and K. Bhat

Mentor: Dr. Kamala Bhat

Department of Physics, Chemistry and Math

To fully understand the material, systems, and applications of Gamma radiation detectors needed, an understanding of the concepts of what are gamma rays, which materials would allow the passage of gamma rays and how the experimental setup should be in order to measure them. For successful Gamma Radiation Detection, a thorough review of gamma rays was conducted. The electromagnetic spectrum is the range of frequencies of electromagnetic radiation and their respective wavelengths and photon energies. Gamma radiation is a form that arises from the radioactive decay of atomic nuclei and is common in stellar decay or interactions. The review conducted was to determine the various types of crystals that could be

used for Gamma radiation and study the parameters required to grow them in the laboratory. The efficiency and properties of the crystals have been compared.

Abstract # 131

Cubic-Quartic Optical Solitons with Lakshmanan-Porsezian-Daniel Model by Semi- Inverse Variation

Joseph Edoki and A. Biswas

Mentor: Dr. Anjan Biswas

Department of Physics, Chemistry and Math

One of the most viable models that govern the transmission of pulses through optical fibers, across intercontinental distances, is the Lakshmanan-Porsezian-Daniel (LPD) model. Such a model, amongst many others, dictates the physics of modern-day Internet communication or quantum communication technology. The two key factors that sustain the stable transmission of such pulses across an intercontinental distance are chromatic dispersion (CD) and the nonlinear form of refractive index. When CD runs low, it is the third-order dispersion (3OD) and fourth-order dispersion (4OD) that collectively comes to the rescue. Thus, LPD model is studied with the inclusion of 3OD and 4OD that sustains the pulse transmission for long distances. A few Hamiltonian perturbation terms are also incorporated into the model for a better structure of the governing model. These perturbation terms are considered with maximum intensity. The semi—inverse variational principle is implemented to extract an analytical bright 1-soliton solution that serves as bit carriers in a typical optical fiber. The parameter restrictions for the existence of such pulses is also enumerated.

Abstract # 132

The Applications and Theory Related to Machine Learning

Kayla Tuck and K. Sartor

Mentor: Dr. Kenneth Sartor

Department of Physics, Chemistry and Math

An overview on how machine learning ties into linear algebra, probably, statistics, calculus and several more mathematical concepts. Such as musical feature spaces, what kind of music college students listen to, the algorithm of social media and the amount of time spent generally. Some topics may be based off of shopping, music, and socials that are used through machine learning.

Abstract # 133

Techniques used to improve the Nonlinear Properties of compounds to suit various novel applications

Sydney D. Greene and Z. Martin

Mentor: Dr. Kamala Bhat

Department of Physics, Chemistry and Math

Nonlinear materials synthesized in the laboratory to produce substances that have properties which can be tailored to (i) increase the efficiency of the property and(ii) possess unique properties that are not found in nature. There are multiple techniques that can be employed to improve nonlinear properties of compounds such as introduction of metal dopants or by introduction nucleophilic or electrophilic substituents, use of polymers or copolymerization bridge to strengthen the backbone and increase polarizability. The analysis of the effects of introducing variations are studied by either Z-scan or TPEF ((Two-photon excited fluorescence). Two examples of main techniques for measuring; induced change TPA cross-sections of nanoparticles. The Z-scan measures the change in phase induced by a laser beam upon propagation through a nonlinear material. Z-scan allows for a sensitive determination of the nonlinear absorption and refraction parameters without the need for an external 2PA (two-photon absorption) standard. The TPEF technique is an indirect method that involves the measurement of the TPEF spectra and intensity in relative to a suitable reference of novel applications. It is a powerful technique in bio-molecular imaging to gain a greater understanding of processes ongoing on a cellular level. The chemical composition of a sample can be identified by using different fluorophores and the nonlinear nature of the 2PA (two-photon absorption) standard. This also allows for 3D deep tissue imaging. There has been an investigation to study the mechanism of the 2PA (two-photon absorption) standard cross sections of polymers that form multi-connected macromolecular networks. Since there have been two new types of TPEF techniques that have emerged to fix this issue: Internal Standard TPEF (ISTPEF) and Solid State TPEF (SSTPEF). They are giving promising results and good NLO responses.

Abstract # 134

Improvement of KDP Synthesis and Properties for Applications

Zakoria Martin and S. Greene

Mentor: Dr. Paul Okweye

Department of Physics, Chemistry and Math

Potassium Dihydrate Phosphate (KDP), a crystalline solid, very versatile in its applications as a fertilizer, in addition to other important piezoelectric, ferroelectric, and electrooptic characteristics. The two methods that I have conducted research own are harvesting amino acids doped KDP and the investigation of crystals based on an improved BEMD. KDP was one of the first compounds to be used for nonlinear and electrooptical properties, and still widely used

in nonlinear optical device. Their synthesis is easy and can be grown easily in the laboratory as well as in the form of large crystals for industrial purposes. They are easily doped with other elements to enhance their property which have wide applications. The laboratory technique involves the mixing of potassium carbonate and phosphoric acid in mole ratio when the crystals appear under ambient condition. Harvesting amino acid with doped KDP are obtained by using temperature and time control for an AVR microcontroller. The data from the harvesting doped with KDP shows the prominent peak of the pure and doped crystals observed. The addition of amino acids alters the lattice parameter values in the observation. Bidimensional Empirical Mode Decomposition method is a technique that decomposes an image into bidimensional intrinsic mode functions and a bidimensional residue. There has been an investigation to see if the KDP crystal surface could cause improvements to the bidimensional empirical mode decomposition method. The reason this was investigated so that it would eliminate the end effects of BEMD method and improve IMFs. The IMF's were improved for efficient identification of certain texture features during a denoising process. The proposed method was a well put together technique without any prior knowledge, but it was a promising tool for the application of online monitoring and many other things.

Graduate

FOOD AND ANIMAL SCIENCES

Abstract # 135

Comparative Analysis of the Antioxidant and Antimicrobial Activity of *Cannabis sativa* L. extracts.

Aaron L Dudley, L. Kassama, A. Jackson-Davis, and A. Mohammed

Mentor: Dr. Lamin Kassama

Department of Food and Animal Sciences

Application of plant bio-actives in food packaging is a promising technology to minimize post-harvest food spoilage due to their antioxidant and antibacterial properties, which provide some form of natural protection. One such candidate is industrial hemp (Cannabis sativa) which contains bioactive components. The objective of this study was to evaluate the antibacterial and antioxidative activities of two Northern Alabama hemp varieties. In this study, botanical parts (Bud-B and Stem-St) of two northern Alabama hemp varieties (Jinma (J1), and Cherry Wine (CW)) were used. The extraction solvent used was ethanol (96%) (E). Antioxidant potential of the extracts was determined by total phenolic, total flavonoid, DPPH (2,2-diphenyl-1-picrylhydrazyl). Antibacterial activity against cocktails of enteric pathogens E. coli O157:H7 and Listeria monocytogenes was determined using a BioScreen-C microtiter and disc diffusion assays. Results were expressed, in triplicate, as mean value ± SE (n=9). Statistical significance

was evaluated by one way ANOVA and P<0.05 were significant. Results showed the total phenolic content in hemp varieties between 2.06±0.03mg GAE/g dw for extract (J1-St-E) to 4.95±0.14mg GAE/g dw extract (CW-St-E). Total flavonoid content ranged from 0.59±0.11mg CE/g dw for extract (J1-St-E) to 2.66±0.18mg CE/g dw (CW-St-E). Total inhibition of DPPH ranged from 27.35% for the CW-B-E extract to 65.22% for the J1-St-E extract. BioScreen-C results showed significant ($p < 0.05$) bacteriostatic effect of hemp varieties on both enteric pathogens. Against E. coli, the percent inhibition ranged from 5.66% for the J1-St-E to 35.99% CW-B-E extracts and 17.42% for J1-B-E to 41.91% CW-B-E extracts against Listeria monocytogenes. In disc diffusion testing against E. coli zone of inhibition ranged from 9.42±0.39mm (J1-St-E) to 10.78±0.55mm (CW-St-E) and against Listeria monocytogenes 11.36±0.58mm (J1-St-E) to 25.79±0.83mm (CW-B-E). Development of hemp based active packaging will contribute immensely to food preservation and the sustainability of the global food supply chain.

Abstract # 136

Phytochemical profile and processing effect on selected *Moringa oleifera* leaves and seed

Morola Oluewu, L.T. Walker, S. Ogutu

Mentor: Dr. Lloyd T. Walker

Food and Animal Sciences

Moringa oleifera is a native plant from Asia grown in the tropics. The leaves, bark, flowers, fruits, seeds, and roots are rich sources of phytochemicals and antioxidants; hence, they have been extensively utilized for medicinal purposes. The aim of this study was to determine the phytochemical content and antioxidant activities in four varieties of Moringa leaves and seeds from Nigeria, Ghana, Haiti, and India. The seeds were subjected to processing methods such as boiling and fermentation, and all samples were extracted using aqueous methanol. Total Phenolic Content (TPC) and Total Flavonoid Content (TFC) were then determined. Results indicated no significant differences ($P \leq 0.05$) in the TPC and TFC in Moringa leaves. However, significant differences in TPC and TFC were noted in the processed seeds. Raw seeds from Haiti (10.30 mg/g GAE) had the highest TPC, while the raw seeds from Ghana (8.90 mg/g GAE) had the lowest. Boiled seeds from Ghana (11.72 mg/g GAE) had the highest TPC, while seeds from Haiti (7.41 mg/g GAE) had the lowest. A similar observation was noted for the fermented seeds. Regarding TFC, raw seeds from Ghana (25.95 mg/g CE) were significantly ($P \leq 0.05$) higher compared to the Nigerian variety (10.83mg/g CE). After fermentation, seeds from the Ghanian variety (17.44 mg/g CE) had the highest TFC, while seeds from Haiti (2.58 mg/g CE) had the lowest. The preliminary results suggest that Moringa leaves, and seeds may be used in the development of functional foods.

Abstract # 137

Regulation of Mg+2-Dependent Phosphatidic Acid Phosphatase Enzymes in the Yeast *Yarrowia lipolytica*

Pasham S. and S. Fakas

Mentor: Dr. Stylianos Fakas

Department of Food and Animal Sciences

Phosphatidic acid phosphatase (PAP) catalyzes the conversion of phosphatidic acid (PA) to diacylglycerol (DAG) in a reaction that depends on Mg+2. In *Y. lipolytica*, the PAH1 and APP1 genes encode for Mg+2-dependent PAP activity, but their regulation has not been studied in detail. In this work, we constructed a strain that lacks both PAH1 and APP1 (i.e., pah1Δapp1Δ) to examine the contribution of these enzymes to PAP activity and TAG biosynthesis. We grew the strains in high glucose media that favor lipid accumulation and measured the PAP enzymatic activity during lipogenesis. The contribution of the genes was examined by comparing the PAP activity and lipid profiles between a wild type strain, a mutant strain that lacks PAH1 (i.e., pah1Δ), and a mutant strain that lacks both PAH1 and APP1 (i.e., pah1Δapp1Δ). The results showed that 90% of the Mg+2-dependent PAP activity is encoded by the PAH1 gene, while APP1 is only contributing 10% of that activity. Next, we examined the role that these enzymes play in TAG biosynthesis. The lack of PAH1 alone (i.e., pah1Δ) resulted in 20% reduction of the TAG levels, while the lack of APP1 did not have a significant effect on TAG levels. These results indicated that APP1 does not contribute to TAG biosynthesis in *Y. lipolytica*.

Abstract # 138

Synthesis and Characterization of Poly Caprolactone Nanoparticles for the Delivery of Lycopene

Sai Vinay Kumar Madala, M. Ul Alam, and L. Kassama

Mentors: Dr. Lamin Kassama and Mohammad Anwar Ul Alam

Department of Food and Animal Sciences

Due to degenerative losses of bioactive compounds biodegradable polymer becomes the prominent component for encapsulating those bioactive compounds which further invent a non-toxic control release mechanism into the GIT system. Advantages using biodegradable polymeric nanoparticles formulation includes, reduced systemic side effects, targeted, and controlled release kinetics, and high capability to cross various physiological barriers. Among the biodegradable polymeric PCL is widely used for encapsulation of many bioactive compounds due to its biodegradability, biocompatibility, high hydrophobicity, strong mechanical strength and involves a slow and steady release of core compounds employed in it. Thus, for nanoencapsulation of lycopene like bioactive compounds, PCL has been employed as an ideal nanocarriers considering its nature and properties. Purpose: The objective of this study is to evaluate the physicochemical characterization, and encapsulation efficiency of PCL nanoparticle for controlled release activities of lycopene in the gastrointestinal (GI) system. The

nanoparticles (NP) were synthesized by emulsion evaporation method and physicochemical properties was determined using a Dynamic Light Scattering spectroscopy and Fourier Transform-Infra red spectroscopy. The results showed the hydrodynamic diameter of the lycopene NP synthesized in PCL (200 mg) and 3.5 mg surfactant and sonicated for 15 min found to be lowest at 79.23±0.85 nm. Significant difference result found in polydispersity index PDI value (0.12±0.07) when PCL of 200mg dissolve in 3.5 mg of surfactant. However, the zeta potential values were found to be highest at -4.21±0.08 mV compared to other experimental condition. The surfactant concentration, biodegradable polymer concentration and sonication time have significant ($P<0.001$) interaction effect on hydrodynamic diameter, mobility, zeta potential and conductivity, where PDI only significantly vary with surfactant concentration. NP synthesized with PCL and surfactant provide a smaller sized, better stability and mono-dispersity value which ultimately provide a confirmation of more bioavailability and bio-accessibility into the human digestive system.

