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ABSTRACT BOOK

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Athens, AL

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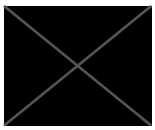

SECTION I. BIOLOGICAL SCIENCES
Paper Session I
Thursday Morning, 8:30 AM – 10:30 AM
Waters Hall, Room N 202
Andrew Coleman, Presiding

1. 8:30 ***g** Improving Rainbow Trout *Oncorhynchus mykiss* Growth Performance Through Optimization of Diet-Epigenetic Interactions. *Khalid Freij* and Serhat Turkmen, University of Alabama at Birmingham; Beth Cleveland, USDA; and Peggy Biga, University of Alabama at Birmingham.

   Rainbow trout are a critical species to aquaculture and serve as a non-model organism to investigate toxicology, evolutionary biology, and nutritional programming. Understanding the impacts of nutritional programming in aquaculture species will aid in understanding the effects of broodstock nutrition on offspring growth performance via inherited epigenetic mechanisms while providing information regarding potential mechanisms of maternal effects. Therefore, this project focuses on the interactions between maternal nutrition and genetic selection utilizing rainbow trout, Oncorhynchus mykiss, used within the industry – disease-resistant selected rainbow trout maintained by the National Center for Cool and Cold Water Aquaculture. Overall project objective includes identifying specific genes and gene pathways in offspring affected by maternal dietary intake of choline supplementation during oogenesis. To accomplish this, global and local DNA methylation patterns were analyzed in trout offspring and compared to global transcriptomic data from corresponding samples. Treatment effects on the methylome and transcriptome were analyzed to identify potential mechanisms altered by maternal choline intake and establish links between epigenetic modifications in the genome and phenotype of the offspring. Results indicate that several metabolic and tissue-specific pathways are under, at least, partial maternal regulation.

2. 8:45 Social Networking in Marine Bacteria Leads to Emergence of Black Queen Metabolic Markets. J. Jeffrey Morris, University of Alabama at Birmingham; Anuradha Goswami, University of Alabama at Birmingham.

   The Black Queen Hypothesis explained that the loss of function in marine bacterioplankton, including the important cyanobacteria Prochlorococcus and Synechococcus, was impelled by natural selection favoring resource savings in environments where the products of the lost functions were available from other sources. Integrated across an entire community, Black Queen evolution is predicted to create networks of interdependent taxa interacting through an extracellular metabolic marketplace that evolves similarly to human economic systems. This study aimed to investigate Black Queen networks in the Atlantic Ocean by manipulating those markets via the addition of key “leaky” metabolites such as vitamins, chelated iron, or the hydrogen peroxide scavenger pyruvate and tracking changes in microbial taxon abundance over 72 hours of continuous growth in shipboard incubations. The idea behind supplementing these nutrients was to reduce the value an organism received for expressing the genes necessary to produce or obtain them, which we hypothesized would reduce the competitive

fitness of any Black Queen "helper" strains on which the community depended. The study found certain 16S rRNA ASVs consistently decreased in abundance across stations during 72 hours of incubation with putative Black Queen products, suggesting they serve a role as helper strains. Metagenomic analysis suggested that these strains were also more likely to carry Black Queen genes like those for siderophore production than the broader community, providing further evidence that they depend on the Black Queenservices they provide to maintain their place in the community.

3. 9:00 Association of Antimicrobial Resistance Gene (AMR) Incidence and Heavy Metal Pollution. Anuradha Goswami, University of Alabama at Birmingham; *J. Jeffrey Morris*, University of Alabama at Birmingham; and Sarah J. Adkins-Jablonsky, Alabama College of Osteopathic Medicine, Dothan.

Heavy metal (HM) contaminated sites like the U.S. Environmental Protection Agency Superfund sites are predicted to have altered ecosystem functioning, with potential ramifications for the health of organisms, including humans, that live nearby. Several studies have shown that metal tolerant bacteria often induce resistance to antimicrobial agents (AMR), HM contaminated soils could potentially act as AMR reservoirs. The study hypothesis stating- chronic HM pollution alters bacterial community structure in ecologically meaningful ways and may also select for bacteria with increased potential to contribute to antibiotics resistance in human bacterial disease. Soil samples were collected from six public locations in the zip code 35207 (the home of the North Birmingham 35th Avenue Superfund site) and in six public areas in a neighboring reference zip code (35214). 16SrRNA gene sequencing revealed that elevated concentrations of HMs As, Mn, Pb, and Zn drove microbial diversity within each region (alpha-diversity), however, non-significant beta diversity was reported at these sampling sites. The study emphasized on several statistical assay to estimate the disparity in soil microbiome (taxonomically and functionally) at Superfund sites. While the culture-based assays demonstrated no differences between sites in terms of either HM tolerance or AMR, the nucleotide sequence alignment to CARD database generated a significant difference between the cross tolerant cultured isolates at two sites. The metagenome inference using PICRUST predicted significantly higher mean relative frequencies from 35207 for several AMR genes related to both specific and broad-spectrum AMR phenotypes.

4. 9:15 A Novel Quantitative Method for Analyzing Antimicrobial Susceptibility Testing Data. *Drew Hataway*, Kwadwo Antwi-Fordjour, Bryce Pierce, and Brad Bennett, Samford University.

Antimicrobial susceptibility tests clinically identify causative microorganisms associated with infections and determine most appropriate treatment plans. These tests measure in vitro susceptibility of a particular microbe to a panel of antimicrobial agents, with the minimum inhibitory concentration (MIC) being a common benchmark parameter for antibiotic sensitivity. The microdilution method is a widely accepted clinical laboratory test that is leveraged to determine these MIC values. The Clinical and Laboratory Standards Institute (CLSI) defines the MIC as "the lowest concentration of

antimicrobial agent that completely inhibits growth of the organism in the tubes or microdilution wells as detected by the unaided eye." We aimed to create a more quantitative assessment of inhibitory concentration (IC) utilizing a microplate reader and spectrophotometry. A series of microdilution MIC tests were performed in 96 well plates on a microbe of interest. After 24 hours incubation, the optical densities of each well were recorded and used to determine bacterial growth. The growth of each experimental well was expressed as a percentage of growth of the control well and graphically plotted against the concentrations of antibiotics to which they were exposed. An exponential decay model was fit to the data to determine growth inhibition for any specified antibiotic concentration. This could potentially provide (1) a more precise MIC value and (2) an inhibitory profile across a continuum of concentration for a given antimicrobial.

5. 9:30 ***u** Resistance to Commonly Prescribed Antibiotics via Weak Selective Pressure: An Adaptive Laboratory Evolution Study. *Bryce Pierce*, Camryn Pierce, Nicholas Hammond, Kwadwo Antwi-Fordjour, Drew Hataway, and Brad Bennett, Samford University.

   Probiotics, live microbes in certain foods such as yogurts, interact in a mutualistic way with humans. Once consumed, they can reside in the GI tract and provide a myriad of beneficial properties including vitamin conversion and barrier protection against pathogens. However, current global over-prescription and misuse of antibiotics poses multiple threats, for example, the cultivation of antibiotic resistance genes and subsequent transmission to pathogens. Little is known of the effects associated with exposure of probiotics to sublethal concentrations of antibiotics. We utilized an adaptive laboratory evolution (ALE) experiment to determine if the functionality and fitness of the probiotic Lactobacillus plantarum is altered by background exposure to sublethal concentrations of amoxicillin, ciprofloxacin, or doxycycline. Minimum Inhibitory Concentrations (MICs) were established using disk diffusion assays and broth microdilution. Replicate cultures of L. plantarum were continuously grown in media containing either 10% of the MIC value or significantly lower concentration based on a global average of surface water values. Culturing progressed for nearly 1000 generations. Fitness tests were periodically performed to examine how the initial MIC values changed over time. Cultures grown in the two different concentration levels of ciprofloxacin and doxycycline showed increases in the MIC, especially at the higher exposure level. This suggests some ability of L. plantarum to rapidly acquire resistance to these antibiotics. Additionally, aliquots of each culture were frozen every 50 generations to explore the mechanisms of acquired resistance.

6. 9:45 Single Cell Protein Can Be A Sustainable Replacement For Fish Protein In The Zebrafish *Danio rerio*. Michael Williams, University of Alabama at Birmingham; Addison Lawrence, Texas A & M, Agrilife Research; Sophie Chehade, Yuan Yuan, Adele Fowler, Jeff Barry, Mickie Powell, and Stephen Watts, University of Alabama at Birmingham.

The common zebrafish, Danio rerio, is an excellent translational pre-clinical model for study providing new human health interventions in a number of areas. However, feed and feed management practices for the model still require standardization that will ensure nutritional requirements are met and will improve study rigor and reproducibility. To this end, the evaluation of consistent and sustainable and energy ingredients should be prioritized. Single cell protein (SCP) can be derived from microalgae, bacteria, or single cell eukaryotes (yeast) that primarily utilize waste carbon sources for growth. As an alternative protein source, SCP has the potential to be environmentally sustainable and compositionally consistent. To understand growth and body composition outcomes related SCP inclusion in the zebrafish diet, we placed 35 days post fertilization (dpf) zebrafish on an 8-week feeding trial (n = 8 tanks per diet). Dietary protein sources consisted of fish protein hydrolysate (FPH), a bacterial SCP replacing half or all FPH, or a yeast SCP replacing half or all FPH. At the end of 8 weeks, male zebrafish provided the bacterial SCP diets had a larger body weight than FPH controls, and females provided the bacterial and yeast SCP diets had lower total body lipid at the same body weight compared to those receiving diets of only the FPH protein source. Results of this study support formulation of zebrafish diets using sustainable SCP ingredients with an overarching goal of improving standardization in zebrafish nutrition.

7. 10:00 ***g** Zebrafish As A Nutritional Model For Injury and Wound Healing. *Jonathan Flowers*, Wenxia Ma, Nicole Conner, M. Murphy, Sophie Chehade, Kate Ledbettter, Anna Thalacker-Mercer, and Stephen Watts, University of Alabama at Birmingham.

Tissue damage, whether a traumatic injury or surgically-induced, can compromise organ structure and function. Traumatic injury affects 38 million people annually in the U.S alone. Much work has been accomplished on defining the pathways associated with recovery, but research on understanding the role of nutrition in wound healing is limited. Zebrafish provide a high-throughput model to elucidate which nutrients are important extracellular components or signals in the regenerative process. Ideally, this model will be able to identify nutrients that are required for wound healing and adverse effects associated with over nutrition. The zebrafish model is ideal, due to their reproductive capacity, quick development, and cost compared to other animal models. Specifically, the caudal fin amputation model is of interest because regeneration can largely be identified with the naked eye and measured through imaging without the need for histological staining or analysis. Adding to its power is the autonomous regeneration of each ray within the caudal fin. Each zebrafish can contain between 16-18 bony rays that will regenerate at a rate that is independent of the others allowing the measurement of each ray to be counted as a replicate for analysis. Combining the benefits of zebrafish with those of the caudal fin regeneration, a robust study, observing the effects of numerous nutrient enriched/depleted diets, is cost-effective. Currently we are confirming methods for this model including: fish housing during recovery, nutrient diets, caudal fin amputation and post-amputation imaging, and optimal imaging time points.