Abstract # 139

Site-directed Mutagenesis Studies of the *Yarrowia lipolytica* PAH1-encoded Phosphatidate Phosphatase

Varsha C. Anche and S. Fakas

Mentor: Dr. Stylianos Fakas

Department of Food and Animal Sciences

Yarrowia lipolytica is used to produce omega-3 polyunsaturated fatty acids (PUFAs) that play a therapeutic role in human nutrition. Yeast PUFAs may replace oily fish PUFAs, but the yeast bioprocess economics are not favorable for commercialization. Improving the economics requires a better understanding of the lipid biosynthetic pathway and its regulation. The PAH1 gene encodes for phosphatidate (PA) phosphatase, which catalyzes the dephosphorylation of PA to produce diacylglycerol that can be further converted to triacylglycerol (TAG). Recently we showed that the pah1Δ mutation caused a significant decrease in total lipid content and TAG levels during the lipogenic phase, where cell growth ceases, and lipid biosynthesis predominates. Also, the expression of the Pah1 protein is regulated under these conditions. To better understand this regulation, we constructed integrative vectors that drive the expression of PAH1 under the control of its native promoter and either the LIP2 or the PEX20 terminator and transformed them into pah1Δ cells. The expression of Pah1 in the transformants was confirmed by immunoblot analysis using antibodies directed against the protein, and its biological function was examined by analyzing the PA phosphatase activity, lipid content, and TAG levels. The results showed that the levels of the Pah1 protein expressed under the LIP2 and the PEX20 terminators were similar to the wild-type levels. Also, the vector expressed Pah1 was able to restore the TAG levels in pah1Δ cells. The function of Pah1 will be further analyzed by using a catalytic site mutant of Pah1 (D350E mutation). We hypothesize that the catalytically inactive Pah1 protein will not complement the phenotype of the pah1Δ cells, thereby confirming that the catalytic activity of Pah1 is responsible for the phenotypical changes

observed in the pah1Δ cells. This study has the potential to improve the production of PUFAs, by increasing the yields of the bioprocess.

FAMILY AND CONSUMER SCIENCES

Abstract # 140

From the School Desk to the Prison Cell

Alexandria Shorter and S. Anasuri

Mentor: Dr. Sadguna Anasuri

Department of Family and Consumer Sciences

As a response to the Columbine school shooting in 1999, a set of policies known as the Zero-Tolerance policies were enacted in schools across America. Over time, these policies set the tone for what we know today as the School-to-Prison Pipeline. The School-to-Prison Pipeline is a system in American schools that accelerate students being pushed out, especially those with disabilities and other minority populations. The population of current African American males in American schools lies at 8% of the total population. In comparison, the suspension and expulsion rate of those same African American male students lies at 25% of all out-of-school suspensions (U.S. Department of Education Office for Civil Rights, 2018). Teacher bias has also contributed to the high funneling of African American students out of the school system and into the prison system. Between zero-tolerance policies and teacher bias, the School-to-Prison pipeline gained traction from protecting against major offenses, such as guns and drugs in school to discipline minor offenses, such as dress code violations and class disruptions, and treating these actions as criminal offenses. The current research will explore the perceptions held by current elementary and secondary teachers toward the School-to-Prison Pipeline in city and county schools in Huntsville, Alabama. The perceptions of these elementary and secondary teachers will facilitate the conversations needed and make recommendations toward ways in which the school-to-prison pipeline can be lessened.

Abstract # 141

Effects of Parenting Styles on Children's Health Outcomes

Bryana Farrington and L. Durrant

Mentor: Dr. Lorna Durant

Department of Family and Consumer Sciences

Parenting style is the standard strategies that parents use to socialize their children. It is one of the many ways to measure the effect parental attitudes and responses have on children. There are several theoretical perspectives that stress the importance of the parent-child relationship regarding positive and negative outcomes in child development. Though many theorists share

different perspectives on child development, they all share the common factor of parental roles in the development process. Leading to the understanding that, children initially develop attitudes and behaviors from parental figures. As a result, this literature review will be conducted to ascertain the impact of parenting styles on children's health related behaviors. According to the CDC, of the estimated 23 million people diagnosed with diabetes is 2015 about 193,000 were children and adolescents younger than age 20. Recent studies have also reported that more people are developing diabetes in their youth. As of 2020, the number continues to rise significantly amongst minorities, primarily non-Hispanic blacks. The youth obesity rate is also concerning; it totaled 19.3% in the years 2017-2018. Obesity reportedly affects 1 in 5 children and adolescents in the U.S. alone. However, healthy dietary habits and physical activity practiced in childhood and adolescence have proven to decrease chances of future health risks. To find the necessary articles for this literature review, the school's library database will be utilized. Word combinations such as children diet and parenting styles; children physical activity and parenting styles; and parenting and children health outcomes will be used to source appropriate research. It is expected that the literature will reveal that parenting style along the dimension of responsiveness and demandingness will influence children's healthy behavioral practices and children's health outcomes.

Abstract # 142

The Influence of Dietary-Related Social Media Content on College Students

Hasina Lee and N. Sistani

Mentor: Dr. Nahid Sistani

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Social media is one of the most influential platforms in college students' lives. It is also one of the main platforms where people share recipes, pictures of meals, and nutritional information. Therefore, it is important to investigate the effects of social media and its potential to have an impact on college students' diets. A study was conducted at Alabama A & M University to determine if there is a positive correlation between the amount of time spent on social media and college students eating habits. Two hundred and six Alabama A&M students were randomly selected to participate in the study. The survey revealed that there was in fact a positive correlation of the two. The 206 students surveyed had a favorable perception of trying out new recipes that they have seen on social media. Students' willingness change their dietary habits was determined by using a SPSS data system to estimate probabilities with respect to sex, race, age and classification. The projected probabilities showed that social media can influence college students eating habits.

Abstract # 143

Workplace Bullying: Inside Job That is Damaging for All

Kaliah Robinson and S. Anasuri

Mentor: Dr. Sadguna Anasuri

Department of Family and Consumer Sciences

Workplace bullying has become unusually problematic throughout recent years, presenting a serious management challenge. More than sixty million Americans workers are affected by workplace bullying (Oade, 2018). Workplace bullying can be defined as anyone in an organization repeatedly causing harm to a colleague by mistreating them through a series of toxic behaviors. There are little-to-no anti-bullying policies in place at work to control such iniquitous behaviors. Main objective of this research was to explore the experiences of working individuals and their awareness of anti-bullying practices in their organizations. This study examined the effects of workplace bullying on employees and ways of alleviating its occurrences. Fifty-three percent of the respondents said they had moderate overall job satisfaction while 72% had witnessed bullying at work, which is almost 3 in 4 cases. Due to bullying, 60% of the employees experienced more significant on-the-job stress. Employees reported belittling (33%), pressurized (28%), received rude emails (41%), insults about intelligence and performance (32%), accused of making errors (49%), interrupted during expressing oneself (51%), coerced other employees against the target individuals (32%), used condescending ways in their interactions (54%), and were reprimanded in front of others (48%). It was also found that the employees felt that they were mistreated (44%), all cultures and backgrounds were not respected and valued (30%). They experienced health-related issues due to workplace bullying (41%). Employees also share other emotional trauma and familial issues correlated to workplace bullying. The results help in planning preventive measures and provide necessary intervention strategies. Measures need to be taken to positive awareness, create a healthy atmosphere, and increase productivity. The study intends to educate and help implement better anti-bullying policies, employees, agencies, and lawmakers must set and stick to zero-tolerance bullying policies and explore further research and outcomes, thus creating healthy working environments for all.

Abstract # 144

Damsels in distress: Healthcare disparities against African American women

Melissa Robinson and S. Anasuri

Mentor: Dr. Sadguna Anasuri

Department of Family and Consumer Sciences

Social injustices in the United States cover a broad spectrum of overt bigotry and biases. Racism, prejudices, and discrimination are deeply rooted in the US legal and social structures. This often leads to systematically oppressing minority groups in all aspects of life. An alarming rate of minorities is becoming victims of racial profiling and police brutality which has been

publicized recently via media. The healthcare disparities often do not see the limelight, specifically those affecting African American women. Women of color often receive low-quality healthcare and are subjected to callous treatment by medical professionals. With factors like sexism, racism, and other systemic and social blockades, there is higher gross mortality linked to pregnancy and childbearing for black women. Women of African descent are 3 to 4 times more likely to die from childbirth complications. Black women are 3 times more likely to have fibrosis than white women and develop them at a younger age. A plethora of chronic illnesses are related to stress in African American women as a result of socioeconomic disadvantages and earlier onset of life stressors. A misdiagnosis of black women often leads to severe complications and increases the rates of preventable deaths. The substratum of this distressing disparity is the stereotypical ideology that leads some medical professionals to provide subpar services to women of color. This poster presentation will explore the roots of such disparities, the impact they have on the African American community, and preventable measures to decrease the mortality rate associated with social injustices in healthcare.

BIOLOGICAL AND ENVIRONMENTAL SCIENCES

Abstract # 145

Cell growth profiles are differentially altered in *Saccharomyces cerevisiae* strains treated with rapamycin and curcumin in 2 common culture media

Jasmin J Clark, T. Baker, and T. Farmer

Mentor: Dr. Tyesha Farmer

Department of Biological and Environmental Sciences

Turmeric, a ground spice derived from the rhizomes of *the Curcuma longa* plant, is a common botanical used in traditional Ayurvedic and Asian medicine as an anti-cancer and anti-inflammatory agent. The beneficial properties of turmeric consumption are mostly ascribed to the activity of curcumin, the major biologically active polyphenol present in turmeric. Previous studies have shown that curcumin delays cell cycle progression, induces both apoptosis and oxidative stress related DNA damage, and blocks signaling of the major growth regulator TOR (target of rapamycin). Limited studies have evaluated the effects of turmeric and curcumin in the context of TOR inhibition. In this study, control and fet3 deletion strains were 10-fold serially diluted from a starting OD (595 nm) of 0.2 and spotted onto synthetic complete and YPD media plates containing increasing concentrations of turmeric or curcumin. Neither strain exhibited sensitivity to turmeric extract, in contrast with previous data using a different control strain (minimum inhibitory concentration = 10 ug/ml). The fet3 deletion strain displayed sensitivity to curcumin that was not observed in the control strain. To examine synergistic effects of TOR inhibition, yeast strains were spotted onto drug plates containing 150 uM curcumin + or – 10 ng/ml rapamycin. Regardless of media type, the fet3 deletion strain exhibited sensitivity to curcumin and hypersensitivity to curcumin + rapamycin. However, these studies revealed significant differential cell growth profiles on different media types for both strains. In YPD liquid culture time course experiments, yeast strains were exposed to 150uM

curcumin + or – 200 ng/ml rapamycin and assayed for OD, spot test survival, and cell cycle distribution. Preliminary data suggests that curcumin interferes with the ability of rapamycin to induce G1 cell arrest. This presumption and the mechanisms underlying the unexpected differential cellular response on various growth media warrant further investigation.