8. 10:15 ***g** Challenges in Sea Urchin Culture. *Logan Holfelder*, University of Alabama at Birmingham; Sophie Chehade, Nicole Conner, Raven Edwards, Jonathan Flowers and Micheal Williams, University of Alabama at Birmingham; Katie Gibbs, Birmingham-Southern College; and M. L. Powell and Stephen Watts, University of Alabama at Birmingham.

Sea urchin culture is important in a variety of disciplines, including aquaculture, biomedical modeling, toxicology, and educational activities. The lack of repeatable and systematic approaches to culture have limited the utility of sea urchins in all disciplines, which is largely due to the complex nature of the sea urchin life cycle. The major challenges in culture include brood stock maintenance, gamete production, embryological and larval development, settlement of competent larvae, metamorphosis from larvae to juveniles, and juvenile nutrition and growth. Each life stage requires an understanding of the physiologic and environmental factors allowing organismal development to proceed. Recently, sea urchin culture has been adapted to synthetic seawater systems instead of natural marine seawater, with the ultimate goal of producing lab-based culture technologies that do not depend on proximity to natural seawater. Small-scale culture can promote the use of advanced genomic research, while large-scale culture can benefit the development of aquaculture technologies. Larval development is accomplished feeding one or more microalgae species; however, the specific environmental cues leading to the induction of settlement and metamorphosis are elusive, and natural cues (natural seawater, seagrass, detritus, epibionts, and live natural substrate) containing biotic and abiotic stimuli are variable in their response. Key future areas of research include larval settlement, metamorphosis, and juvenile nutrition and growth. Funded by NSF.

SECTION I. BIOLOGICAL SCIENCES
Poster Session I
Thursday Morning, 10:30 AM – 12 noon
Sandridge Student Center, Ballroom/Annex
Andrew Coleman, Presiding

9. ***g** Characterization of Cardiovascular Disease and Dietary Impact of Portulaca Oleracea in an Induced Model of Systemic Lupus Erythematosus. *Terrance Platt* and Montessa Mitchell, Tuskegee University; Deangelo Mahone, South University, Montgomery; and Toufic Nashar, Marcia Martinez, and Chastity Bradford, Tuskegee University.

   Systemic Lupus Erythematosus (SLE) is a multifactorial autoimmune inflammatory disease that increases cardiovascular morbidity and mortality. SLE has a higher prevalence and incidence rate in women than men; and in African Americans compared to Caucasians. SLE promotes a break in tolerance to self-antigens culminating in targeted end-organ damage of the heart and kidney. Although the pathophysiological mechanisms underlying the development of SLE-induced cardiovascular disease (CVD) remain poorly understood, the role of diet as a potent source of dietary cardioprotective constituents to reduce the risk for CVD is well-known. Studies show that green leafy vegetables (GLVs), such as Portulaca oleracea, have anti-inflammatory and antioxidant properties. Epidemiological evidence confirms the association between GLV consumption and CVD risk reductions; yet there is limited research examining the effects of Portulaca oleracea (purslane) on SLE-induced CVD. We hypothesize that Portulaca oleracea will attenuate the pristane-induced cardiovascular end-organ damage in a murine model of SLE. Methods: Male and female DO11.10 mice (9-weeks old) were injected with 0.5mL of Pristane to induce SLE. They were fed a diet of 0%, 4% or 6% Purslane for 11 weeks. Systolic, Diastolic and Mean Arterial Pressures and Heart Rates were measured weekly. Serum was collected at 8 weeks, 16 weeks, 25 weeks, 31 weeks and 38 weeks from un-injected and pristane-injected animals. Heart, left ventricle, lung, kidneys, and spleen were collected from the animals and then compared to tibia length. Upper thoracic aortas were assessed for medial wall thickness. Total serum levels of Immunoglobulin M (IgM) and Immunoglobulin G (IgG) were determined to confirm the model. Using H&E stain, histological analysis of 10 cardiomyocytes in 10 random fields were measured to confirm cardiomyocyte hypertrophy. To determine aortic and arterial remodeling, the widths of the medial walls of the aorta and of left ventricular interstitial arteries, respectively, were measured. Results: We demonstrate that dietary intervention with 4% purslane decreased systolic and mean arterial pressures and heart rate, while both 4% and 6% purslane decreased diastolic pressure in DO11.10 mice injected with pristane. We found that cardiac expression of ACE1 was higher in female animals compared to male animals; the ratio of ACE1/ACE2 was also higher in females. Dietary intervention with 4% and 6% Purslane also decreased cardiomyocyte width in female animals but increased it in males. Moreover, female animals experienced a decrease in left ventricular free wall thickness. However, injection with pristane followed by 6% Purslane diet increased IgG in males at 31 weeks and in females at 38 weeks. Additionally, the ratio of IgG to IgM in females increased following feeding 4% and 6% purslane. Conclusion: Pristane-injected DO11.10 mice could be used to study SLE-

induced vascular remodeling, and dietary intervention with purslane may provide some cardioprotective effects in a dose-dependent manner.

10. ***u** Bacteriophage Host Range Assay. *Mason Anderson* and Melissa Walker, University of Alabama at Birmingham.

    A bacteriophage's ability to infect multiple bacterial species and strains is one that relies on many factors such as host receptor compatibility, kinetics, and other environmental requirements for proper penetration. Some lab procedures attempting to identify host range of phage tend to be laborious, heavily resource dependent, and may not provide a high degree of useful information surrounding the logistics of the infection across multiple host; example being the standard spot test for a plaque on multiple host candidates. In attempts to address all of these issues a repeatable and less resource heavy protocol involving flow cytometry has been devised. The nature of flow cytometry automatically addresses the resource and labor problems. Utilizing Propidium Iodide and SYBR Green staining to differentiate between viral and bacterial DNA respectively; by giving quantitative analysis on lone phage particles, uninfected bacteria, and pre-burst infected bacteria. However, to further reduce the resources of the protocol the use of frozen bacterial cultures (at –80 C) in a 96-well plate has been implemented in conjunction with the use of a 96-pin-transfer device. Allowing for an organized stock culture of varying bacterial strains to be maintained then accessed for efficient transfer to the plate being used for the flow cytometry. Bacteria used in testing storage transfers and phage infection include two strains of Pseudomonas aeruginosa, two strains of Staphylococcus aureus, and a single strain of Escherichia coli. The phages utilized include two known pseudomonas phages (Ab17 and Ab27), as well as two phages gathered from bodies of freshwater in Alabama (DeltaAII.4 and LL).

11. ***u** Identification of Novel Antibiotic Producing Bacteria. *Nia Booth*, Sanchez Rolle, Etinosa Iyayi, and Sheritta Fagbodun, Tuskegee University.

    Antibiotic resistance is one of the most urgent public health problems in the world. Over 2.8 million antibiotic-resistance infections occur each year and lead to over 35000 deaths each year. The rapid development of antibiotic resistance is attributed to the overuse and misuse of antibiotics. Furthermore, the pharmaceutical industry lacks economic incentives to develop new drugs due to challenging regulatory requirements. Consequently, there is an urgent need for the identification of novel antibiotics. Soil contains incredible biodiversity; therefore, it is a significant source for discovering new bacteria with antibiotic properties. Approximately 80% of antibiotics used are isolated from the genus Streptomyces, a soil bacterium. The purpose of this study was to identify bacteria with antimicrobial properties. In this study, unknown soil bacteria isolates were tested for antimicrobial properties, biochemically characterized, and identified using 16s rRNA gene analysis.

12. The Comparative Study of Homologous MicroRNA-Binding Sites in the Human Genes. *Alexander Kofman*, Jahnavi Raval, and Summer Stephens, Troy University.

    MicroRNAs (*miRs*) are evolutionarily conserved, single-stranded, regulatory RNA molecules of about 22 nucleotides long. Deep-sequencing and computational approaches indicate that almost every mammalian mRNA can be targeted by hundreds of *miRs*, whereas mammalian genomes harbor thousands of *miRs*, and each miR can potentially

influence the expression of hundreds of genes. The homologous miR-binding sites (HS) are suggested to act cooperatively to enhance miR-mediated effects. However, the published data on HS are very scarce and it is not clear if such sites are frequent in human genes. We explored the presence of HS in the mRNAs of several human genes, such as ACE2, VTCN1, ARID5B, CCR2, CD46, ABL1, AFF1, CDKN2A, CDX2, ERG, ETS1, GAS7, KIT, KMT2A, KNL1, MYB, MYC, NCL, NCOR1, NDRG1, NRAS, PBX1, PHF6, PIM1, and PIM2. All these genes had HS in the 3'UTR of their mRNAs although at varying frequencies. We suggest that the homologous miR-binding sites have a capacity of not only enhancing the effects of *miRs* but also rescuing the phenotype if one of the miR-binding sites becomes non-functional.

13. ***u** Isolation of Novel Mycobacteriophages as Potential Sources of Phage Therapy Candidates. Elin Zaman, Jacksonville State University; Christopher Murdock, Jacksonville State University.

    The use bacteria-specific viruses (bacteriophages), known as phage therapy, to combat disease-associated bacterial infections was first proposed over one hundred years ago. Since that time, the discovery of and wide-spread use of antibiotics has overtaken this potentially therapeutic use of bacteriophages. Phages have been shown to provoke a T-cell dependent type of immune response, which is fundamental for immunological memory and the retention of abilities to recognize and respond to foreign antigens. Therefore, in addition to infecting and killing targeted strains of bacteria, phages may act as immunomodulatory mediators. In terms of discovery and diversity, bacteriophages are ubiquitous in nature and can are found in all habitats across the globe. The goal of this study was to isolate novel mycobacteriophages, which target and infect mycobacteria, from soil samples. Notable mycobacteria species includes those that are responsible for tuberculosis (*Mycobacterium tuberculosis*) and leprosy (*Mycobacterium leprea*). *Mycobacterium smegmatis*, had been used as the host cell for the discovery of novel mycobacteriophages reported in this study as it had been a safe and easy to culture alternative to these pathogenic strains of mycobacteria. Multiple soil samples had been recovered from random sites within Northeast AL. A number of viral isolates had been recovered through the enrichment of the collected soil samples. Current research is now focused on the purification and characterization of each of the mycobacteriophage isolates. This data will hopefully allow for the identification of potentially therapeutic mycobacteriophages that could be used against mycobacteria-associated diseases.