Abstract # 146

Microbiomes Associated with the Oral and Fecal Samples of White-Nose Syndrome (WNS) Infected Gray Bats and Tricolored Bats

Kristina M. Burns, V. R. Sripathi, G. C. Sharma, W. Stone, J. Jones, and L. Nyochembeng

Mentors: Dr. Venkateswara R. Sripathi, Dr. Govind C. Sharma, Dr. William Stone, Dr. Jeanette

Jones, and Dr. Leopold Nyochembeng

Department of Biological and Environmental Sciences

White-nose syndrome (WNS) has spread rapidly across the eastern United States and Canada since it was first documented in New York over a decade ago. The causative organism for WNS in bats is *Pseudogymnoascus destructans*, and it has accounted for 5.7 million deaths of bats in the United States. Molecular mechanisms associated with the WNS and the resultant shift in the microbial diversity are underexplored. Species identification was achieved by using both field-based methods and molecular techniques. This study included two bat species (gray, Myotis grisescens and tricolored, Perimyotis subflavus); one condition (WNS-infected); two populations (males and females); two sample types (oral and fecal swabs) with twelve replicates (R1 – R12). In total, 48 microbiome samples (2 x 1 x 2 x 2 x 12) were selected for microbial DNA extraction (ZymoBIOMICS). The best practices in preserving bat microbiome samples for molecular analyses were tested by comparing DNA isolated from two different sample types (oral and fecal) using two different methods (spectrophotometer-based and quantitative PCR) and three different preservation media (ethanol, NaCl-saturated dimethyl sulfoxide (DMSO), and silica desiccant) and suggested that the DNA isolated from fecal samples and silica yielded more DNA. Microbial diversity was assessed by sequencing single-end libraries of amplified 16S rDNA genes from respective microbiomes and analyzed using Qiime 2. The reads were clustered into operational taxonomic units (OTUs), and phylogenetic trees were constructed with closely related bacterial species to compare microbiomes. Results indicated that the majority of OTUs identified belonged to the phyla Proteobacteria, Firmicutes, and Actinobacteria being dominant. Our ITS sequencing and analysis revealed Chlorophyta, Ascomycota, Basidiomycota, and Zygomycota as major phyla associated with both oral and fecal swabs. We observed more microbial diversity in fecal samples than in oral samples. Further, bats being a mammalian system, the knowledge generated here can be applied to humans.

Abstract # 147

Estimating the Carbon Budget of Soybeans under Till and No-Till Cropping Systems

Moonsun Yang, M. Mbila, and X. Xiao

Mentor: Dr. Monday Mbila

Department of Biological and Environmental Sciences

Net ecosystem exchange (NEE) is a measurement of how much carbon is entering and leaving the ecosystem. For agricultural ecosystems, NEE measurement has been used to characterize the fluxes in photosynthetic uptake of CO2 by plants and ecosystem release of CO2 by plant respiration and decomposition. The balance between CO2 uptake and release by an ecosystem is important because it regulates net ecosystem productivity. However, not much progress have been made in documenting CO2 flux studies for agricultural ecosystems, and even more scarce is studies that partition the NEE profile of agricultural ecosystems. This study is part of a wider research being conducted to estimate the carbon balance for selected major agronomic crops by evaluating above-crop canopy-C, biomass-C, below-canopy-C, and soil-C by using multi-method approaches. In this study, CO2 flux from the soil (soil respiration) of soybean crop was monitored by the CO2 chamber method. The CO2 chamber was used to measure CO2 flux from soil collars installed in the tilled and no-till sites once a week for sixteen weeks. Results of the CO2 flux from the tilled and no-till plots during the entire growing season were compared and evaluated. The preliminary data of the weekly sampled soil-surface CO2 fluxes ranged from 0.88 to 5.95 µmol CO2 m−2 s−1 over the growing season. And there were significant differences between till and no-till CO2 flux with time. Qualitative measurements of CO2 such as this study enhances our understanding of carbon budgets of agronomic ecosystems and helps in integrating agriculture into climate proposals.

Abstract # 148

Yield Performance of Specialty Vegetable Crops in an Alley cropping Agroforestry System

Mounika Pudota, L. Duong, S. Kumar, T. Pham, D. Price, K. Scott, M. Mbia, D. Davis, and S.R.

Mentreddy

Mentors: Dr. Dedrick Davis and Dr. Srinivasa Rao Mentreddy

Department of Biological and Environmental Sciences

Combining agricultural crops with tree production in the Agroforestry system ensures effective land and natural resource utilization and provides multiple income streams to the landowner. Research-based information on alley cropping specialty crops among timber and nut tree stands for providing a steady flow of income in the short-term would encourage small landowners to practice such enterprises. Therefore, an agroforestry alley cropping study was conducted in North Alabama with the objective of determining the yields of specialty crops, two eggplant varieties, two Capsicum varieties, and two leafy vegetables, *Ocimum basilicum*

and *Hibiscus sabdariffa*, in newly established stands of timber (*Pinus taeda*) and pecan nut tree (*Carya illinoinensis*). Six-week-old greenhouse-grown plants were transplanted onto raised beds covered with plastic with drip tape underneath. Fruit and leaf yields of specialty vegetable crops were determined in pine and pecan stands. The Indian eggplant variety, 'Black Beauty' with fruit yields of 0.94 kg/plant in Pine and 0.64 kg/plant in Pecan, outyielded the Chinese eggplants (0.27 kg in Pine and 0.25 kg/plant in Pecan). Similarly, the 'Sweet' peppers (0.13 and 0.09 kg/plant in Pine and Pecan) were higher than those of Ancho (0.11 kg/plant and 0.08 kg/plant in Pine Pecan). Leafy vegetables, lemon basil, and sorrel produced 0.30 kg/plant in Pine and 0.28 kg/plant in Pecan stands; and 0.04 kg/plant in Pine and 0.05 kg/plant in Pecan stands, respectively over the season. The number of harvests made in season varied with the vegetable type. Chinese eggplant and Black Beauty eggplants gave 9 and 8 harvests, respectively. Sweet and Ancho peppers gave 8 and 7 harvests, respectively. The study showed that specialty vegetable crops planted in early June provide fresh fruit and leaf yields and a continuous cash flow beginning July through November annually. This project was supported by grant: NIFA-AFRI- 2016-68006-24764.

Abstract # 149

Comparative Transcriptome Analyses of Cotton Species for Fiber Traits

Shalini Priya Etukuri, Z. Gossett, G. Sharma, and V. Sripathi

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Department of Biological and Environmental Sciences

Cotton is valued as the world's leading natural textile fiber and a major oilseed crop. The genus Gossypium consists of 45 diploid and five tetraploid species. Although it contains more than 50 species, only four species produce spinnable fiber, of which two are diploids (2n=26), and two are tetraploids (2n=52). Among them, Upland Cotton, *Gossypium hirsutum* (AADD) is the most widely cultivated cotton species. It is likely evolved from two wild ancestral genomes, the A-genome donor being *G. herbaceum* (A1) or *G. arboreum* (A2), and the D genome contributor being G. raimondii (D5). In this study, transcriptome analyses of four Gossypium species (*G. hirsutum* cultivars, Texas Marker, TM-1 and Fiber Max, FM-1944; *G. herbaceum*, A1-141; and *G. arboreum*, A2-44) were conducted from three tissues (leaf, root, and seed) by using RNA Sequencing aimed to generate ~250 million reads from 72 samples (four genotypes x three tissues x six replicates). The leaf, root, and seed tissues collected were homogenized in a lysis buffer using a bead beater for isolating total RNA. Then, RNA purity (quality and quantity) was assessed using 2200 TapeStation (Agilent Technologies) and used for sequencing on NovaSeq System (Illumina, Inc.). The sequenced data collected in reads will be trimmed (Trimmmomatic) and filtered, and FastQC assesses sequence quality. Filtered reads are mapped against the reference cotton genome using HISAT2 Aligner, StringTie can reconstruct transcripts using gene locations, DESeq2 can identify differentially expressed genes (DEGs), and Ballgown for visualizing the data. Our preliminary analysis estimates 42,000 - 36,000 transcripts and 16000 - 12000 DEGs among the genotypes and tissues that are compared. Our pipeline is efficient in detecting novel transcripts and isoforms or alternate spliced products. Further, gene

enrichment, annotation, Gene Ontology (GO) classification, and pathway analyses will be carried out to predict fiber-, defense-, and stress-related genes and mechanisms.

Abstract # 150

Individual curcuminoids exhibit varying effects on cell growth in *Saccharomyces cerevisiae* when TOR signaling is inhibited

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Curcuminoids are polyphenolic compounds and major biologically active components of the Asian spice turmeric. This group consists of curcumin, demethoxycurcumin, and bisdemethoxycurcumin. Although all of the curcuminoids have been shown to have anti-cancer and anti-inflammatory activity, curcumin is the most widely used and extensively studied. Curcumin has been shown to influence signaling of the TOR (target of rapamycin) kinase growth signaling pathway, though the molecular underpinnings of this observation are still unclear. Many commercial preparations advertised as curcumin also contain some amount of the other curcuminoids. This study examines the effect of curcuminoids on TOR activity and the growth of transgenic strains of Saccharomyces cerevisiae, a common model system used to study aspects of TOR signaling. Control and fet3 deletion strains were diluted to an optical density (595 nm) of 0.3, serially diluted, and spotted onto YPD or synthetic complete media plates containing 10 ng/ml rapamycin +/- 200 uM curcumin, demethoxycurcumin, or bisdemethoxycurcumin. Plates were incubated at 30^{o}C over 5-7 days and evaluated for growth on agar plates. Demethoxycurcumin exhibited significant ability to inhibit cell growth of all strains assayed and displayed synergistic effects in combination with rapamycin. Bisdemethoxycurcumin treatment, in contrast, decreased cell growth only when TOR kinase activity was inhibited. Curcumin, as previously shown, displayed antagonistic activity to rapamycin when strains were grown on synthetic complete media, but not when grown on YPD media. Additional studies are underway to examine changes in protein expression, cell morphology, and cell cycle distribution when yeast cells are exposed to these curcuminoids and rapamycin. Delineating the effects of each individual curcuminoid on TOR signaling may have medicinal implications beyond those currently ascribed to curcumin.

PHYSICS, CHEMISTRY AND MATHEMATICS

Abstract # 151

Smart Nanocomposites for sensing applications

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In the present research Polyvinylidene Fluoride (PVDF) doped with Calcium Titanate-composite material is investigated for its ability to be a smart material for sensing applications. The Ferroelectric material has been utilized for many applications because of its large piezoelectric, pyroelectric, dielectric, and electro optic-coefficients. Efforts were made to understand DC and AC conduction mechanisms. From these parameters figure of merit for device applications such as heat sensors and high-value capacitors will be calculated. The parameters obtained will be used to calculate the other dependent parameters such as DC conductivity, AC conductivity, and dielectric constant. Preliminary results indicate the dependency of the Resistivity characteristics on the weight percentages of CaTiO3 embedded in PVDF.PVDF thin films are smart materials used in flexible devices. PVDF thin films have pyroelectric and piezoelectric properties. Researchers recently discovered PVDF thin films also have the ability to detect ultraviolet and infrared radiations. This research involves the fabrication of PVDF thin films, Fourier-transform infrared (FTIR) spectroscopy, Raman spectroscopy, and surface resistivity testing. PVDF samples were made with different amounts of powder which caused variations in thickness. The technique used to make these films was the solution cast method. Ultimately causing different absorptions of infrared and Ultraviolet rays. Research on PVDF thin films was done using a Raman Spectrometer and an FTIR machine. Multi-wall Carbon Nanotubes (MWCNT) doped and undoped were made in variations of thickness to test surface resistivity. Research on PVDF thin films was done using a Keithley Model 8009 Resistivity Test Fixture and a Keithley Model 6517 Electrometer in unison.

Abstract # 152

Investigating the Impact of Perovskite Structured Materials in Ferroelectric Polymers

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Mentors: Dr. Ashok Batra and Dr. Padmaja Guggilla

Department of Physics, Chemistry and Math

In the recent years, nanocomposites have exhibited a catalytic role in improving electronic and optoelectronic properties of conventional ferroelectric polymers such as Polyvinylidene Fluoride (PVDF). In the present work, it was discovered that PVDF doped with (Zn/Ca) TiO3 nanoparticles would display improved bandgaps, high absorption, and superior dielectric and pyro electric properties. These features are further complimented by optical studies that

display improved absorption and finer spectral analysis, dielectric studies that display higher dielectric constant and lower dielectric loss for doped samples. Also, different figure of merits has been obtained using pyroelectric study.

ORAL PRESENTATIONS

FOOD AND ANIMAL SCIENCES

Abstract # 153

Physiochemical Properties of Different Components in *Cannabis sativa L*.