14. Diversity of Freshwater Turtle Populations at Oak Mountain State Park. Jenny Estes Layton, Samford University; Lizzie Grolle, California State University, Stanislaus; Kaylyn Swenson, Massachusetts College of Liberal Arts; Alex Armor, Samford University; Frank Gonzalez, Samford University; Aaron Hathcock, Ruffner Mountain Nature Preserve.

    The Southeastern United States has one of the highest rates of freshwater turtle biodiversity in the world, making central Alabama an ideal area for their population analysis. Oak Mountain State Park covers 10,000 acres, and knowing which species are present and their habitat use will be beneficial for future conservation measures. To document how the turtles are using the freshwater habitats, headcount surveys as well as trapping/mark recapture methods were implemented beginning in 2013. This included more than 850 hours of trapping time. For each turtle caught, standard measurements

were taken, and turtles were given a unique marking with a scute notch and tag using the proximate binary-coded decimal scute-notch system. This ongoing, multi-year study has confirmed the presence of a large number of turtles including a variety of species and a range of sizes. These species included red-eared sliders (Trachemys scripta elegans), yellow-bellied sliders (Trachemys scripta scripta), common musk turtles (*Sternotherus odoratus*), loggerhead musk turtles (*Sternotherus minor*), common snapping turtles (Chelydra serpentina), the river cooter (*Pseudemys concinna*), and the gulf coast spiny soft shell (*Apalone spinifera aspera*). Recapture data were used to estimate population sizes. This survey fills a gap in the knowledge of turtle diversity in this protected urban habitat and can be leveraged for future conservation proposals.

15. ***u** DNA Barcoding Using Eggshells from Depredated Turtle Nests. Alice Hunt, Samford University; Catherine Gurley, Samford University; Mike Reynolds, Share the Beach; Drew Hataway, Samford University; Jenny Estes Layton, Samford University.

    Conservation of rare turtles with threatened status is enhanced by identification and protection of nesting sites, and identification of depredated or vacated nests will expand protected nesting habitats. Eggshells were collected from depredated nests of unknown species, and the size and depth of the nests and the number of eggshells provided a preliminary species identification. DNA extraction was done using Quiagen DNEasy kits, though extraction success was varied due to degradation of the samples as a result of the predation event. Species were identified using mitochondrial d-loop loci primers specific to the subset of potential species. These sequences were subsequently aligned to previously published data for species identification. Identification of the species will identify new nesting habitats, and the results will provide data for monitoring and management collaborators such as Share the Beach, which monitors marine turtle nesting in the State of Alabama.

16. ***u** Genetic Assessment of Congenital Stationary Night Blindness-Associated *TRPM1* Variants of Uncertain Significance in *C. elegans*. *Sara Morris* and Ashley Turner, Jacksonville State University.

    Congenital stationary night blindness (CSNB) is a disorder of the eye that impacts the ability to see in low to no light conditions. It occurs in horses and humans. Mutations in *TRPM1* have been identified by previous researchers in horses with leopard complex pattern (LCP) suffering also from CSNB. Due to a lack of available DNA sequencing information for this gene in impacted horses across equine studies, we turned to VUS identified in human patients with CSNB to examine actual VUS identified among another vertebrate causing a similar condition. We examined evolutionary conservation analysis of missense *TRPM1* variants across horse (*TRPM1*), human (*TRPM1*), and nematode (gon-2). Using Benchling, 31 VUS were examined through multiple sequence alignments and 3 were identified to be conserved across all species. Conducting a gene mutational analysis revealed the variants at H1195R and I875V were most likely to be pathogenic due to their positioning next to pathogenic or likely pathogenic variants. Poly-Phen2 analysis revealed I875V to be predicted to be the most likely pathogenic (HumDiv score 0.775). Primers were designed to amplify this VUS region in C. elegans gon-2. Future experimentation includes CRISPR RNA guide design to target gon-2, CRISPR-Cas9

microinjection to generate the VUS-gon-2 C. elegans model, and phenotyping of the VUS model. If the VUS does impact function of gon-2, then it is expected to impact gonadal and vulva development. This study will provide in vivo assessment of this CSNB-associated VUS shedding light on its clinical significance for humans and horses.

17. ***g** Do Coastal Marine Bacteria Help Precipitate Settlement in Sea Urchins? *Melissa Walker*. J. Jeffrey Morris, Sophie Chehade, Nicole Conner, and Stephen Watts, University of Alabama at Birmingham.

    Urchins are an important player in the coastal community ecosystem as well as being a model organism used for a plethora of research studies. Despite their importance inside and outside the lab, little is known about the interactions which precipitate settlement in their planktonic larvae. In May 2021, samples were collected by the Watts lab from urchin habitats in Port St. Joe, Florida. Samples were taken from the bulkwater, sediment, rocky substrate and seagrasses. Nine individual marine bacterial species were isolated from the bulkwater samples and saved as frozen specimens for downstream work. Community DNA was extracted and sequenced using Illumina technology to look at the bacterial populations co-occuring in each of these ecosystem habitats. Quality control and taxonomic analysis was performed using Qiime2. Bacterial communities were highlighted in the hopes of identifying species whose presence may act to precipitate larval settlement. The taxonomic analysis results will be discussed.

18. ***u** Microbial Community Characterization in a Closed Microcosm Landfill System Designed at Laboratory Scale. *Halee Stewart*, J. Jeffery Morris, Anuradha Goswami, and Kellen Cowen, University of Alabama at Birmingham.

    Landfills are constructed to dispose solid waste in a scientific manner to mitigate the risk of environmental pollution and disease transmission. The biodegradable and other toxic waste are aggregated at landfills and are degraded by indigenous microbial community into less or non-toxic, low molecular weight compounds. The landfills are also created for the purpose of preventing surface water, groundwater, and air pollution which would have otherwise triggered, if the waste is left unattended to degrade on itself. Despite of vital role in the pollution prevention, landfills are yet to be explored for a vivid knowledge about complex microbial community and their characteristics. For the purposes of filling out the gap, the study proposes a method to design a landfill microcosm at laboratory scale. The garden soil was inoculated with kitchen waste (left to degrade in compost for a month before inoculating), household waste, metals, and common pharmaceuticals. The microcosm (built in a closed system) was left untouched for a year to mature before collecting samples. To design a comparative study between natural and artificially built ecosystem, soil from the openly dumped waste located next to the operating landfill was collected from North Birmingham, AL USA. The study found a significantly accelerated bacterial growth in copiotrophs (open dump) than oligotrophs (microcosm landfill). Further, the study will compare the biofilm formation capacity, antimicrobial resistance, and culturable strains to establish a protocol for landfill design at laboratory for future scale-up experiments on comprehending landfill functioning.

19. ***u** Demographic Modeling of the Endangered Morefield's Leather Flower, *Clematis morefieldii*. *Evan Marth*, Tyler Williams, and Jewel Courson, Athens State University; Tracy Cook, Huntsville Botanical Gardens; Derek Newland, Athens State University; Drew Greenway, University of Alabama in Huntsville; and Shannon Pittman, Athens State Univerity.

    Clematis morefieldii, known as Morefield's leather flower, is a federally endangered, perennial vine of the buttercup family (Ranunculaceae) endemic to limestone outcrops of the Cumberland Plateau. This species has strict habitat requirements, consisting of shallow rocky soils, open understory, and southwest facing slopes. Anthropogenic habitat loss has led to the extirpation of several local populations. However, little is known about the population status of extant populations due to the lack of long-term, population-level studies. We compiled demographic data on *C. morefieldii* to build a stage-based matrix model to project the population growth of extant populations. We estimated the projected population growth rate as the dominant eigenvalue of the matrix. To determine the life stage that contributed the most to *C. morefieldii* population growth, we conducted an elasticity analysis, which estimated the proportional sensitivity of each stage class to population growth. Our average population growth rate (λ) indicated a slightly declining population ($\lambda = 0.94$), and this rate was most sensitive to assumptions about survival of the reproductive life stage. Our results suggest that management strategies which improve the survival of reproductive individuals may have the proportionally largest impact on population recovery. However, additional research on the survival of the reproductive life stage is necessary to reduce uncertainty in our model and would improve our ability to recommend effective management or restoration strategies.

20. ***g** Characterization of Anti-Microbial Properties of Excrement And Functional Microbiome of New World Vultures In Alabama. *Bee Gray* and Ashley Turner, Jacksonville State University.

    Two distinct species of New World vultures are native to North America and inhabit Alabama, black vultures (*Coragyps atratus*) and turkey vultures (*Cathartes aura*). They are scavengers that consume carrion. Currently, these two vultures are one of the seven vulture species with least concern and stable in Alabama and the world. However, it is important to remember current threats to these vultures exist. It has been observed that vultures will sometimes excrete waste onto their legs. There are two ideas behind this behavior, one is urohidrosis and the other is microbial control. The second idea of microbe control has not been directly studied or tested experimentally. To test this proposed question, we will collect fecal samples from both black vultures and turkey vultures. Antimicrobial properties of both species' excrement will be tested by a Kirby-Bauer test, both from fresh and treated excrement samples. The samples will be screened against 10 microorganisms and zone of inhibitions for each will be measured. Microbiome analysis will also be examined with frozen excrement samples through 16S ribosomal RNA sequencing utilizing the Illumina MiSeq. This study proposes to gain a better understanding of how these scavengers evolved to consume carrion, as it is important to understand their biology, health, and status. We plan to examine the antimicrobial properties of vulture excrement and the microbiome of black vultures and turkey vultures in the Alabama area.

21. ***u** A Search for the Borg: Using Environmental Sequencing to Survey the Subsoil Anaerobic Prokaryotic Biota at Blount Springs, AL. *Mattie Grace Holley* and David Johnson, Samford University.

    We have undertaken a survey of the subsoil prokaryotic biota at several locations at Blount Springs, AL. This anaerobic strata, which is high in sulfur content, might support unique microorganisms, possibly including the archaean *Methanoperedens*, associated with "Borg" DNA (10.1126/science.abl4769). We PCR-amplified 16S rDNA then cloned and sequenced amplicons in order to identify numerous prokaryotes present. Preliminary results are presented.

22. ***u** Investigation of a Novel Planarian, *Phagocata* sp., Found at Blount Springs, AL. *Sarah Thomas*, Guy Madeline, and David Johnson, Samford University.

    A novel planarian found in the sulfur water of Blount Springs, AL, was previously shown to belong to the genus *Phagocata* and to be very similar to a worm previously sequenced. Our further sequencing shows indicates that, while very close to this worm, it might possibly be a different planarian. We also found evidence for intraindividual sequence variation in the 5.8S rRNA gene of this planarian. These results, plus the previous discovery of a novel annelid at the springs, indicate that this unique microecosystem deserves further study.