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Mentor: Dr. Lamin Kassama

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Application of plant bio-actives in food packaging is a promising technology to minimize post-harvest food spoilage due to their antioxidant and antibacterial properties, which provide some form of natural protection. One such candidate is industrial hemp (*Cannabis sativa*) which contains bioactive components. The objective of this study was to evaluate the antibacterial and antioxidative activities of two Northern Alabama hemp varieties. In this study, botanical parts (Bud-B and Stem-St) of two northern Alabama hemp varieties (Jinma (J1), and Cherry Wine (CW)) were used. The extraction solvent used was ethanol (96%). Antioxidant potential of the extracts was determined by total phenolic, total flavonoid, DPPH (2,2-diphenyl-1-picrylhydrazyl). Antibacterial activity against cocktails of enteric pathogens *E. coli* O157:H7 and *Listeria monocytogenes* was determined using a BioScreen-C microtiter and disc diffusion assays. Results were expressed, in triplicate, as mean value ± SE (n=9). Statistical significance was evaluated by one way ANOVA and $P<0.05$ were significant. Results showed the total phenolic content in hemp varieties between 2.06±0.03 mg GAE/g dw for extract (J1-St-E) to 4.95±0.14 mg GAE/g dw extract (CW-St-E). Total flavonoid content ranged from 0.59±0.11 mg CE/g dw for extract (J1-St-E) to 2.66±0.18 mg CE/g dw (CW-St-E). Total inhibition of DPPH ranged from 27.35% for the CW-B-E extract to 65.22% for the J1-St-E extract. BioScreen-C results showed significant ($p < 0.05$) bacteriostatic effect of hemp varieties on both enteric pathogens. Against *E. coli*, the percent inhibition ranged from 5.66% for the J1-St-E to 35.99% CW-B-E extracts and 17.42% for J1-B-E to 41.91% CW-B-E extracts against *Listeria monocytogenes*. In disc diffusion testing against *E. coli* zone of inhibition ranged from 9.42±0.39 mm (J1-St-E) to 10.78±0.55 mm (CW-St-E) and against *Listeria monocytogenes* 11.36±0.58 mm (J1-St-E) to 25.79±0.83 mm (CW-B-E). Development of hemp based active packaging will contribute immensely to food preservation and the sustainability of the global food supply chain.

Abstract # 154

Determination of Antiproliferative, Anti-inflammatory, and Anti - Oxidative Effects of Citrus on a Hormone Sensitive Breast Cancer Model

Adrienne C. Johnson, R. Kaur, S. Hale, S. Willis, and M. Verghese

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

A multifactorial diverse disease, breast cancer is a growing public health concern in U.S., with 276,480 new cases projected to be diagnosed in 2020 alone. Research suggests that citrus fruits contain phytochemicals that may reduce the risk and incidence of breast cancer. Though peel is often discarded, this portion of citrus may also be beneficial to health. Objective of this study was to determine chemopreventive effects of citrus (peel and flesh) in an in-vitro breast cancer cell model (MCF-7). Four varieties of citrus fruit and peel (Lime, Lemon, Grapefruit and Mandarin) were extracted with 80% methanol. MCF-7 cells were grown in Eagle's Minimum Essential Medium (EMEM) media with 10% fetal bovine serum and 1% human recombinant insulin. Cells were treated with citrus fruit and peel extracts (0.05 g/mL, 0.01 g/mL, and 0.005 g/mL) and incubated at 37°C for 24 hours. Effects of citrus extracts were evaluated for cytotoxicity (lactate dehydrogenase (LDH) release), induction of apoptosis, and modulation of antioxidant enzyme activities including [Catalase (CAT), Superoxide Dismutase (SOD), Glutathione-S-Transferase (GST), Glutathione Peroxidase (GPx)]. Effects of extracts on cyclooxygenase-2 (COX-2) were also measured to determine possible anti-inflammatory potential. Cytotoxicity in MCF-7 cells treated with the lowest concentration (0.005g/mL) of Mandarin, Lemon and Grapefruit peel extract (86.35%, 86.15%, 75.85%, respectively) was highest, compared to cells treated with other concentrations of citrus peel. It was also observed that cells treated with the highest concentration (0.05g/mL) of Lime, Lemon, and Grapefruit fruit extracts exhibited the highest LDH release (99.93%, 99.44%, 86.06%, respectively) compared to cells treated with lower concentrations of citrus peel. Results of this study suggest that citrus fruit and peel may have potential to be used in combination with or as chemopreventives or in chemotherapeutic treatment in hormone related breast cancers.

Abstract # 155

An investigation into the effect of carob pods *Ceratonia siliqua* as a prebiotic and antioxidant source

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Mentors: Dr. Judith Boateng and Dr. Martha Verghese

Department of Food and Animal Sciences

Carob (*Ceratonia siliqua*) is a flowering evergreen tree in legume family,
Fabaceae. Carob pods are usually processed for its gum content in food industry and sometimes, by-products are used in beverages and as cocoa substitute. Prebiotics are defined

by as a nonviable food component that confers a health benefit on the host associated with modulation of the microbiota. Carob can be utilized as a prebiotic source due to its high fermentable fiber content and phenolic contents. Therefore, postbiotics produced from carob fermentation can increase its antioxidant levels and radical scavenging potential, via production of bioactive polyphenol metabolites. Four strains of probiotics, (*Lactobacillus paracasei*, *Lactobacillus acidophilus*, *Bifidobacterium bifidum*, and *Streptococcus thermophilus*) were grown in respective media in presence (2.5 and 5%) and absence of carob powder and incubated for 24 and 48 h. The following characteristics were observed: probiotic growth, acidification, and postbiotic parameters (determination of total phenolic content (TPC), total flavonoid content (TFC), free radical scavenging ability using 2,2-diphenyl-1-picrylhydrazyl radical (DPPH), ferric reducing antioxidant power (FRAP), and rolox equivalent antioxidant capacity (TEAC)). The growth increased significantly in *L. paracasei* (2.5 and 5% concentrations with 24 h incubation and 5% with 48 h incubation), *B. bifidum* (2.5% with 24 h incubation and 2.5 and 5% concentrations with 48 h incubation), and *S. thermophilus* (2.5 and 5% concentrations with 48 h incubation) compared to control (no carob). The highest growth was witnessed after B. bifidum fermentation with 5 % carob and 48 h incubation (10.61 CFU). pH decreased significantly in both concentrations of carob after 24 h incubation with B. bifidum ($P<0.05$). More than one treatment showed significant increase in antioxidant activity (FRAP value: 109.63 µmol Fe2+/ml). Formulating fermented functional foods with carob can increase viability and stability of probiotics and extend product shelf life.

Abstract # 156

Evaluating the ability of ProSan to control *Salmonella enterica* in a broth system

Bria Cooper, A. Lamb, D. Bailey, and A. Jackson-Davis

Mentor: Dr. Armitra Jackson-Davis

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The per capita consumption of tomatoes has significantly climbed due to the versatility and popularity of the fruit. Unfortunately, the number of foodborne illnesses remain a public health concern. Tomatoes have been responsible for various *Salmonella enterica* multistate outbreaks. During 1996-2006 tomatoes were involved in 17.1% of produce-related outbreaks. Chlorine is commonly used in the tomato industry to control microbial growth. Although effective, the chemical comprises of toxic byproducts that are invasive for both the environment and human health. Current trends in the produce industry suggest that consumers are drawn to more eco-friendly alternatives, and less chemical preservatives. Therefore, the objective of this study was to evaluate the ability of an alternate sanitizer to control *Salmonella* in a broth system. For the study, the Bioscreen C was utilized to determine the minimum inhibitory concentration (MIC) of alternate sanitizers on controlling *Salmonella enterica*. The MIC was observed as the lowest concentration to inhibit the growth of the bacterium. Results indicated that the selected sanitizer at various concentrations was efficient at controlling *Salmonella enterica* in a broth study. These concentrations will be used to evaluate the efficacy on tomatoes.

Abstract # 157

Effects of Dry Processing on Persimmon Fruit and Leaves

Chynna Gross, D. Nash, V. Ward, S. Willis, and 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 disease and cancer. Belonging to the botanical family Ebenaceae, persimmon (*Diospyros kaki*) is of Asian origin and suggested to have antibiotic, antioxidant and anti-inflammatory properties. Persimmon fruit is known for its high flavonoid, beta-carotene, as well high fiber contents; but there has been limited research conducted on the leaves of this plant. The objectives of this study were to determine the effects of processing on antioxidant content, antioxidant capacity and metabolizing enzyme inhibition of persimmon fruit and leaves. Persimmon fruit were sliced (3.15 mm) and dried using three different drying methods: freeze-dried (control) oven (121°C for 3 h), dehydrator (54°C for 14 h). Leaves and processed fruits were extracted with water and 80% ethanol. Extracts were then evaluated for total phenolic content (TPC), total flavonoid content (TFC), DPPH free radical scavenging (DPPH), ferric reducing antioxidant capacity (FRAP), rolox equivalent antioxidant capacity (TEAC), and nitric oxide radical scavenging (NORS). Overall, ethanolic extracts had higher phytochemical and antioxidative potential. TPC ranged from 50 mg GAE/100 g (aqueous leaf extract) to 503 mg GAE/100 g (freeze-dried fruit extracted with ethanol). Oven drying (40mg CE/100 g) increased total flavonoid yield of persimmon fruit by more than 50% compared to control (18mg CE/100 g), when extracted with water. Both persimmon leaves and fruit were able to scavenge the DPPH free radical. Although persimmon fruit has antioxidant potential, results from this study suggest that leaves of this plant also have some antioxidant properties. Therefore, persimmon fruit and leaves could be further utilized as functional ingredients to improve consumers' antioxidant status and aid in preventing chronic diseases.

Abstract # 158

Evaluating the effectiveness of low temperature plasma on background microflora of chicken skin

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Department of Food and Animal Sciences

As health-conscious consumers demand leaner meat options, the rate of chicken consumption among Americans continues to increase. The natural microflora of chicken contains bacterial constituents that are not harmful in small amounts but, have the potential to increase the rate of spoilage if present in large quantities. A study was conducted to investigate the ability of low

temperature plasma to control the growth of background microflora harvested from chicken skin. Chicken thighs were purchased from a local retailer and skinned. The skin was separated and rinsed in a buffer solution. Rinse was enriched in a nutrient broth to enumerate microorganisms. Final samples were suspended in 0.85% saline solution prepared in 5 mL sample volumes. To determine the initial background microflora, enriched microorganisms were serially diluted and plated on Standard Plate Count Agar. To determine the effect of low temperature plasma, samples were subject to 99.9% helium generated low temperature plasma for 5-, 10-, and 15-min. Untreated samples served as controls. For each treatment, serial dilutions were performed and plated on Standard Plate Count Agar, incubated at 37^{o}C for 24 h and compared to the control in order to estimate the microbial population before and after treatment and determine the effect of low temperature plasma. Treatments resulted in a 2-log reduction. This technology may be an alternative for the control of *Salmonella* on poultry.

Abstract # 159

Evaluation of Antioxidant Potential of Garlic, Ginger, and Turmeric and Their Impact on Carbohydrate and Lipid Metabolizing Enzymes

Dawn D. Nash, V. Ward, S. Willis, F. Hester, and M. Verghese

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

Research suggests that spices contain high levels of bioactive compounds, some with disease fighting abilities. Spices are not only used to enhance the flavor of various dishes, but also to prolong shelf life, and are utilized for their potential health benefits. Garlic (*Allium sativum*), ginger (*Zingiber officinale*), and turmeric (*Curcuma longa*) are ever increasing in popularity as they are incorporated into diets globally. These three spices may have hypoglycemic, hypolipidemic, and antioxidant activities, which can play a role in preventing/treating diabetes and the complications from this disease. The objectives of this study were to determine antioxidant content, activity and effect on carbohydrate and lipid metabolizing enzymes of garlic, turmeric, and ginger. Total phenolic content (TPC), total flavonoid content (TFC), free radical scavenging activity by 1,1-diphenyl-2-picryhydrazyl (DPPH), rolox equivalent antioxidant capacity (TEAC), ferric reducing antioxidant power (FRAP) and inhibition of lipase, α-glucosidase and α-amylase were evaluated in garlic (GAR), turmeric (TUM), and ginger (GIN) extracted with deionized distilled water (W) and 80% ethanol. GINE had the highest TPC (234.00 GAE/100 g) while the TUMW had the lowest TPC (32.07 GAE/100 g) as compared to the other spice extracts. TUME had the highest TFC (1,673.13 CE/100 g) while GARW had the lowest TFC (8.50 CE/100 g). Though all extracts were able to scavenge the DPPH radical, TUME scavenged the radical more efficiently (92.27%) compared to GARW (11.66%). The FRAP value of GINE was highest value (3,259.00 mg Fe2+/100 g) while GARW had the lowest (102.35 mg Fe2+/100 g) compared to all other extracts. TEAC of TUME was significantly (p≤) higher (52,008.89 µmol TE/100 g) compared to other extracts. Highest α-glucosidase inhibition was seen by TUME (78.85%). Garlic, turmeric and ginger may act as therapeutic agents upon incorporation into the

diet, as these functional spices may influence antioxidant status and reduce risk of chronic diseases.

Abstract # 160

Ultrasonication and Compositional Effect on Morphology and Encapsulation Efficiency of Curcumin Loaded in PLA

Edwin Ochieng and L. Kassama

Mentor: Dr. Lamin Kassama

Department of Food and Animal Sciences

Curcumin is the primary phytochemical responsible for the characteristic yellow color of turmeric (*Curcuma longa*) with diverse pharmacological applications. Traditionally, it's used as a spice and nutritional supplement, have no toxic effect on humans and can be consumed at high doses of up to 12 g/day. However, high hydrophobicity, rapid metabolism, and low bioavailability limit its application. Encapsulation in biodegradable polymer improves the bioavailability, stability, and solubility of this active compound. The dispersion of solvent into polymer matrices can be enhanced by ultrasonication treatment. The objective of the study was to investigate the ultrasonication effect and the compositional parameters on the physical attributes and encapsulation efficiency (EE) of the curcumin nanoparticles. Through the emulsion evaporation method, curcumin nanoparticles (CN) were loaded into the biodegradable polymer (poly-lactic acid -PLA). The selected parameters: curcumin concentration, surfactant concentration, sonication amplitude, and time were performed to achieve the highest nanoparticle attributes. Curcumin concentration of 0.2, 0.4, and 0.6 mg/mL at sonication amplitude of 80 and 100 µm with varying sonication time was used to prepare CN. The CN encapsulated in PLA (CNPLA) were characterized by differential scanning calorimeter. A dynamic light scattering instrument was used to determine the Poly-dispersity Index (PDI), average hydrodynamic diameter (HD), and the zeta potential (ZP) and EE determined by UV vis-spectrophotometer. The results show that an increase in amplitude and 5 min sonication time resulted in significant ($p < 0.05$) decreased nanoparticle length. Concentrations of 0.2 mg/mL and 400 mg of dimethylamine boren at 100 µm exhibited an optimum PDI, HD, ZP, and EE values. At 5 min sonication time, PDI of 0.221±0.048, mean HD was 458.6±58.6 nm, and ZP was -57.3 mV. The EE was highest at 0.2 mg/mL concentration of curcumin. Additionally, longer sonication time resulted in improved dispersion of the solvent. The results show that ultrasonication and compositional parameters can affect the processing of curcumin nanoparticles.

Abstract # 161

Utilization of hemp (byproducts for sustainability) as a functional snack food ingredient with health benefits

Elvis Baidoo, M. Verghese, E. Cebert, and J. Herring

Mentor: Dr. Joshua Herring

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Snacking is an environmental influence of obesity, as consumers often eat snacks instead of meals. Relaxation and improving the quality of life are major reasons for cannabidiol (CBD) usage and can be coupled with snacking for improved health and relaxation. Research objectives are to develop a healthy and acceptable puffed snack using hemp flakes containing CBD. Hemps flakes were obtained from a local hemp CBD producer. Flakes were incorporated into a puff formula and extruded with a laboratory scale twin screw extruder (Brabender Plasti-Corder). The impacts of feed moisture, screw speed, and die temperature on physical and chemical properties of extrudates were studied. The extrudates were analyzed for physical properties and compared to the raw formulas for health potentials. The acceptability (objective (texture) and subjective (sensory evaluation)) measurements compared formulas with varied flake concentrations and moisture content. The puffs obtained showed high levels of CBD oil after extrusion. CBD oil is approximately 80% unsaturated and contains omega-3 fatty acids which are beneficial to health. The maximum expansion ratio of 3.7 was obtained at low moisture and high screw speed conditions. Formulas with higher flake concentration exhibited puff with higher oily characteristics for hand feel. Formulas with higher moisture content had higher hardness values for texture and were more dense than formulas with lower moisture content. CBD infused food products are rapidly increasing and consumer products once taboo are being now developed for mainstream usage. As consumer polls report desires for healthier foods, consumers traditionally buy foods they like, healthy or not. Development of snack puffs to compete with current products that contain highly sustainable functional ingredients is necessary to combat obesity and other health-related diseases.

Abstract # 162

Effect of Conventional Heat and Microwave Pasteurization on the Size of Lycopene Nanoparticles

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Mentor: Dr. Lamin S. Kassama

Department of Food and Animal Sciences

Nanotechnology has become a potential tool for enhancing nutritional content of food and likewise chronic diseases. Surely nanoencapsulation of bioactive compounds offers a platform for preventive treatment against degenerative diseases. Fruit juice would be a good medium for incorporating nanoparticles to supplement human diet. Furthermore, Conventional Heating

(CH) and Microwave Pasteurization (MP) can compromise the bioavailability of bioactive compounds in the human GIT. The objective of this study was to determine the effect of processing (CH and MP) on physicochemical and morphological characteristics of lycopene nanoparticles. Polylactic acid was used to encapsulate lycopene by emulsion-solvent evaporation method. Two (5° and 15° brix) different types of artificial fruit-flavored juice were fortified with lycopene nanoparticles. The six different treatment group were developed based on concentration of lycopene (10, 20, 40mg/100mL of acetone). Physical properties were tested using SEM, colorimeter, DLS and FT-IT analysis followed by conventional heating (60°C for 30 min) and microwave treatment (1.25 min at 1.4 KW). The results showed that CH and MP treatment had no significant ($P>0.05$) effect on the hydrodynamic diameter and its size distribution, conductivity, color, total soluble solids, and polydispersity index of the nanoparticles. However, mobility values observed were -0.23±0.08 cm2/Vs and –1.066±0.08 cm2/Vs for group-1 and 2 respectively which had changed to -0.27±0.08 and –1.98±0.08 cm2/Vs after CH and -0.24±0.08 and -2.21±0.08 cm2/Vs after MP treatment, respectively. Both CH and MP had a positive effect ($P<0.05$) on the zeta potential value for the less concentrated fruit juice (5o Brix) than the higher (15° Brix) (changes were from -14.03±0.97mV to -25.20 and -28.83 mV, for group-1 and 2, respectively). Nanoparticles developed were stable enough to CH and MP treatment and hence enhance the bioavailability of lycopene into the GIT.

Abstract # 163

Development of Meat Alternative Product Utilizing Mushrooms

Rajwinder Kaur, I. Moore, C. Jackson, S. Willis, D. Wallace, and J. Herring

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

Mushrooms (*Agaricus bisporus*) occur in natures as many different varieties. The Portabella mushroom is common in North America and Europe, while the White Button is known for its high vitamin D content and is often used as a supplement. Objective of this study was to develop a meat analog product (Mushroom snack bites- MSB) using mushrooms. The product was prepared using portabella and white button mushrooms, arrow root flour, and a variety of seasonings. MSB was seasoned and baked for 15 min at 400°F. The physio-chemical characteristics analyzed for the finalized product were color, texture, pH, and water activity. Also, sensory, and proximate analysis were conducted for nutritional value and consumer acceptance. Sensory testing was conducted in which 65% of the panelists were females and 35% males. The panelists rated the product acceptability on a scale of 1 to 5 (where score 1 was for dislike very much, 2- dislike a little, 3- neither like nor dislike, 4- like a little, and 5- like very much) in which the overall acceptability was scored 4 or better by 50% of the panelists. The L*, a*, and b* values for MSB (77.22, 13.5 and 40.2) was similar when compared to turkey meatballs (71.22, 15.87 and 37.56) which was used as control. The serving size was determined to be 6 pieces of MSB (101 g) with 4% total fat, 6% total carbohydrates and total calories were 110 per serving. Overall, the mouthfeel of the product was perceived to be chewy by the

panelists. The shelf life of the food product is anticipated to be 4 months. Mushrooms may have potential uses as functional ingredients in food products for added health benefits especially for consumers who are vegetarians or pescatarians. Future research involves determining the functional properties of the MSB.

Abstract # 164

Antioxidant Potential of Selected Plant Protein Powders (Pea, Hemp and Brown Rice)

Shornare Brown, T. Mosley, S. Willis, and M. Verghese

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

Plant proteins and protein powders have been trending due to their potential health benefits and increased consumer demand. The food industry has been striving to explore non-traditional plant proteins to develop innovative and functional food products. Plant proteins such as pea, hemp and brown rice have been shown to have vast amino acid protein profiles that may improve disease states such as obesity and diabetes. Objective of the study was to determine antioxidant content and activity of pea, hemp, and brown rice protein powders. Total phenolic content (TPC), total flavonoid content (TFC), ferric reducing antioxidant power (FRAP) and 2,2-diphenyl-1-picrylhydrazyl radical solution (DPPH) were evaluated in pea protein (P), hemp protein (H) and brown rice protein (B), extracted with water (A) or 80% ethanol using standard protcols. Among ethanolic extracts, HE had significantly ($p \leq 0.05$) higher TPC (78.79mgGAE/100g) compared to PE (32.56mgGAE/100g) and BE (29.30 mgGAE/100 g). Among aqueous extracts, PA yielded significantly ($p \leq 0.05$) higher TPC (95.18 mgGAE/100 g) compared to HA (73.74 mgGAE/100 g) and BA (35.11 mgGAE/100 g). HE had significantly ($p \leq 0.05$) higher TFC (24.56 mgCE/100 g) compared to PE (7.43 mgCE/100 g) and BE (<1.00mgCE/100g) among powders extracted with ethanol. PA yielded significantly ($p \leq 0.05$) higher TFC (17.81 mgCE/100 g) compared to HA (4.18 mgCE/100 g) and BA (2.16 mgCE/100 g), among aqueous extracts. Among ethanolic extracts, HE had significantly ($p \leq 0.05$) higher FRAP (1344.74 mgFe(II)/100 g) compared to PE (360.82 mg Fe(II)/100 g) and BE (103.17 mgFe(II)/100 g). PA yielded significantly ($p \leq 0.05$) higher FRAP (2288.97 mg Fe(II)/100 g) compared to HA (974.84 mgFe(II)/100 g) and BA (124.09 mgFe(II)/100 g) in aqueous extracts. HE had significantly ($p \leq 0.05$) higher DPPH scavenging ability (82.60%) compared to PE (15.76%) and BE (22.15%) in powders extracted with ethanol. PA yielded significantly ($p \leq 0.05$) lower DPPH scavenging ability (3.30%) compared to HA (11.40%) and BA (21.18%) among powders extracted with water. Results suggest extraction solvent influenced antioxidant potential and may impact antioxidant potential. Plant proteins may serve as alternatives in food product development.

Abstract # 165

Processing Effects on Antioxidant Potential of Hemp Seeds and Their Impact on Carbohydrate and Lipid Metabolizing Enzymes

Vanessa V. Ward, D. Nash, J. Mack, S. Willis, and M. Verghese

Mentor: Dr. Martha Verghese

Department of Food and Animal Sciences

The Cannabis genus has been cultivated for many centuries and used to treat a variety of disorders. Hemp is derived from cultivars of the Cannabis sativa plant and is also known as industrial hemp. In recent years, hemp seed has grown in popularity, mainly due to its versatility and use in various foods. Several health benefits have been attributed to hemp, but there is limited information available on the effect of processing on hemp seeds. The bjectives of this study were to determine effects of processing (roasting, defatting) on antioxidant content, antioxidant activity and effect on carbohydrate and lipid metabolizing enzymes of hemp seeds.Total phenolic content (TPC), total flavonoid content (TFC), free radical scavenging activity by 1,1-diphenyl-2-picryhydrazyl (DPPH), rolox equivalent antioxidant capacity (TEAC), ferric reducing antioxidant power (FRAP) and inhibition of lipase, - glucosidase and □-amylase were evaluated in raw whole (W), roasted (110-115°C for 5 min) whole € and defatted (D) hemp seeds (H) extracted with water (A) and 80% ethanol €. HRE had a higher total phenolic content (16,506.33 mg GAE/100g) compared to other extracts. Similarly, HRE (185.23.80 mg CE/100g) yielded higher TFC compared to lowest 110.62 mg CE/100 g (HDW). Though all extracts were able to scavenge the DPPH radical, HRE scavenged the radical more efficiently (82.39%) compared to other extracts. FRAP value of whole defatted hemp seeds (207 mMFe2+/100 g) was higher compared to whole roasted hemp seeds (AE) (27.00 mMFe2t/100 g). TEAC of whole hemp seeds (330.57 µmol TE/100 g) was higher than (AE) of roasted hemp seeds (276.27 µmol TE/100 g). Highest inhibition of glucosidase was by defatted hemp seeds € (64%). Results suggest different processing methods influence antioxidant potential of hemp seeds and may benefit consumers by improving their antioxidant status. Future research will include utilization of hemp seeds in chronic disease prevention and functional food product development.