23. ***u** Investigation of Intraindividual Variation of the 5.8S rRNA Gene Sequence in the Plant Parasite *Cuscuta pentagona*. *Adam Cason* and David Johnson, Samford University.

    The rRNA genes present in a eukaryote's genome are usually maintained as completely identical copies, but cases have been found where individual organisms have variation in their rDNA sequences. Earlier research in our lab indicates that *Cuscuta pentagona* (the five-angled dodder), a parasitic plant, is such a case: both the 18S and 5.8S rRNA gene show this intraindividual variation in DNA sequence. We are investigating a related question: Are these multiple copies of rDNA actually used to make rRNA in the cell — are they all transcribed? RNA was isolated from the same specimen that showed 5.8S rDNA variation, then the RNA was reverse-transcribed into DNA, and as segment of the 5.8S rDNA was PCR-amplified. These amplicons were then cloned into *E. coli* and clones were sent for sequencing to determine if all of the variable rDNA sequences are transcribed and, presumably, used to make ribosomes.

24. ***g** Glutathione Relays a 12-Oxo-Phytodienoic Acid Signal in Coordinating Growth and Defense Responses, Optimizing Plant Fitness under Environmental Stresses. Ashna Adhikari, Auburn University; Sang-Wook Park, Auburn University.

    In nature, plants encounter a consistent array of multiple ecological constraints, while concurrently endeavoring growth and developmental processes in order to maximize their yields and productivity. However, little is known about molecular mechanism underlying 'the growth and defense coordination'. Here we describe glutathione (GSH)-dependent reductant signaling, which relays a 12-oxo-phytodienoic acid (OPDA) signal to protecting photosynthesis during triggering the retrograde regulation of defense gene expressions. Under stressed states, OPDA - accumulates in the chloroplasts - binds and stimulates its receptor, cyclophilin 20-3 (CYP20-3), to form a cysteine (Cys) synthase complex (CSC) that leads to increased levels of thiols such as GSH and the buildup of

cellular reduction potential. The enhanced redox capacity then coordinates the expression of a subset of OPDA-responsive genes that actuate and calibrate pathogen defense and stress adaptation processes. In parallel, GSH instantly binds (S-glutathionylation) and activates 2-Cys peroxiredoxin A (2CPA), a thiol-based peroxidase. 2CPAGS then metabolizes the reduction of toxic byproducts (i.e., H2O2) of photosynthesis for optimizing growth and development. In contrast, oxidative singling (GSSG)-dependent S-glutathionylation of 2CPA inactivate its peroxidatic activity, suppressing the peroxide detoxification machinery. Thus, we conclude that GSH can act as a signal, capable of regulating interface between OPDA (defense) signaling and photosynthesis (growth), ultimately balancing optimal growth phonotype under stress conditions in plants.

SECTION I. BIOLOGICAL SCIENCES
Paper Session II
Thursday Afternoon, 1:00 PM – 3:15 PM
Waters Hall, Room N 202
Andrew Coleman, Presiding

25. 1:00 Socioeconomic Influence of Health and Covid-19 in Black Belt Communities in Alabama. *Ram Alagan*, Seela Aladuwaka, Manoj Mishra, Alabama State University.

The Covid-19 pandemic has affected every community across the world. Still, the global Covid-19 data shows that the United States remains the most affected nation. Over 930,000 people perished, and approximately 80 million people became ill due to the virus (CDC, 2021). It is also noteworthy that extreme socioeconomic, healthcare access and racial disparities played a significant role in Covid-19 cases and deaths in the US, specifically among African American minority population. The situation is notably evident among African American population in Alabama's Black Belt region. Subsequently, socioeconomic status, Covid-19, racial disparities, and health inequalities have become central to the national and regional conversation and underscore being too complicated to solve among minority communities. This research examines the associations between Covid-19, socioeconomic, and the systematic health disparity in African American population in Alabama's Black Belt region using Geospatial Technologies and the concept of uneven spatial development. Understanding the relationship between Covid-19 and health disparities within a spatial context is vital to developing pathways to overcome the pandemic's effects and combat the systemic discrimination in this region. The derived policy recommendation could apply to other regions experiencing social inequality and health disparity.

26. 1:15 ***u** Tracking Sources of *Escherichia coli* in Turkey Creek Nature Preserve (Pinson, Alabama). *Aubrey Cox* and R. Scot Duncan, Birmingham-Southern College.

Turkey Creek Nature Preserve (TCNP) in Pinson, AL, is considered one of the state's best swimming locations, and has been enjoyed by residents for thousands of years. However, *E. coli*, a bacterium that can cause severe illness in humans, has been recently observed in increasing quantities in the creek. Our analysis aimed at determining the possible source for the *E. coli*. We hypothesize that if there is a single source of pollution causing the increase in *E. coli* levels, then measuring *E. coli* at various positions upstream should help us locate the source of the pollution. For three weeks in November 2021, biweekly water samples were collected from six locations in and upstream of the preserve. Water was sampled, plated, and incubated following the Utah Water Watch Protocol. Bacterial counts were then compared using a repeated-measures ANOVA and adjusted for sphericity using a Greenhouse-Geisser correction. Concentrations of *E. coli* dramatically increased from the most upstream location, Goodwin Bridge (144 Colony Forming Units (CFU)/100 ml) to the most downstream, Turkey

Creek Falls (491 CFU/100 ml). In our sample, a significant increase of 142 CFU/100 mL was observed between State Routes 75 and 79. Because of the proximity of these two samples (400 meters part), we conclude that contaminates responsible for this increase are entering the creek between these two roads. Likely sources of contamination are either of two small tributaries entering the creek in this section.

27. 1:30 ***u** Developing a Rapid Method to Estimating Potential Fecundity in Black Crappie. *Jacqueline Hintz* and Anthony Overton, Samford University; Kaitlyn Wade, University of Maryland.

Determining reproductive growth potential in fishes is essential to managing fish populations. This is primarily done best estimating fecundity. Estimating individual reproductive potential is key to understanding the reproductive biology of fishes. Typically, fecundity has often been estimated using the gravimetric method, in which fecundity is the product of the number of oocytes per gram of ovary tissue (oocyte density) and the weight of the ovary in grams. This method of counting is very time-consuming. This research presents a method of estimating oocyte density using image analysis. We compared gravimetric methods and digital image analysis to calculate fecundity estimates in Black Crappie P*omoxis nigromaculatus* from Lake Purdy, Birmingham, Alabama. We analyzed 20 Black Crappie oocytes and distinguished the oocyte density approximating between the gravimetric and image systems. Processing time, including the manual preparation of the sample for analysis and the data processing afterward for the gravimetric method, was approximately two hours per sample, whereas; image analysis processing time was roughly one hour. There was a significant relationship between the gravimetric and image oocyte density estimates (Y=0.89x+103.5; r2=0.91). The imaging system oocyte density estimates were routinely lower than the gravimetric method. This is possible because of the oocyte's diameter. Our samples were collected from fish early in the pre-spawn season whose oocytes were smaller and lesser developed. We hypothesize that more significant, more developed oocytes would provide more accurate oocyte density estimates and easier processing methods. Accurate and more precise measurement of oocyte density is vital in assessing the maturity and spawning of fishes. The image analysis approach represents a highly time-efficient procedure compared to the traditional gravimetric techniques.

28. 1:45 ***u** An Analysis of Age and Length Relationships for Black Crappie (*Pomoxis nigromaculatus*) at Lake Purdy, Birmingham, Alabama. *Kathryn Jones*, Anthony Overton, and Kaitlynn Wade, Samford Univesity.

Black Crappie (*Pomoxis nigromaculatus*) are a popular game fish for recreational fisherman across their native range. Consequently, their popularity has led to some populations becoming overfished or stunted in growth. Implementing regulations regarding fishing and boating along with taking regular population assessments is important in preserving these populations. Regular assessments will help to assess year to year health and size of the target populations. This project aimed to assess 172 Black Crappie from Lake Purdy, Alabama from the spring of 2020 to the spring of 2021. The lengths and ages of each fish were

recorded to determine this population's Von Bertalanffy Growth (VBGF) curve and back-calculated lengths. The otoliths of each of the 172 fish were collected and aged; this sample of fish ranged from 2 to 6 years of age. The VBGF showed that the length at age for Lake Purdy crappie is as expected from a healthy population. The back calculations suggest that the individual fish were slightly smaller than they could be when compared to the VBGF for the population.

29. 2:00 ***g** Long Term Evaluations of Nesting Beach Temperatures of Hawksbill Sea Turtle Rookery in the Western Caribbean. *Forrest Collins* and Thane Wibbels, University of Alabama at Birmingham; Jenny Estes Layton, Samford University; and Cynthia Lagueux and Cathi Campbell, University of Florida.

The Hawksbill sea turtle, *Eretmochelys imbricata*, is a critically endangered species that is found world-wide within tropical waters. Like all sea turtles, it has temperature dependent sex determination (TSD) which is influenced by environmental temperature. The Hawksbill is well known to utilize foraging grounds and nesting beaches throughout the Caribbean. The abundance and variability of nesting beaches throughout the Caribbean could potentially have a variety of impacts on TSD. The current study evaluated beach temperatures on Hawksbill nesting beaches within the Western Caribbean over twelve nesting seasons (2008 - 2019). Temperature was monitored at nest depth on up to ten nesting beaches per year in the Pearl Cays, Nicaragua. Nesting beach temperatures varied significantly by location, month, and year. In general, nesting beach temperatures were relatively cool, suggesting the production of male biased sex ratios. These beaches in the Pearl Cays could be essential for the production of males for the Caribbean Hawksbill population. Further, it is plausible that increasing environmental temperatures associated with global climate change could result in the production of extreme female biases on the majority of sea turtle nesting beaches. Therefore, it is important to identify nesting beaches that are relatively cool and that could be essential for the production of male sea turtles in the future.

30. 2:15 ***u** Analyzing the Molecular Dynamics of TUBB2B and TUBB5 Q15K Variants. *Hannah Mueller*, Sara Cline, and Fallon Beck, Athens State University.

A variant of uncertain significance (VUS), Q15K (c.43C>A), was identified in Tubulin Beta 2B Class IIb (TUBB2B) by the Characterizing Our DNA Exceptions (CODE) project through clinical sequencing in a patient with agenesis of the corpus callosum. Previously, mutations in TUBB2B have been associated with a number of different phenotypes, including cortical malformation. In addition, the Q15K variant in Tubulin Beta 5 Class I (TUBB5) has been identified as disease-causing. We are investigating the effect of this variant in both TUBB2B and TUBB5 using molecular dynamic simulations. Specifically, we aim to characterize the functional consequences of the Q15K variant in TUBB2B and TUBB5.

31. 2:30 ***g** Evaluation of Hatchling Sex Ratios in the Kemp's Ridley Sea Turtle Conservation Program: 2013-2019. *Katherine Presz*, Sarah Livett, and Elizabeth Bradley, University of Alabama at Birmingham; Donna Shaver and J. Shelby

Walker, National Parks Service; and Thane Wibbels, University of Alabama at Birmingham.

A variety of reptiles possess temperature-dependent sex determination (TSD), where the incubation temperature of the egg determines the sex of the hatchling. TSD can potentially produce highly biased sex ratios. Therefore, this form of sex determination has significant implications for the ecology, evolution, and conservation of these reptiles. The existence of TSD necessitates the monitoring of sex ratios produced in conservation programs. The current study evaluated hatchling sex ratios produced in the Kemp's Ridley Recovery Program. Histological analysis was utilized to determine the sex of hatchlings from nests laid on the Padre Island National Seashore in Corpus Christi, Texas. These tissues were obtained from hatchlings that were found dead in the nest after all live hatchlings had emerged. The results indicate a female bias in samples from 2013 to 2019. It is plausible that the female bias could enhance the recovery of this population, by increasing the reproductive output of this endangered species in future years. Furthermore, the long-term monitoring of hatchling sex ratios is a prerequisite to evaluating the potential impact of global climate change on population sex ratios in sea turtle populations.

32. 2:45 Investigating the Molecular Dynamics of CCR5 to Create a Workflow for Damaging Variant Identification: CODE Community Collaborative Research Between Clinical Genetics and PUIs. *Stenger Cynthia*, University of North Alabama; Sara Cline, Athens State University; and Michele Morris, HudsonAlpha Institute for Biotechnology.

The Delta 32 variant of CCR5 has risen to the forefront of bioinformatic investigation due to discovered links to HIV-1 and the November 2018 CRISPR edit of human children by Chinese researcher He Jiankui. Here we present a crowd sourcing approach to computational analysis of CCR5 variants. Faculty at Athens State University and the University of North Alabama, collaborating with HudsonAlpha Institute for Biotechnology in the CODE project, have utilized undergraduate researchers at their schools to speed the analysis of these variants. In this talk, we will share results from homology modeling and bioinformatic analysis using publicly available databases. We will also consider the ethical and biological ramifications of the CRISPR edit. The CODE initiative, using teams of multi-disciplinary undergraduates and faculty mentors, is a vehicle to bring bioinformatics research to underserved students at predominantly undergraduate institutions.

SECTION I. BIOLOGICAL SCIENCES
Poster Session II
Thursday Afternoon, 3:00 PM – 5:00 PM
Sandridge Student Center, Ballroom/Annex
Andrew Coleman, Presiding

33. ***u** An Investigation of the *PSEN2* Swap Mutation T380M. *Luke Terwilliger*, University of North Alabama.

    The *PSEN2* gene, which encodes for the Presenilin-2 protein, is an early onset Alzheimer related gene. Many mutations of this Chromosome 1 gene can lead to problems in the formation of the protein itself or its protein complex, gamma secretase. A known mutation, at position 430 of the amino acid sequence, swaps a Threonine amino acid with a Methionine. Another mutation of uncertain significance swaps the same amino acids at position 380. Using the prediction tools: MutationAssessor, SNPSandGO, and Polyphen-2; the results support a pathogenic classification for the Threonine to Methionine swap of the yet unclassified variant at position 380. A molecular dynamics simulation will provide more evidence if a structural change occurs.

34. ***u** A Preliminary Analysis of Otolith Morphometrics to Predict Fish Age and Length. *Simi Komenda*, Anthony Overton, and Kwadwo Antwi-Fordjour, Samford University.

    Otoliths are often used to determine the age and size of a fish. This study assesses the use of otolith weight to predict age, otolith length-total length relationship, as well as otolith width-total length relationship. We collected Black Crappie (*Poxomis nigromaculatus*) from Lake Purdy in Birmingham, Alabama (N=176) during 2020 and 2021. Our fish ranged from 2 to 6 years old. The mean otolith weight was 0.08g (S.D. + 0.03). There was a positive correlation between otolith weight and fish age for both the linear (y=0.023x+0.0013 RSS=0.092) and logarithmic (y=-0.015+0.080*Log(x) RSS=0.091) models. Otolith length and otolith width have a linear relationship with total length. Our preliminary results are promising based on the estimated model parameters. We will continue our research where we will develop maximum likelihood models otolith weight as complementary but independent functions of age (mg/year) and fish length (mg/mm). Once these relationships are established, we will determine the age probabilities for each fish based on their measurements.

35. ***u** Reproductive Ecology of a Non-arribada nesting population of Olive Ridley Sea Turtles (*Lepidochelys olivacea*). *Eliza Croom* and Andrew Coleman, Talladega College; and Damaris Marin and Felipe De Jesus Crispin, Campamento Tortuguero Ayotlcalli.

    Campamento Tortuguero Ayotlcalli is a sea turtle conservation organization that has monitored sea turtle nesting habitat located near Zihuatanejo, Mexico since 2015. Staff and volunteers patrol the beach on a nightly basis to document nesting and retrieve turtle nests to incubate them in a protected corral because poaching of nests and nesting females were common in this population. Olive ridley sea turtles (*Lepidochelys olivacea)* were the predominant nesting species, but green turtles (*Chelonia mydas*) and the highly endangered Pacific leatherback (*Dermochelys coriacea*) also utilized this nesting beach. Olive Ridley sea turtles show two distinct nesting strategies, large aggregations of

arribada nesting and more isolated non arribada nesting. This monitored population displayed the non-arribada strategy. The highest monthly nesting mean occurred during the months of August, September, and October. If females were encountered, morphological data were collected, and the females were tagged using Inconel flipper tags. Non arribada nesters typically show less nest site fidelity than arribada nesters, but a number of females were encountered multiple times across years. Though arribada nesting populations are larger in size, studying.

36. ***u** Feeding Ecology of Female Alabama Map Turtles (*Graptemys pulchra*). *Che'Isha Johnson* and Andrew Coleman, Talladega College.

    Alabama map turtles (*Graptemys pulchra*) are Emydid turtles that display a high level of sexual dimorphism, with adult females growing to larger size than adult males. In addition, adult females of this species, along with several other Graptemys species (e.g., *Graptemys barbouri, Graptemys ernsti, Graptemys gibbonsi*, and *Graptemys pearlensis*) grow extremely large heads that allow them to consume a wide range of aquatic mollusks. Through the Urban Turtle Project, an urban population of Alabama map turtles inhabiting the Cahaba River has been studied through mark-recapture methods. During sampling, several female Alabama map turtles have been held over for a short period of time to obtain fecal samples. Asiatic clams (*Corbicula fluminea*) were observed to be a major prey item for this population. The access to these samples allowed for an examination of the relationship between Alabama map turtle female head size and size range of Corbicula shells consumed. The purpose of the study was to investigate the maximum size of Corbicula shell consumed versus female turtle head size. These data provide insight into the feeding ecology of this historically understudied species.

37. ***u** Prevalence of *Rickettia* sp. Virus in Ticks from Alabama and Minnesota. *Jermiya Tarrance* and Andrew Coleman, Talladega College; and Heather Patterson, University of Alabama at Birmingham.

    Ticks are known to be vectors of several human pathogens and investigating the prevalence of these pathogens in local tick populations is of public health importance. Ticks were collected from Red Mountain Park located in Birmingham, AL, in May 2021 and from Hubbard County, MN in July 2021. Ticks were identified to species through morphology and verified genetically through sequencing of a portion of the 12S ribosomal RNA gene. Extracted DNA from tick samples were also tested through PCR and DNA sequencing for the presence of *Rickettsia* bacteria using a portion of the citrate synthesis gene. The main tick species identified were the dog tick (*Dermacentor variabilis*) and lone star tick (*Amblyomma americanum*), although a small number of deer ticks were collected. The presence of *Rickettsia* sp. was detected in a low percentage of ticks, although it was not isolated to any one tick species. Understanding the disease ecology of a prevalent vector species can guide public health messaging and increase public awareness.

38. ***u** Investigation of Bacteria Cultured from North Alabama Soil on Tryptic Soy and Nutrient Agar Media. *Eric Villapaz*, Jewel Courson, T. Bre Tuck, and Sara Cline, Athens State University.

    Globally, Antimicrobial Resistance Collaborators estimated that, in 2019, there were 4.95 million deaths associated with antibiotic resistant bacteria. In an attempt to identify novel

antibiotics, we analyzed soil bacteria from locations throughout North Alabama cultured on various media, including Nutrient Agar and 10% Tryptic Soy Agar, for antimicrobial properties. In addition, we screened for synergistic effects and commensal interactions of microbes cultured from disparate locations and soil types. Several strains were chosen for further analysis.

39. ***u** Investigation of Bacteria Cultured from North Alabama Soil on Various Media. *Myka Magness*, N. Tyler Williams, A. J. Gordon, R. Chase Christopher, and Sara Cline, Athens State University.

    Globally, Antimicrobial Resistance Collaborators estimated that, in 2019, there were 4.95 million deaths associated with antibiotic resistant bacteria. In an attempt to identify novel antibiotics, we analyzed soil bacteria from locations throughout North Alabama cultured on various media, including Potato Dextrose Agar, Skim Milk Agar, and different percentages of Luria Broth Agar for antimicrobial properties. In addition, we screened for synergistic effects and commensal interactions of microbes cultured from disparate locations and soil types. Several strains were chosen for further analysis.

40. ***g** Blinding Lights: Nighttime Light Exposure Alters Physiology and Body Condition in a Model Songbird. *Kevin Pham*, Madeline Choi, and Haruka Wada, Auburn University.

    Biological systems across taxa rely on a circadian rhythm to synchronize behavioral and physiological processes to the external light-dark environment. With the threat of nighttime light exposure increasing due to anthropogenic perturbation, organisms may suffer deleterious effects on behavior and physiology derived from light-induced circadian disruption. However, organisms may be able to cope with such stress by mounting adaptive responses to combat environmental stressors. Thus, whether there are permanent changes to the phenotype or carry-over effects in response to light-induced circadian disruption is not known. Here, we experimentally exposed diurnal zebra finches (*Taeniopygia guttata),* a model songbird, to continuous light at night (24L:0D) for 23 days followed by a recovery period of 12 days where the light stressor regime ceased, and the light-dark cycle returned to 14L:10D with controls undergoing a consistent light-dark cycle (14L:10D). We measured blood glucose levels and body mass across 4 timepoints. We found that continuous light exposure increased body mass compared to initial baseline body mass. After recovery, light-exposed birds' body mass returned to initial baseline body mass prior to treatment. Additionally, we found that continuous light exposure decreased stress-induced blood glucose levels, with no alteration to baseline blood glucose levels. After recovery, stress-induced blood glucose levels returned to initial levels prior to continuous light exposure. Taken in sum, these results demonstrate that continuous light exposure can incur deleterious effects, however, do not cause carry-over effects on the phenotype after recovery, suggesting that birds are able to combat nighttime light exposure stress.