BIOLOGICAL AND ENVIRONMENTAL SCIENCES

Abstract # 166

The plant growth responses of stevia (*Stevia rebaudiana*) to organic manures

DeAnthony Price, S. Kumar, L. Duong, K. Scott, and T. Pham

Mentor: Dr. Rao Mentreddy

Department of Biological and Environmental Sciences

Stevia rebaudiana (Asteraceae), a perennial herb native to South America, is emerging as a source of natural sweetener in the U.S.A. Stevia is considered a safe sweetener for consumption by diabetics because the bloodstream does not absorb it and thus does not increase blood sugar levels. Owing to a growing demand for stevia, the U.S. currently 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. This research aims to determine optimal levels of organic manures for stevia production using organic production systems. A field experiment was conducted in randomized complete block design with four treatments, No manure (Con); chicken manure (ChM); vermicompost (V.M.); and cow manure (CM). Each treatment was replicated three times. Each manure was applied to provide Kg/ha of N. The ChM treated plants were taller (56.9 cm) and showed relatively better growth than other treatment plants. Plants receiving ChM had heavier stems (6.3g dry weight/plant and leaves (5.6 g/Plant dry weight) were bigger (18.6 g/Plant dry weight) than the plants in the other treatments. The plants in the cow manure, vermicompost, and control no manure treatments did not differ in leaf or stem dry weights. Thus, the application of chicken manure enabled plants to produce more fresh leaf weight (24.4 g/plant), which was 51.5, 59.8, and 62.3% higher than that of cow manure, vermicompost, and Control treatments, respectively. Control treatment plants produced the lowest amount of leaf biomass compared to other treatments. The results are based on a one-year experiment and must be repeated at least one more year to conclude. This research was supported by the grant: NIFA-SCRI- 2017-51181-26828.

Abstract # 167

Metallic Nanoparticle Synthesis by Engineered *E. coli* Cells Transformed with Phytochelatin Synthase Gene

Haley D. Hill, Q. Yuan, M. Bomma, and Z. Xiao

Mentor: Dr. Qunying Yuan

Department of Biological and Environmental Sciences

In this study, the phytochelatin gene of *Rhizobium tropici* was assembled by PCR, incorporated in a pUC19 vector, and transformed into recombinant E coli DH5α cells. Our results showed that engineered E. coli DH5α cells synthesized more selenium nanoparticles than the DH5α cells

transformed with pUC19 vector. SEM and TEM examination of selenium nanoparticles from both cell groups showed that the nanoparticles had s spherical shape with sizes ranging from 100 nm to 200 nm. Compositional analysis using EDX spectroscopy detected selenium in the nanoparticles. Thus, engineered E. coli DH5α cells exhibited enhanced capacity to produce selenium nanoparticles.

Abstract # 168

Bio-activity Study on Industrial Hemp Plant

Iyinoluwa E. Sofowora and K. Keith

Mentor: Dr. Florence Okafor

Department of Biological and Environmental Sciences

The non –drug variety (*Cannabis sativa L*.) generally known as 'industrial hemp' differ botanically from marijuana; the drug variety even though they belong to the same species, Cannabis sativa. The difference lies in the Δ9-tetrahydrocannabinol (THC). THC is higher in Marijuana as compared to industrial hemp. Industrial hemp has numerous industrial applications and is suspected to have antimicrobial and antioxidant properties and could serve as a source of antimicrobials. This study is aimed at profiling the phytochemicals present in industrial hemp and possible antioxidant and antimicrobial properties of the methanolic extracts of different parts of the plant (leaves, shoot, floral parts, roots). The samples were obtained from the AAMU Winfred Thomas research farm. The bioactive compounds were extracted using methanol through the Soxhlet extractor. The extracts were evaluated for antimicrobial activity against Gram-negative bacteria (Escherichia coli and Pseudomonas aeruginosa) and Gram-positive bacteria (*Bacillus brevis* and *Staphylococcus epidermidis*) using agar well diffusion, disc diffusion and the BioScreen method. The total flavonoid and phenolic assay were carried out using the 96-Well plate total flavonoid method and Folin-Ciocalteu method respectively while the antioxidant activity was determined using the 1,1-Diphenyl-1-pirrylhdrazyl. The flower and root extracts did not exhibit inhibitory activities against all the tested microorganisms while the leaf extract had inhibitory effect on the tested Gram-positive microbes but showed no inhibition against the tested Gram-negative bacteria. The shoot and seed extracts exhibited inhibitory effect against all the tested bacteria, Gram-positive and Gram-negative. The methanolic-derived phenolic contents of the leaf and root were 231.33 mg/g and 248.67 mg/g respectively, the seed and shoot 209 mg/g and 197 mg/g respectively. DPPH inhibition of the extracts was low. In conclusion our results indicate a lack of correlation between the phytochemical contents, antioxidant, and antimicrobial activity of extracts.

Abstract # 169

Bat community species richness, diversity, and condition trends at stream sites in Bankhead National Forest from 2009 to 2019

Jonathan Nemati and W. Stone

Mentor: Dr. William Stone

Department of Biological and Environmental Sciences

Pseudogymnoascus destructans, the fungus responsible for White Nose Syndrome (WNS), was detected for the first time in Alabama in 2012 and was first detected in Bankhead National Forest (BNF) in 2013. WNS primarily affects cave-dwelling bat species and has caused massive declines in many species, although forest-dwelling bats tend not to be affected by it. This study evaluates the response of bat communities to the arrival of WNS based off of capture data from 9 sites in BNF for an 11-year period stretching from 2009 to 2019, assessing whether forest bat species have exhibited any changes in condition or in population. Bats were netted at stream sites using a set of mist nets, and, after identifying captured bats, we recorded their body mass to the nearest gram using a Pesola scale and measured their right forearm length in millimeters using calipers to derive an index of physical condition. The condition index was calculated by dividing the body weight in grams by the forearm length in centimeters. Acoustic data was also collected for part of the study period. Over the study period, major declines in the capture rate for many bat species have been observed, while red bats have seen major increases in the capture rate since 2013. However, preliminary analysis indicates that the condition index of the red bats captured has decreased along with the increases in population. In this presentation we will discuss our preliminary results and review potential explanations for observed changes. This research will help evaluate the health of bat populations and whether other species have filled the niches caused by declines in species affected most by WNS.

Abstract # 170

Evaluation of an organic fertilizer, Smartgro for potential use in organic production systems

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

Mentor: Dr. Srinivasa Mentreddy

Department of Biological and Environmental Sciences

In organic agriculture production, there is need for reliable liquid fertilizers that offer various plant nutrients and can be distributed via irrigation systems. This research sought to determine if SmartGro, a slurry made from human hair, is an effective organic fertilizer for potential use in organic agriculture. A pot trial in open field conditions was conducted using lemon basil (Ocimum basilicum). The objectives were to i) assess the relative effects of SmartGro at 10% and 20% concentrations on plant growth and biomass in comparison with organic soluble fish emulsion, and control no fertilizer, and ii) determine the fresh weight partitioning pattern among various plant parts. Four treatments comprising of i) SmartGro at 20% concentration

(SG20); ii) SmartGro at 10% concentration (SG10), iii) Fish Emulsion at an equivalent of 30 Kg of N/ha (Fish), and no fertilizer Control (CON) were applied biweekly. Moisture levels were maintained utilizing drip irrigation. The plant heights were recorded at weekly intervals, the number of branches/plant and fresh and dry biomass production were determined at final harvest after 72 days of planting. Plants receiving SmartGro at 20% concentration outgrow the remaining treatments. In the SG20, the fresh leaf weight (81.8 g/plant) of the plants was significantly higher than that of other treatments. In comparison, SG20 plants were taller, produced more branches/plant (20), developed longer roots and partitioned larger quantities of dry matter to the leaves relative to other treatments. The evidence suggests SmartGro warrants further analysis as a liquid fertilizer for sustainable and organic production systems.

Abstract # 171

Exposure to Low-temperature Plasma Enables Sprouting and Plant Growth of Immature Turmeric (*Curcuma longa*) Rhizomes.

Lam Duong, S. R. Mentreddy, K. G. Xu, and R. Gott.

Mentor: Dr. Srinivasa Rao Mentreddy

Department of Biological and Environmental Sciences

Studies have shown that Low-temperature Plasma (LTP) enhanced seed germination and plant growth of grain crops, but such studies on root crops (e.g., turmeric) have not been reported to date. Turmeric (*Curcuma longa*) has proven anti-cancer and anti-inflammatory properties besides other benefits. Lack of timely sprouting, particularly in immature rhizomes, results in poor crop establishment and yields. The objective of the greenhouse experiment was to determine the effects of LTP exposure durations on days to sprouting and plant growth of immature six-month (6MG) and mature 7-month (7MG) old turmeric rhizomes. Sixteen rhizomes, each of 6MG and 7MG, were divided into four batches of four rhizomes in each. Each set (four rhizomes) from each maturity group was exposed to helium pulsed LTP for 0 (Untreated Control), 60 s, 90 s, or 120 s. The untreated and treated rhizomes were then planted in pots containing potting mix at one rhizome/pot rate and placed in the greenhouse. The date of sprouting and plant heights were recorded for 63 days after treatment (DAT). In the 6MG, the untreated control rhizomes never sprouted, whereas the untreated 7MG rhizomes sprouted 14 and 28 days later than rhizomes exposed to 60s and 90 or 120s, respectively. In the 6MG, rhizomes exposed to LTP for 60 s, 90 s, and 120s sprouted 49, 28, and 21 DAT, respectively. In the 7MG, the rhizomes sprouted 49, 35, 21, and 21 DAT after exposure to 0, 60, 90, and 120 s, respectively. In the 6 MG, the plant height was 6, 21, and 9.3 cm in the 60, 90, and 120 s exposure times, respectively, compared to 3.5, 9.0, 26.3, and 18.8 cm in the 0, 60 s, 90 s, and 120 s exposure times, respectively in 7MG. Exposure to LTP for 90 s appeared to be optimum in both rhizome maturity groups. The study showed that LTP promotes sprouting in immature rhizomes and could improve turmeric plant establishment and plant growth. This research was supported by NSF EPSCoR RII Track 1 Grant OIA – 1655280.

Abstract # 172

Comparison of four Mountain Mint (Pycnanthemum spp.) varieties for yield in North Alabama

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

Mentor: Dr. Srinivasa Rao Mentreddy

Department of Biological and Environmental Sciences

Mountain Mint (*Pycnanthemum spp*.) is a peppermint flavored, aromatic herb of the Lamiaceae family and is mostly used for culinary, medicinal, aromatic, and ornamental purposes. North Alabama weather is conducive for growing mint for oil that can be used in confectionery and medicinal products. There is, however, a need for varieties that are adapted and easily grown varieties for production in North Alabama. Towards this end, four varieties (M1, M2, M3, M4) were evaluated for growth and leaf biomass production in a field trial. Thirty-day-old greenhouse-grown plants of the four varieties were transplanted on raised beds at the Winfred Thomas Agricultural Research Station, Alabama A&M University. A mixture of composted cow manure, poultry litter, and vermicompost at a rate equivalent to 45.5 kg of N/ha was soil incorporated before making the raised beds. Soluble organic fish emulsion-based fertilizer was applied at 3-week intervals through drip irrigation. The plots were arranged in a randomized complete block with three replications. The study's objective was to compare the four varieties for biomass yield at three times of harvest, 135, 155, and 170 days after planting (DAP). The results showed that variety M1 with fresh biomass yield of 111 g/plant at 135 DAP was superior M2, M3, M4 by 31.1, 74.97, and 58.02%, respectively. However, at 155 DAP, the M3 had the highest yield (182 g/plant). At 170 DAP, variety M3 with a yield of 110.1 g/plant out yielded M1, M2, and M4, by 18.21, 50.57, and 68.57%, respectively. Overall, the M1 variety had the highest mean yield over the harvesting times (116 g/plant). The study showed that mountain mint offers potential for production in North Alabama. Two varieties, M1 and M3, merit further studies to determine yield stability, oil yield, and its composition and develop cultivation practices.

COMMUNITY AND REGIONAL PLANNING

Abstract # 173

A comparative analysis of motor vehicle traffic fatality rate in the state of Alabama between 2004 and 2018

Abimbola Babatunde, J. Oluwoye, E. Olaleye, and R. Debnar

Mentor: Dr. Jacob O Oluwoye

Department of Community and Regional Planning

Reduction of automobile crash death was ever amongst the best health achievement of the 20th century. However, quite 32,000 are killed and a couple of million are injured annually from automobile crashes. The purpose of this study is to compare and analyze motor vehicle crash

fatality rate in both metropolitan and non-metropolitan areas of Alabama. Data obtained from the US Department of Health and Human Services, National Highway Traffic Safety Administration and US Department of Transportation between 2004 to 2018 are used to show the trend in graphs. Descriptive statistics and bivariate correlation were used to analyze the data. It was observed that the rate of fatality is higher in the non -metropolitan areas compared with metropolitan areas of Alabama, out of the total motor vehicle fatality which occurred during the period of review, 63% was from non – metropolitan (rural), 36.4% from metropolitan (urban) while 0.23% was unknown. Conclusively, over speeding, driving under influence of alcohol, driver -inexperience, breaking roadway rules and regulations are some of the major causes of high motor vehicle fatality rate in the state. There is need to implement more stringent policy to encourage drivers in enforcing traffic regulation to reduce loss of property and lives.