41. ***u** Using CRISPR for Genome Editing of *Arabidopsis thaliana* to Confirm The Role of a FAM210b-Like Protein (At2g27290) in Heme Transport into The Chloroplast. *Olivia Rizzo*, Emily Goodman, Jeremy Fortson, Caitlin Turner, and Sara G. Cline, Athens State University.

    The FAM210b proteins are highly conserved across eukaryotes. In humans, the mitochondrial targeted FAM210b protein has been identified as having a role in iron

import for heme synthesis. In addition to a mitochondrial targeted FAM210b protein, the green linage has a FAM210b domain containing protein targeted to the chloroplast. To confirm a role of heme transport into the chloroplast, a CRISPR construct, pHEE + At2g27290gRNA for genome editing of *Arabidopsis thaliana*, was designed against the chloroplast targeted FAM210b domain containing Arabidopsis gene At2g27290. The construct was used to transform wildtype line CS70000 and SALK line SALK_082302, which contains an insertion in the mitochondrial targeted Fam210b domain containing gene At2g20940. Transformants were confirmed via PCR and phenotypes of the At2g27290 mutants and At2g27290/At2g20940 double mutants analyzed.

42. ***u** Riparian Tree Communities Along a Suburban, Channelized Stream. Anna Martin, Samford University; Betsy Dobbins, Samford University; Lawrence Davenport, Samford University.

    Riparian zones allow the transition from aquatic to terrestrial communities. Extensive linear and lateral riparian forests and wetlands (widths of 100m or more) are required to protect stream banks and aquatic communities. Greater tree cover is associated with increased stream taxon richness and reduced bank erosion. In many urban and suburban environments, the riparian plant communities are highly altered. The ecosystem functions of the individual species in these communities have not been well explored. To address these gaps in knowledge, we documented the riparian tree communities along four 100 meter stretches of Shades Creek, a suburban, channelized stream, during the Winter of 2022. All trees within 1 meter of the bank edge were identified, breast height circumference determined, and the distance from the bank measured.

43. ***u** Molecular Dynamic Analysis of Three CAPN3 Variants Associated with Limb-Girdle Muscular Dystrophy in Comparison to One Variant of Uncertain Significance. Camille Greer and Sara Cline, Athens State University.

    Two variants were identified in Calpain 3 (CAPN3) by the Characterizing Our DNA Exceptions (CODE) project through clinical sequencing of a patient who had phenotypes of developmental delays and unusual body movements, like jumping and flapping of the arms. Previously, CAPN3 mutations have been shown to be associated with limb-girdle muscular dystrophy (LGMD). The patient was heterozygous for two different variants: Arg698His and Arg440Trp. The second of these was known to cause LGMD. However, Arg698His had no known connection to LGMD. We compared molecular dynamic simulations of both variants to two disease-causing variants, Arg698Pro and Ala702Val, near the Arg698His variant. Evidence shows similar movement changes in the amino acids of the C-terminus. This suggests that this may be a novel LGMD-causing variant.

SECTION II. CHEMISTRY
Poster Session
1:00 PM – 2:30 PM
Sandridge Student Center, Ballroom/Annex
Stephen Slauson, Presiding

1. ***u** Maleimide Diels-Alder Reaction of Homoepibatidine Derivatives. *Lia Meadows*, Jhanvi Vakharia, and Stephen Slauson, Jacksonville State University.

   Epibatidine is a potent alkaloid produced by *Epipedobates tricolor* (Poisonous Ecuadorian frog). This chemical is found on the epidermal layer that targets the nicotinic acetylcholine receptor. Epibatidine binding assists acetylcholine release, a neurotransmitter that causes muscle contraction and slows heart rate, leading to paralysis and hypoventilation. Many compounds including epibatidine are nonselective when binding to nicotinic acetylcholine receptors in respect to nicotinic subtypes. Clinical trials are using Tebanicline, an analgesic drug found to be more potent than morphine derived from epibatidine. During Phase II trials, the experiment failed due to gastrointestinal side effects in humans, presumably from a lack of nicotinic subtype selectivity. This research derives from the concept of altering the binding selectivity of epibatidine.

   Utilizing maleimide epibatidine derivatives, rigid bicyclic systems can be synthesized to discover the optimal nitrogen to nitrogen distance for binding specific nicotinic subtypes. To accomplish this hypothesis, the Diels- Alder reaction was performed with 2-maleimide acid and 3-maleimide acid to form homoepibatidine derivatives that give the structure of the rigid system.

   The structure and the distance of this compound may determine the optimal derivatives for epibatidine. This research may play a part in the process of creating analgesics that are not addictive.

2. ***g** The Optimization Of A Brain Metabolite Isolation Protocol and Normalization Technique For Use With Proton Nuclear Magnetic Resonance and Its Implementation in Rats With Metabolic Syndrome. Victoria McConnell, Bernhard Vogler, and Sharifa Love-Rutledge, The University of Alabama in Huntsville.

   Metabolomics can provide novel information during disease onset. We were interested in whether the LEW.1WR1 rat's metabolic syndrome would affect brain amino acids. The first objective was to establish the efficacy, accuracy, and reproducibility of a brain metabolite isolation protocol in extracting water-soluble metabolites for proton nuclear magnetic resonance quantification and to determine the best normalization strategy. The second objective was to test the hypothesis that the LEW.1WR1 rat with metabolic syndrome would have higher glutamine and lower glutamate levels in the striatal brain.

   In order to monitor potential loss of metabolites beta-alanine was added. Tracking beta-alanine indicated that filtration caused large losses, so filtration was eliminated. The improved protocol was applied to rat brains, with beta-alanine added in proportion to the brain mass. An optimized protocol gave easily quantifiable spectra and was then applied to rat striatal brain tissue. Since we recognized beta-alanine degradation over time, we investigated other methods of normalization. The beta-alanine method of normalization

was determined to be the best, followed by the brain mass method. Changes in glutamine and glutamate were not seen, but the glutamine:glutamate ratio and taurine were determined to be significantly different in the control rat group.

3. ***u** Improvement in Photovoltaic Performance of Dye Sensitized Solar Cells Using Co-sensitization and rGO/MWCNT Bybrid Counter Electrode. *Emily Hamm* and Md Abu Shohag, University of North Alabama; William Ghann and Jamal Uddin, Coppin State University; and Md Huayun Kabir, University of North Alabama.

   Dye-sensitized solar cells (DSSCs) are currently considered highly promising as a method for the efficient and economical conversion of solar energy to electricity. Practical applications of DSSCs require efficient light harvesting and high conversion efficiency across the full solar spectrum. The purpose of this experiment is to employ co-sensitization which is an attractive approach to enhance the light harvesting efficiency of a DSSC, whereby two or more dyes having complementary absorption spectra are co-adsorbed within a DSSC. We have explored the potential of carbon materials for the counter electrode preparation and to use them to fabricate a high performance DSSCs. The counter electrode in a DSSC should have high catalytic activity to regenerate the redox couple as well as high conductivity and low charge transfer resistance in order to facilitate the charge transport and obtain high efficiencies. In this study, we report on the synthesis of reduced graphene oxide-multiwall carbon nanotube hybrid (rGO-MWCNT) for counter electrode preparation and the fabrication and characterization of co-sensitization of N719 with a blue 1 organic dye for photoanode. The photocurrent density–voltage (*J–V*) characteristics, electrochemical impedance spectroscopy, powder X-ray diffraction (XRD), UV-vis spectroscopy, and scanning electron microscopy (SEM) were used to analyze electrode materials and photoelectrochemical performances of the cell.

4. ***u** The Toxicity of Silver Nanoparticles on Four Freshwater Species: E. Coli, Microalgae, Brine Shrimp Eggs, and Zebrafish. *Matthew Kutz* and Humayun Kabir, University of North Alabama.

   Engineered nanomaterials have recently been the focus of intense research because of their widespread and increasing presence in commercially produced goods and their applications in electronics, cosmetics, sporting goods, coating materials, and many others. Their toxicity to human health and the environment are not yet well understood. Among the nanomaterials, silver nanoparticles (AgNPs) are considered as one of the most important due to their strong antimicrobial property, and applications in numerous other consumer products including textiles, cosmetics, and health care items. The aim of this work was to evaluate the toxicity of silver nanoparticles on E. coli, and marine organisms such as microalgae, brine shrimp eggs, and zebrafish were evaluated at different concentrations, since studies on marine organisms are meagre. First, the nanoparticles were synthesized, then diluted to various concentrations and finally added to E. coli and selected aquatic organisms. It was found that applications of higher concentrations of nanoparticles on all these organisms have severe effect. Toxicity effects of silver nitrate, polyvinylpyrrolidone coated AgNPs, and uncoated AgNPs on marine organisms are also compared. All four test species were exposed for 96 hours to five different concentrations of AgNPs and AgNO3. This result confirms that the toxic effect could be mainly attributed to the AgNPs. The toxicity effect AgNPs on marine organisms

such as microalgae, brine shrimp eggs, and zebrafish as a bioindicator in the aquatic environment will be discussed in the presentation.

SECTION II. BUSINESS MEETING [Elect a Vice-Chair, term ending 2023-24]

SECTION III – PHYSICS AND MATHEMATICS
Paper Session
Thursday Morning, 9:30 AM– 10:15 AM
Waters Hall, Room N 201
Matthew E. Edwards and Byunghoon Lee, Presiding

1. 9:30 ***g** Low Lattice Thermal Conductivity Materials from Machine Learning and First-Principles Predictions. *Chia-Min Lin* and Cheng-Chien Chen, University of Alabama at Birmingham.

   We graphically construct a model of 1/6 Blastosphere Multiverse using geometric shapes and angles to illustrate multiple dimensions and multiple universes.

2. 9:50 Equitably Harmonious Labelings of Disjoint Unions of Fixed-Length Paths. *Ken Roblee* and Atif Abueida, University of Dayton; Tatum Warminsky, Troy University.

   For a simple, non-edgeless graph G = (V, E) of positive with |E| =m, an equitably harmonious labeling of G is an injective function L from the set V to the set Z_m such that L(u) + L(v) (mod m) is unique for each edge e with endpoints u and v. If G has an equitably harmonious labeling, then G is said to be equitably harmonious. We show that a disjoint union of fixed-length path graphs is equitably harmonious.

3. 10:00 ***g** Development of Nanocomposite Films for Biomedical Applications. *James Sampson*, Ashok Batra and Mohan Aggarwal, Alabama A&M University.

   Polyvinylidene fluoride (PVDF) is utilized in a wide range of devices due to their excellent mechanical and optical properties, high thermal and chemical stability, piezoelectricity, pyroelectricity, and ferroelectric responses. In the present investigation, the praseodymium oxide (Pr_2O_3) nanoparticles embedded poly vinylidene fluoride (PVDF) thick films were fabricated via solution casting/intercalation technique. Infrared vibrational spectroscopy (FTIR) revealed the presence of ferroelectric β-phase in the annealed nanocomposite films. The electrical parameters were determined via QuadTech LCR meter. Results of their characterization for use in biomedical applications will also be presented.

SECTION III – PHYSICS AND MATHEMATICS
Poster Session
Thursday Morning 10:30 am – 12:00 Noon
Sandridge Student Center, Ballroom/Annex
Matthew E. Edwards and Byunghoon Lee, Presiding

4. ***u** Degree of Hyperuniformity Correlation with Surface Roughness in Amorphous Network. *Carter Swafford*, Tuyako Kristoforova, and Durga Durga, Alabama School of Mathematics and Science.

Static structure factor and scattering intensity patterns from amorphous silicon have been studied in atomistic models of various sizes generated by classical molecular dynamics simulations. The behavior of the structure factors in the X-ray wavelength range is examined to determine the degree of hyperuniformity. X-ray intensity patterns from the corresponding models are analyzed to identify the size of the inhomogeneities present in the sample. We also, investigate the effect of introduced surface roughness on structure factor during slicing the models. This emphasizes the necessity of suitable surface passivation to improve the degree of hyperuniformity and quality of the heterojunction interface. Our results are compared with the results from available experiments, which are in close agreement.

14. ***u** Liquid Phase Exfoliation of SnS Nanosheets By Probe Sonication Method. *Sanju Mupparaju* and Rima Patel, Alabama School of Mathematics and Science; Arjun Dahal, University of South Alabama; and Durga Paudel, Alabama School of Mathematics and Science.

Two-Dimensional tin monosulfide (SnS) nanosheet is successfully isolated using probe sonication, and hand grinding method in water. It opens a cost-effective toxic free & environmentally friendly exfoliation process in semiconducting material research which can be useful commercially in photothermal agents and drug delivery platforms for cancer therapy application. Absorption spectra from UV Vis spectrometer and nanosheets using atomic force microscope are compared for both samples. Our result shows that, nanoparticle concentration in the hand grinding sample appeared higher but the better lateral size of nanosheet is formed in probe sonication sample.

6. ***u** Review of Superconductivity at Very Low Temperatures and High Temperatures. *Micah Hall*, Prakash Sharma, ; Akshaya Kumar, Tuskegee University.

Review of superconductivity, historical development, diamagnetism, and application of superconductivity in medicine industry, transportation industry and electric power industry and other areas would be discussed. An attempt would be made to explain superconductivity and basics of BCS (Bardeen, Cooper & Schrieffer) Theory would be discussed.

7. ***g** X-Ray Photoelectron Spectroscopy (XPS) and Raman Spectroscopy Characterization of The Dehydration Process of Dihydrate Calcium Sulfate and its Hemihydrate. *Alexander Egarievwe*, Mebougna Drabo, Matthew Edwards, Aschalew Kassu, and Stephen Egarievwe, Alabama A&M University.

We have shown how to transform the dihydrate, calcium sulfate $CaSO_4 \cdot 2H_2O$, also known as gypsum, into hemihydrate, $CaSO_4 \cdot \frac{1}{2}H_2O$, a basanite material. This change was observed to occur at relatively high temperature, specifically at 140^o C for a time interval of two hours. To make these observations and measurements, our research involved two major instrumentations for surface material characterization: the Raman Spectroscopy and the X-ray Photoelectron Spectroscopy (XPS). Raman Spectroscopy showed how the dehydration diffusion process affects the compound and the X-Ray Photoelectron

Spectroscopy (XPS) showed the effect that the process had on each element present in the sample. We were readily able to measure the shifts in the oxygen binding energy using the X-Ray Photoelectron Spectroscopy (XPS). Accomplishing the hemihydrate condition and possibly the final anhydrate state from a dihydrate is a process that requires both extended duration in time, starting at one hour minimally, and at a temperature of 140° C as indicated above. The speed of phase change is no longer based on a definite temperature, but rather only on the time necessary to implement the transformation. The amount of time $CaSO_4 \cdot 2H_2O$ sample was subjected to the high temperatures determined its products. When this process is continued over an extended time, $CaSO_4 \cdot \frac{1}{8}H_2O$ occurred and later became $CaSO_4$ the desired anhydrous state. Therefore, as time passed, with the sample at 140° C or higher, we observed that calcium sulfate dihydrate, becomes calcium sulfate hemihydrate, and finally the calcium sulfate anhydrate. Therefore, as time passed, after reaching 140° C or higher, we observed that calcium sulfate dihydrate, became calcium sulfate hemihydrate, and finally the calcium sulfate anhydrate.

8. The How To of Modeling the Blastosphere Multiverse. *Paul Hall*, Tuskegee University.

   We graphically construct a model of 1/6 Blastosphere Multiverse using geometric shapes and angles to illustrate multiple dimensions and multiple universes.

9. Quantitative Analysis of Batting Friendliness of Australian Cricket Grounds. *Arjun Tan*, Alabama A&M University.

   Australia has been the dominant cricketing nation for most of cricket history with the best win-loss record against all other cricketing nations. This dominance is particularly emphatic for Test matches played on home soil, which had perpetuated the myth that it is difficult for visiting teams to bat well in Australia. However, statistics on Australian Test pitches show that they are actually quite batting-friendly. The average runs per wicket were mostly over 30 with the Adelaide cricket ground leading the way with 35.39 followed by Perth (33.30), Brisbane (32.71) and Sydney (30.75) with only Melbourne (29.95) recording below 30. Large numbers of centuries, double centuries and triple centuries were recorded on Australian turfs, especially in Adelaide. In this paper, the relative batting-friendliness of Australian Test cricket grounds are analyzed and causative factors determined. It is found that ground size is the major factor with smaller grounds aiding batting performances. Also, environmental factors such as atmospheric moisture and wind tend to help bowlers to the detriment of batting performances.

10. Causality Analysis of Australia's Cricket Supremacy. *Arjun Tan*, Alabama A&M University.

    In the game of cricket, Australia have reigned supreme. They have better win/loss ratios in Test matches against all opposing nations by substantial to infinite margins. These ratios are significantly magnified for Tests staged on Australian soil. In this study, we have identified several intangible factors like rule differences, match durations, ground sizes and weather conditions which likely had contributed to the Australian dominance to some extent. More significantly, we have also identified and analyzed two main causative

factors, which are responsible for the win/loss ratios in favor of Australia: (1) Most of the great opposition batsmen with the exception of a few, have under-performed against Australia as compared with against other cricketing nations in general, and in Australia in particular; (2) Most of the great opposition bowlers, with few exceptions, have also under-performed against Australia and in Australia in a similar manner. These two factors amply demonstrate the causality between them on one hand and Australia's win/loss ratio on the other.

11. Mathematical Scheme for Ranking the Spin Quartet of Indian Cricket. *Arjun Tan*, Alabama A&M University.

    In the 1960s, a quartet of world-class spin bowlers appeared in the Indian cricket scene named Prasanna, Venkataraghavan, Chandrasekhar and Bedi who would excel in both First Class and Test cricket. So close were their bowling figures that debate raged as to who was the best bowler among them. In this study, the attempt has been made to rank the bowlers according to some mathematical scheme. First, the concept of Other First Class (OFC) cricket is introduced by separating Test matches from all First-Class matches. Then the bowlers are ranked according to a rank index. Based on the total rank indices for OFC and Test cricket, Bedi is ranked first, Chandra and Prasanna are tied for the second place, and Venkat is ranked third. The Test cricket rankings are limited to Prasanna, Chandra and Bedi only. Rank indices are determined when two bowlers played and the third did not; and when all three played in the same matches. In this scheme, Prasanna, Bedi and Chandra were all tied for the first plane. Finally, in order to break the tie, rank indices were determined for Test matches played in different cricketing nations. In this scheme, Bedi emerged in first place, followed by Chandra in second place, and Prasanna in third place. The overall rankings in OFC and Test cricket were Bedi, Chandra, Prasanna and Venkat, in that order.

12. Understanding the Microsat-R Breakup Puzzle with Theorem on Apsidal Line Slopes of Gabbard Diagram. *Arjun Tan*, Alabama A&M University.

    The Indian anti-satellite (ASAT) experiment of 27 March 2019 on Microsat-R satellite created several unexpected results. The most unusual amongst them was that the Gabbard diagram was that of four separate fragmentations, the first of its kind ever recorded. The primary fragmentation was caused by the hypervelocity impact of the ASAT, which was followed by three successive explosive fragmentations of the main remnant of the target satellite. The fragments produced by each breakup was characterized by its apogee and perigee lines of definite slopes. A theory of apsidal slopes is formulated which shows that the sum of the slopes of the apogee and perigee lines is a constant for fragmentation from any location in the same orbit. The slopes of the apsidal lines were calculated at various true anomalies of the fragmenting orbit and compared with the observed slopes. The true anomalies of the breakup locations were determined where the calculated values of the slopes matched the observed values. It was concluded without ambiguity that the explosions occurred at 1-minute intervals at true anomalies of 93o, 97o and 101o in the ascending phase in a remnant orbit, 0.12404 day or approximately two revolutions after

the initial collision of the ASAT with its target. The dramatic increases in the size and ellipticity of the remnant orbit following the explosions support these findings.

13. A Creation Theory of the Blastosphere Multiverse. *Paul Hall*, Tuskegee University.

    This presentation will explain the formation and development of the Blastosphere Multiverse.

14. The Visualization of the Multiverse. *Paul Hall*, Tuskegee University.

    We graphically construct a model illustrating the possibility of 8640 dimensions and 2160 universes.

15. The How To of Multidimensional Travel and Navigation. *Paul Hall*, Tuskegee University.

    We graphically illustrate the path to other dimensions using a model of the multiverse. We graphically illustrate a tool to be used for navigation throughout the multiverse.

SECTION IV. ENGINEERING AND COMPUTER SCIENCE
Paper Session
10:00 AM – 12:00 noon
Waters Hall, Room N 205
Ruigang Wang, Presiding

1. 10:00 ***g** The Role of Using Data Cleaning and IoT Technology on the Enterprise as Process. *Abdulrahman Alharthi*, Mohammad Alhefdi, Michael Lipscomb, Murat Tanik, University of Alabama at Birmingham.