Abstract # 174

Analysis of temporal trends in autovehicle fatalities in the State of Alabama (1975 – 2018)

Eyitayo Olaleye and J. Oluwoye

Mentor: Dr. Jacob Oluwoye

Department of Community and Regional Planning

It is the responsibility of Government to promote the health, safety and well-being of its people by the enactment of laws and policies. However, in order to make rules and regulations that promote the health, safety and wellbeing of the citizenry, they need to be able to obtain and appropriately analyze information about those issues that affect the citizenry. The purpose of this paper is to examine the factors that might have impacted auto vehicle fatality trends in the State of Alabama. The method adopted for this paper is mainly secondary data information extracted from the Alabama Department of Transportation from 1975 – 2018. Analysis of the data shows that auto vehicle fatalities reduced from 975 to 953 between 1975 and 2018, and the occurrence of accidents increased by 46% from 109,300 to 159,925 in the same timeframe. This means that an accident occurred every 3 minutes and 17 seconds in 2018. Registered vehicles and licensed drivers increased in the time frame from 2.6m and 1.9m to 5.7m and 4.0m respectively, while most accidents and fatalities in 2018 happened on Fridays and Saturdays, respectively. The paper concludes that there are lesser fatalities but higher incidents of accidents despite increased print advertising, billboards, and public service announcements in the time frame. In addition to sustaining the enlightenment campaigns, the study recommends increased surveillance and monitoring over the weekend, when accidents are most likely to happen, and fatalities occur.

Abstract # 175

The analysis of the geographical distribution of COVID-19 cases and the family structures in Alabama

Moriah Smith

Mentor: Dr. Deden Rukmana

Department of Community and Regional Planning

The Coronavirus disease 19 (COVID-19) pandemic has impacted Housing and Food insecurity among children in rural Alabama. As the virus spreads, social isolation and social distancing have made it hard for families to be able to have all the resources they need. Unemployment in cities has increased tremendously because many businesses were forced to shut down. This has led to a direct impact in the ability for people to be able to provide for their families and pay their rent or mortgage. The closure of schools and the shelter-in-place orders are more than likely contributing to the increase the food insecurity rates among children.

Abstract # 176

An Examination of the Causes of Highway Construction Projects Delay and Cost Overrun: Osun State Nigeria Scenario

Peter Oyewale and J. Oluwoye

Mentor: Dr. Jacob Oluwoye

Department of Community and Regional Planning

Delay and cost overrun are key problems of any highway construction project. Furthermore, the frequency of deviation of highway construction projects from planned cost and time of execution is an issue of interest to project management professionals in Osun State. These issues are causing a negative impact on the country's economic growth and prosperity. The purpose of this paper is aimed to ascertain the most impelling factors causing highway project delay and cost overrun, and highlight the possible measures, so that, the impact on highway construction projects could be reduced. A questionnaire survey was conducted on the main stakeholders (clients, consultants, and contractors) involved in a highway construction project in Osun State to measure the identified factors on a Likert scale. The relative importance weight technique was used to determine the importance level of the measured factors in causing delay and cost overrun in highway construction projects. The paper concluded that the main stakeholders involved in the highway construction project in Osun State agreed that economic, project financing, material, and natural factors are the major causes of delay and cost overrun on highway construction projects in Osun State.

Abstract # 177

Comparative Analysis of Increasing Personal Automobiles Dependency: A case study of Alabama, USA

Ratul Debnath

Mentor: Dr. Jacob Oluwoye

Department of Community and Regional Planning

Personal automobile dependency refers to high usage of per capita personal automobile, personal automobile-oriented land use patterns, and limited other transport alternatives. Automotive places have numerous impacts on its citizens, society, and the economy. The detrimental effects of Personal automobile dependency are increased transportation costs, vehicle expenses (vehicle registration fees, insurance, fuel cost, maintenance cost, garage rent, parking tolls, etc.), congestion, and many other environmental disasters. It also causes less economic productivity as well as development. The purpose of this research is to analyze and examine personal automobile usage compared to other means of transportation in the years from 2009 to 2018. The researcher used home to work trips to analyzing and compare different automobile uses from 2009 to 2018 because of the reliability and availability of data. The first step of the methodology is to collect secondary data of all counties' means of transportation (home to work trips) in Alabama from the US census bureau. The next step is to input these data into SPSS and conduct the comparative analysis. Finally, the researcher interpreted and manipulated the comparative analysis. The r square values reveal the reliability and validity of the output result. The result unveils that usage of personal automobiles is increasing, and public transportation or walking is decreasing day by day. The model also examines that personal automobile usage will rise gradually, and the usage of other modes of transportation will drop significantly in the future. The paper concluded that personal automobile dependency is hugely increasing day by day in Alabama, USA. Although personal automobile increases mobility and convenience to its users, excessive automobile dependency also brings social and economic inequity. If this situation is going on, it will adversely affect the environment and people's health & personal lives. Developing multimodal transportation connectivity will reduce the over-dependency of personal automobiles and beneficial from social, economic, and environmental perspectives.

Abstract: 178

Analysis of Carpooling by Latinx Population in Alabama and Georgia

Samar Misra

Mentor: Dr. Emily Erickson

Department: Community and Regional Planning

As immigrants fuel population growth, demographic makeup shifts transportation modes in the country. According to literature, factors such as household, employment type, family, and

ethnicity network influence travel behaviors. Immigrants particularly Latinxs and Hispanics have grown significantly in the southern United States, creating large networks of carpooling as identified in 22 case sites located in Alabama and Georgia. The Alabama case sites consist of the cities of Alabaster, Albertville, Athens, Birmingham, Decatur, Fort Payne, Hoover, Huntsville, Lipscomb, Madison, Pelham, and Russellville. The Georgia case sites consist of Atlanta, Brookhaven, Chamblee, Dalton, Doraville, Duluth, Dunwoody, Norcross, Peachtree Corners, and Sandy Springs. The purpose of this paper is to answer why carpooling is prevalent with Latinxs and Hispanics in the region and what it says about the communities, as well as what traits these communities have in common as well as any differences. Finally, this paper hopes to find how this prevalence and dynamics differ from other ethnicities and what the significance is. According to the use of data sources, Census data and the American Community Survey have been used in combination with data from the National Household Travel Survey and data from the Atlanta Regional Commission's Household and Activity Travel Survey to create its finding. The research finding indicates higher rates of carpooling for Latinxs and Hispanics compared to other races in 17 of the 22 case sites in Alabama and Georgia. There will be further use of the Census and other surveys mentioned earlier for the paper in addition to some case studies in analyzing other factors of land density, transportation types, employment, and possible others linked with Latinx and Hispanics' higher rates of carpooling. The significance of this paper is to consider implementing new travel plans to incorporate the changing demographics with rising globalization. This is essential for planners to accommodate new populations with existing ones or else risk these populations falling behind.

Abstract # 179

An Assessment of the Collaborative Planning Efforts of the Homeless Agencies in Madison and Limestone County, Alabama

Shardae King

Mentor: Dr. Deden Rukmana

Department of Community and Regional Planning

Homelessness is a societal issue in America that has increased with each major shift in the American economy. These shifts include situations like budget cuts and economic downturns that leave individuals either homeless or at-risk of being homeless. Based on previous research provided such as Patsy Healey and Judith Innes, collaborative planning is an effective solution to reducing some of the societal issues a community may face. The goal of this preliminary research is to analyze the collaborative planning efforts of the agencies and non-profit organizations in Madison and Limestone County, Alabama. Specifically, I intend to use the analytical framework of networking capacity, innovativeness, and the governance/process implementation presented in prior research by Healey and Innes to answer the research question, Has the collaborations among the homeless agencies in the Continuum of Care programs in Madison and Limestone County, Alabama had impacts on reducing the rate of homelessness in their respective areas?

FAMILY AND CONSUMER SCIENCES

Abstract # 180

College Students' Perceptions of and Willingness to Pay for Organic Foods

Oluwafunmilola Akinbode, N. Sistani, S. Mentreddy, and S. Khan

Mentors: Dr. Nahid Sistani, Dr. Srinivisa Mentreddy, and Dr. Salam Khan

Department of Family and Consumer Sciences

Organic food consumption is on the rise and becoming a trend in the United States and the World. This may be attributed to an increase in awareness of its perceived nutritional, health, and environmental benefits. Understanding organic food perceptions of young adults in college is of significance in promoting the health and nutritional benefits of organic food products. It is essential to note that youths specifically are of nutritional concern, which is a basis for the nutrition professionals' concentration. The purpose of this study was to investigate the perception and factors that influence the willingness to pay (WTP) a premium among students of Alabama Agricultural & Mechanical University, Alabama, with regards to organic food products. A survey of 184 participants was conducted, and data collected was analyzed using descriptive statistics. Results indicated that most students know organic foods, the most effective source of awareness was word of mouth/social media, have a positive perception of organic foods, and are willing to pay a premium for organic foods. Furthermore, health/nutritional value, taste, affordability, availability, quality, and environmental factors may influence their WTP more for organic foods. With this growing awareness, organic food market producers must strategically address this growing demand as college students are potential future consumers of organic foods. The positive attitude towards organic foods among college students, especially the perception of organic food as healthy and nutritious can help health professionals (nutritionists/dietitians) give tailored advice to clients in this category concerning nutrition and cost issues.

HEALTH SCIENCES, HUMAN PERFORMANCE, AND COMMUNICATIVE DISORDERS

Abstract # 181

An Introduction to Jugular Paraganglioma Tumors

Kimberly G. Townsend and Z. Austin

Mentor: Dr. Diana Blakeney-Billings

Department of Health Sciences, Human Performance, and Communicative Disorders

This research paper examines published articles, journals, and textbook definitions to help discuss the etymology, symptoms, and different treatment options available for persons with

jugular paraganglioma tumors. The findings in this research paper will analyze what jugular paraganglioma tumors are and help us better understand why a detailed analysis of the tumor's name helps us understand its overall pathology. It is critical to know and understand the anatomy and physiology surrounding the paraganglioma tumor. The tumor's location and size will also determine the patient's plan of treatment and outcomes. If the patient exhibits a need for physiologic and symptomatic voice therapy, a referral to a speech-language pathologist may be needed to ensure the patient has a better quality of life after removing the tumor.

MARKETING, MANAGEMENT & LOGISTICS

Abstract # 182

Perils at Sea and Risk Analysis

Shachi Jagtap and K. Rana

Mentor: Dr. Krishan Rana

Department of Marketing, Management & Logistics

Global transportation is not only important but also essential for a successful global business. Global shipping has played a very important role in providing competitive as well as absolute advantage to world economies and promoted trade partnerships and free trade agreements between regions and countries. Ninety percent of entire world cargo is moved by water transportation. Water transportation is not only the cheapest mode of transportation, but it is also the least pollutant. Nevertheless, history has witnessed disastrous maritime accidents and many other kinds of perils at sea, like the Titanic, Exxon Valdez oil spill in Alaska, and recent oil spill from a Venezuelan oil tanker, Nabarima. My research describes the factors, uncertainties, and impact of perils at sea. We further develop strategies for identification, monitoring of risks, assessing uncertainty factors and impact of maritime disasters and accidents at sea. Our methodology for research involves Business Flow Analysis, Data Analysis, and predictive techniques. My analysis will reveal the impact of perils at sea in terms of monetary loss and loss of human life. This research will motivate maritime industry to develop maritime regulations, and insurance companies to enforce those regulations on to shipping companies. Although all employees, especially deck and navigation experts, as well as, engineers must be licensed, some greedy ship owners tend to cut costs, especially for providing required training of ship's crew and sufficient time to familiarize with the ship's machinery and equipment. World witnessed perils like the Titanic that although considered to be an unsinkable ship but was damaged and sank on its maiden voyage. And its impact is known to the entire world. My research will collect the relevant data from literature, use data analysis techniques, and provide predictions for future.

PHYSICS, CHEMISTRY AND MATHEMATICS

Abstract # 183

Smart Nanocomposites for Sensing Applications

Lawrence Jackson, P. Guggilla, M. Edwards, A. Batra, and M. Curley

Mentor: Dr. Padmaja Guggilla

Department of Physics, Chemistry and Math

Smart Nanocomposites for Sensing Applications. In the present research Polyvinylidene Fluoride (PVDF) doped with Calcium Titanate-composite material is investigated for its ability to be a smart material for sensing applications. The Ferroelectric material has been utilized for many applications because of its large piezoelectric, pyroelectric, dielectric, and electro optic-coefficients. Efforts were made to understand DC and AC conduction mechanisms. From these parameters figure of merit for device applications such as heat sensors and high value capacitors will be calculated. The parameters obtained will be used to calculate the other dependent parameters such as DC conductivity, AC conductivity and dielectric constant. Preliminary results indicate the dependency of the Resistivity characteristics on the weight percentages of CaTiO3 embedded in PVDF (PVDF) thin films are smart materials used in flexible devices. PVDF thin films have pyroelectric and piezoelectric properties. Researchers recently discovered PVDF thin films also have the ability to detect ultraviolet and infrared radiations. This research involves the making of PVDF thin films, Fourier-transform infrared (FTIR) spectroscopy, Raman spectroscopy, and surface resistivity testing. PVDF samples were made with different amounts of powder which caused variations in thickness. The technique used to make these films was the solution cast method. Ultimately causing different absorptions of infrared and Ultraviolet rays. Research on PVDF thin films was done using a Raman Spectrometer and an FTIR machine. Multi-wall Carbon Nanotubes (MWCNT) doped and undoped were made in variations of thickness to test surface resistivity. Research on PVDF thin films was done using a Keithley Model 8009 Resistivity Test Fixture and a Keithley Model 6517 Electrometer in unison.

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List of STEM DAY 2021 First Authors by Last Name and Page Number

The Founder of STEM Day

Dr. Matthew E. Edwards, Professor of Physics

Fall Semester 2006

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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

Institute of Food Technologists Student Association - AAMU Chapter

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

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ACKNOWLEDGEMENTS

On behalf of STEM Day 2021 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.

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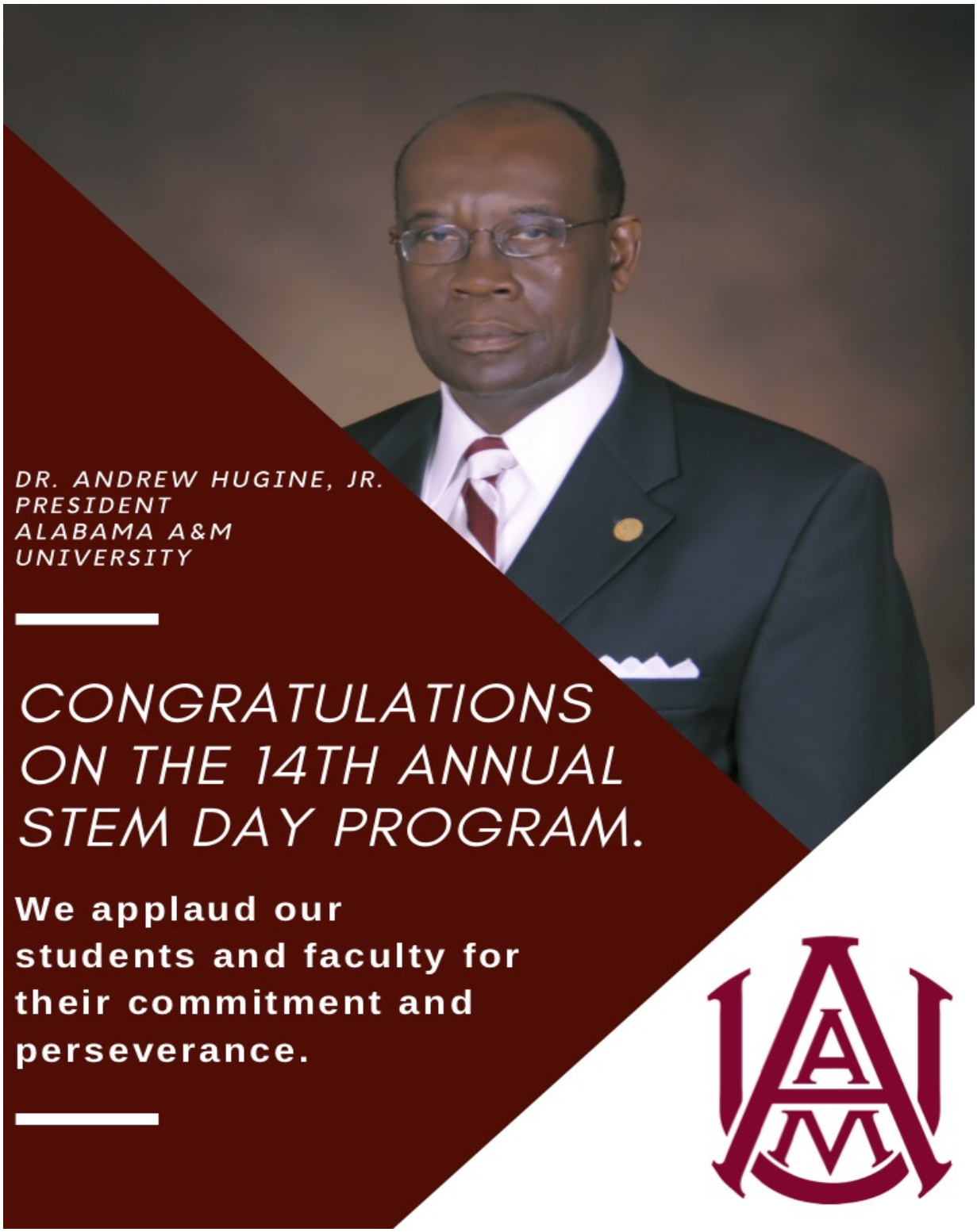
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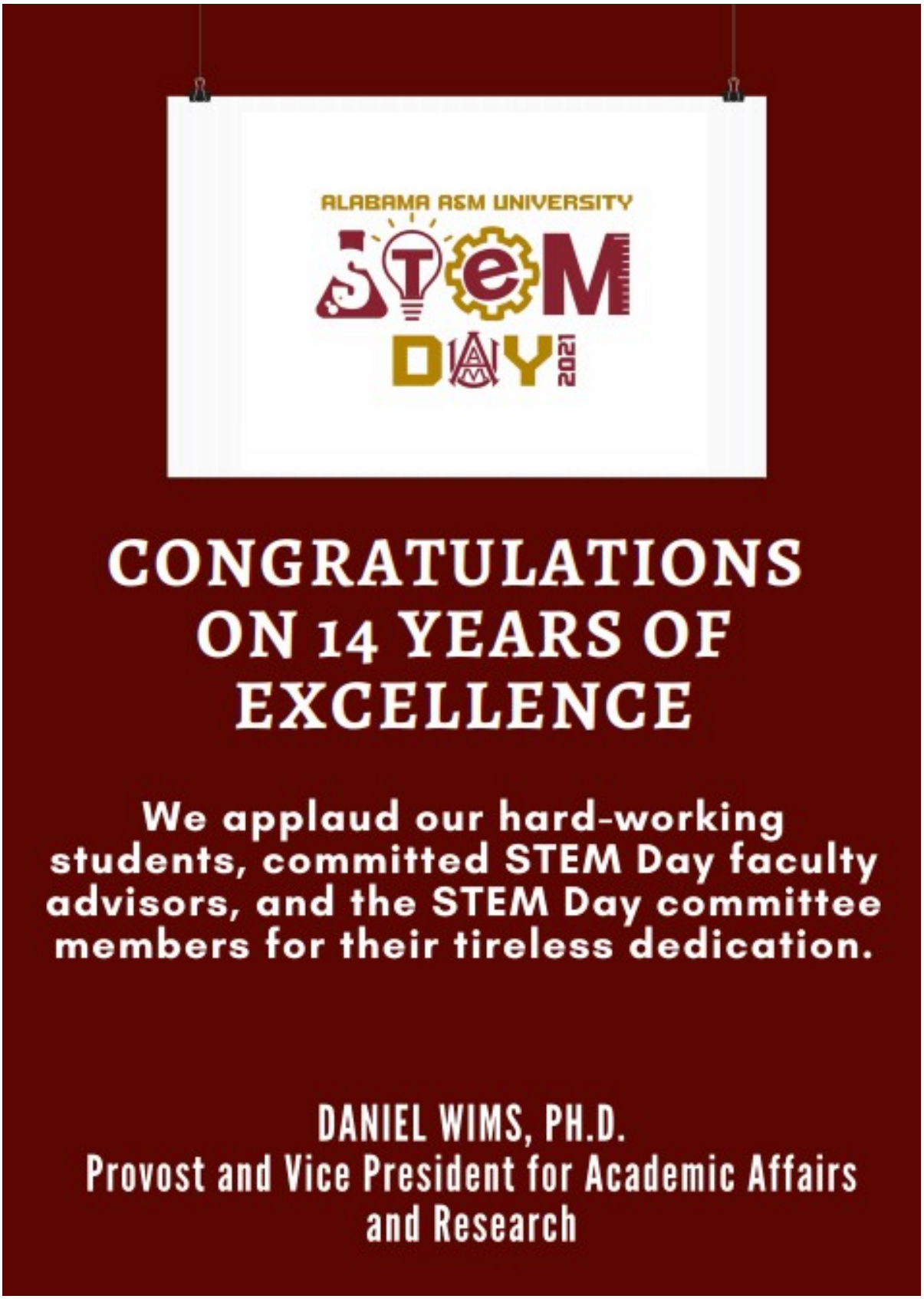
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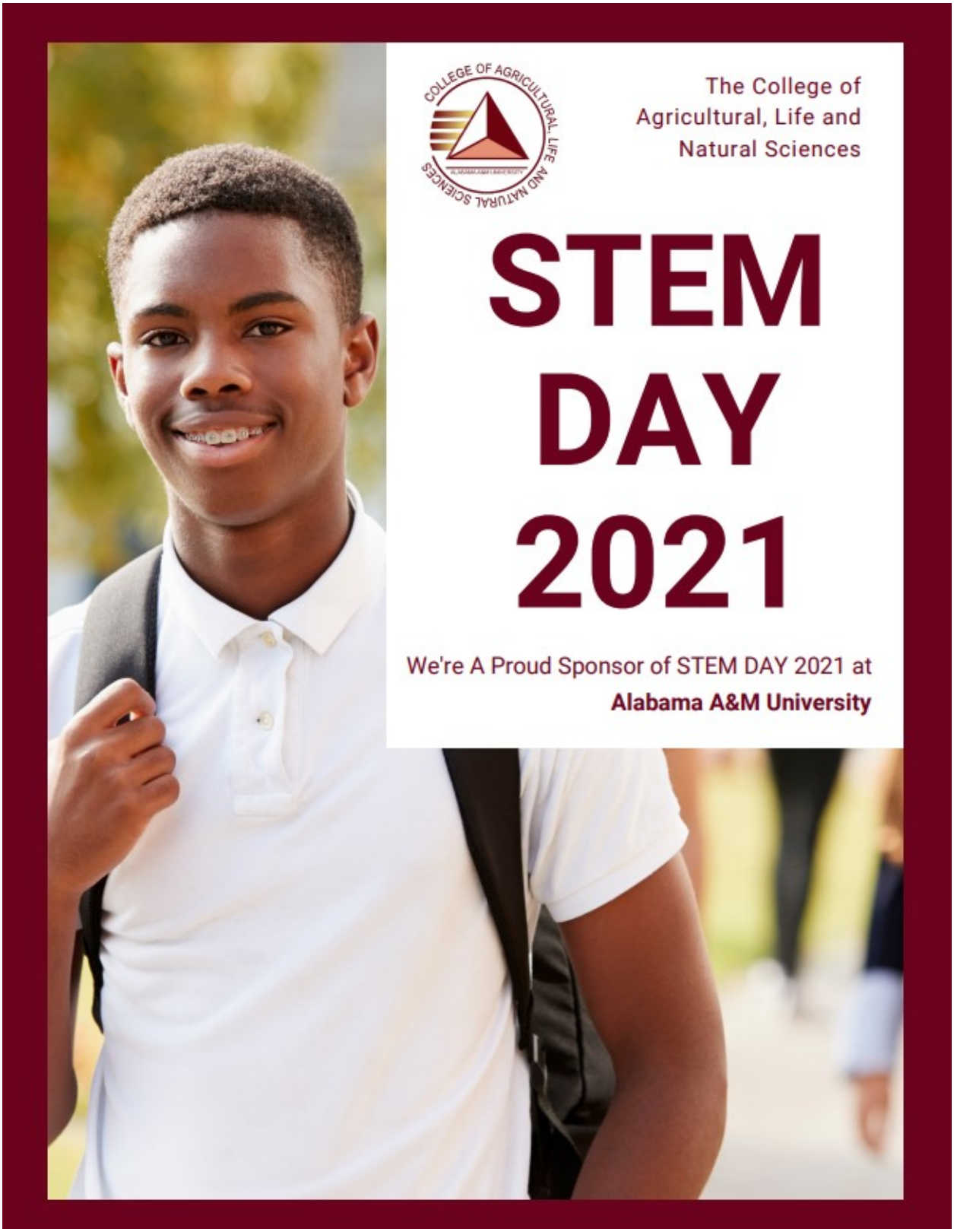
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