   The expansion of the internet twenty years ago has significantly enhanced the need to utilize smart systems to grow businesses. So, this leads to further demonstrated by the fact that the online systems provide larger audiences and committed readerships when carefully and effectively engaged. Moreover, the expansion of the internet has increased the data types and quantity. That leads to exposure to many problems that reduce data quality, such as missing some data and data duplication, which inevitably affects the enterprise's data analysis results. This discussion focuses on improving the data quality by utilizing data cleaning and IoT technology in the enterprise as process improvement. Process improvement in the enterprise's domain has several issues: hard to manage, lack of data, and waste time and money. We proposed a general enterprise framework that minimizes the process improvement's issues. This proposed framework uses P3Tech PArchitect, which benefits from capturing the issues and ways of fixing or minimizing them. Using data cleaning and IoT technologies has a significant role in this process improvement in getting clear fast results.

2. 10:20 ***g** 3D Printing of Poly(ε-caprolactone) (PCL) Porous Scaffolds for Periodontal Tissue Engineering. *Rakesh Pemmada*, Vinoy Thomas, and Sahaj Patel, University of Alabama at Birmingham.

   Scaffolds meeting all these design requirements can be produced with a range of techniques such as gas foaming, solvent casting, melt molding, freeze-drying, photolithography, salt leaching etc. However, considering the complexity in design of scaffold architecture, each of these techniques owns certain limitations such as issues of gradient pore size, pore geometry, pore interconnectivity and spatial distribution of pores throughout the scaffold. Additive Manufacturing (AM) techniques or 3D printing techniques shows a great potential for scaffold fabrication, owing to its ability to design any complex structure with precisely controlled dimension. Bioactive scaffolds made of poly(ε-caprolactone) (PCL) were 3D printed by Fused Deposition Modelling (FDM) technology to obtain porous scaffolds suitable for periodontal tissue engineering problems. This research explores a cutting edge of 3D-printing advancements for periodontal membrane development, with specific emphasis on the design of highly optimized computer-aided scaffold design systems and direct FDM 3D printing of porous graded scaffolds. The designed scaffold structures were evaluated in terms of

structural strength, dimensional accuracy, mechanical performance, porosity and pore sizes. Successful results were obtained in terms of porosity, pore size and mechanical strength in the scaffold geometries designed within the scope of the study. Technical limitations of 3D printing (PCL) will be examined to feature the chance of future enhancements for new 3D-printing materials development for periodontal tissue engineering. In general, the results show that (PCL) scaffolds with inclination in filament design possess improved mechanical properties when compared to the scaffolds without inclination.

3. 10:40 ***u** Automating the Parallel Composition of Cyberattack Models – The Experiences of a University Capstone Team. *Levi Seibert*, Nischal Thapa, Katia Maxwell, Athens State University.

   Several universities have been adapting their curriculum to provide students with a more active hands-on learning experience that will provide them critical knowledge and skills to be successful in their careers. In a capstone class offered by Athens State University, a team of two students was created to work on a research and application project that builds off a previous group's work from 2019. The focus of the current team is to add functionality to an application that stores cyberattack models, so that these models can be composed in parallel to create a system attack model representative of multiple cyberattacks taking place at the same time. In its current state, the application allows users to view, filter, import, edit, and select models for sequential composition. The Athens State University capstone team is developing a method to auto-generate the parallel composition of multiple cyberattack models selected by the user. The team has had to study and investigate the published research papers related to the development of the current application, selection methods, and process of composition. The team has had to construct their own theories about how to achieve their goal. This project has provided team members with experiences in applying a modified agile development approach, managing time, handling technical difficulties, learning new programming languages and tools, and pivoting development plans. This paper details these experiences and provides insights into the underlying motivations of this project.

4. 11:00 ***u** Dynamic Control of Sensitivity in a Graphene-based Surface Plasmon Resonance (SPR) Based Sensor – Preliminary Experimental Data. *Reece Phillips*, Vivek Kumar, and Ravi Gollapalli, University of North Alabama.

   Graphene-based SPR sensors have been found to provide better sensitivity than conventional metal-based SPR sensors. In this presentation, we will present our numerical results which show that by the application of electrical field across the graphene and metal layers provides a handle to tune and dynamically control the sensitivity of these SPR sensors.

11:30 BUSINESS MEETING [Elect Vice-Chair with term ending 2023-24]

SECTION IV. ENGINEERING AND COMPUTER SCIENCE
Poster Session
1:00 PM – 3:00 PM
Sandridge Student Center, Ballroom/Annex
Ruigang Wang, Presiding

7. ***u** Critical and Interpretive Analysis of Classical Texts Using Natural Language Processing Methods. *David Sellers*, John Jordan, and Adam Lewis, Athens State University.

   Objectivity of interpretive text analysis has been a topic of contention throughout the history of the social sciences. The source of contention is an inherent suspicion of how sources of bias could influence the interpretive process. The development of unsupervised machine-learning tools for text analysis has the promise of providing evidence for interpretations in a fashion that is both scalable and less subject to the biases from the preconceptions of interpreters.

   In this work, we consider a set well-understood literary sources that have evolved from Early Modern English to Modern English to test a series of hypothesizes about how unsupervised machine learning goes about representing patterns of thoughts in text and how such tools may be used to aid interpreters in the analysis of texts, classical and modern. At this phase of the project, we strive to identify methods that can compare two semantic models and analyze the differences to find indicators of bias.

15. ***u** Conversion of a Gas-powered ATV to a Battery-powered ATV – An Undergraduate Student Team Experience. Maciah Murphy, John Lucius, *Hillary Holcomb*, Mary Hardwick, Barkley Johnston, Jaylon Davis, Chris Winton, Jonathan Phillips, Ike Nail, Bailey Barnett, and Ravi Gollapalli, University of North Alabama.

    Electric vehicles are currently the fastest growing vehicle market in the United States. For us as engineers, especially electrical and mechanical engineers, it is imperative to keep up with the newest technology being used in the real world. This project has presented us with the perfect opportunity to do just that. Starting with a gas-powered, four wheeled ATV (all-terrain vehicle) and successfully converting it to an electric powered ATV, we have seen and dealt with all the components of modern gas-powered vehicles, for example the brakes and rear axle. We have gained understanding of the difference between electric-powered and gas-powered vehicles. This project has provided us with an avenue to get hands-on experience that will carry over into the workforce. Overall, this project has been one of the most valuable experiences for an engineering student at the University of North Alabama. In our poster, we will be presenting our work, experiences, results, and details at the AAS annual meeting.

16. ***g** Load Measurement at Riprap Toe of Embankment Dam. *Kofi Ntow Opare*, University of Alabama at Birmingham; Fjola Gudrun Sigtryggsdottir, Norwegian University of Science and Technology; and Rouzbeh Ross Nazari, University of Alabama at Birmingham.

    Riprap is widely used as slope protection and when placed on the downstream slope of a rockfill dam, it provides erosion resistance under overflow conditions. For steep downstream slopes (S > 50%), initiation of riprap failure at the dam toe can be considered a possibility under overtopping conditions of rockfill dams. The present study focuses on the load generation mechanisms present at the dam toe in the event of overtopping. Placed ripraps for the tests were constructed in an interlocking pattern on a model of a downstream slope of an embankment dam in the laboratory.

    Load cells were installed at the toe to measure loads during overtopping tests. Tests revealed two different types of loads acting on the toe section of the dam. Self-weight of the riprap stones during building and the other is the hydraulic load as a result of overtopping of the dam. The effect of the latter at the toe is dependent on the discharge of the overflow with higher discharges resulting in higher hydraulic loads at the dam toe. The hydraulic load causes a two-dimensional displacement of the riprap stones that causes the entire structure to deform in a buckling-like pattern resembling that of a slender long column pinned at one end and free at the other end. This buckling eventually leads to riprap failure. Rearrangement of the riprap stones resulted in progressive displacement of the stones along the slope leading to compaction of the stones at the toe. This compaction leads to a change in the magnitude of the effect of the riprap self-weight felt at the toe of the dam even when overtopping ceases.

17. ***g** Modeling and Protection of Solar Water Heater Performance by Coupling Artificial Neural Network (ANN) Optimization and Computational Fluid Dynamics (CFD). *Muslat Alanizi*, Leon Jololian, and Tanik Murat, University of Alabama at Birmingham.

    Sustainable energy research has received significant attention from many researchers. One source of sustainable energy is solar energy which can be applied to various domains. The domain of solar water heaters is an important field that needs further investigation. The utilization of machine learning techniques to predict the performance of solar water heaters is a promising research area. Hence, the current proposal aims to optimize a solar water heating system's flow and heat transfer performance by enhancing the heat transfer in the pipe. The passive method for improving the heat transfer rate is supposed to be used. The finite volume method will be used to solve the governing equations. Due to a large number of the design parameters such as different cross-sections of vortex generators, dimensions, number, and arrangement, design points will be selected based on Statistical methods such as the design of the experiment method. Flow field and heat transfer will be simulated in each design point. We will evaluate the value of objective functions such as pumping power and outlet water temperature. Based on the created Computational Fluid Dynamics (CFD) -based database, machine learning models such as Artificial Neural Networks (ANNs) and Response Surface Method

(RSM) will be employed to predict and optimize flow and heat transfer performances. By conducting this study, we believe we will optimize the overall performance of solar water heaters.

18. ***g** Social Distancing Monitoring of Crowd using Path Prediction, behaviour Analysis and Distance Monitoring by exploiting the Least Action Principle and Advanced Deep Learning Methods. *Muhammad Alolaiwy*, Murat Tanik, and Leon Jololian, University of Alabama at Birmingham.

    With the ongoing variants of Corona Virus, social distance has become mandatory. Social and physical distancing measures aim to slow the spread of disease by stopping chains of transmission of COVID-19 and preventing new ones from appearing. These measures secure physical distance between people (of at least one meter), and reduce contact with contaminated surfaces, while encouraging and sustaining virtual social connection within families and communities. The aim of this framework is to provide a comprehensive mechanism that can effectively measure the social distance between people and predict the path of the crowd, i.e., where will the people go next, what the behavior of the crowd will be.

19. ***u** Prototyping A Metallic Design on The Effectiveness of Non-Contacting Magnetic Driving System in Spatial Atomic Layer Deposition. *Vivek Kumar*, Puneet Paul, and Dongqing Pan, University of North Alabama.

    Atomic Layer Deposition (ALD) is a precise nanomanufacturing technique which is being adopted by the semiconductor industry, as consumer electronic devices such as smartphones, tablets, computers, etc. continue to be computationally powerful. ALD uses alternating surface reactions to create thin layers on a substrate in nanometer scale. It has been used in multiple applications to create transistors, processors, memory drives, as well as solar panels. However, the traditional ALD process is time-consuming, and it has very low throughput. A conventional single wafer ALD system can only achieve a few nanometers of layer thickness per minute of deposition. This is due to the sequence time when the reactive chemicals must be deposited and purged one at a time. To solve this problem, our research project is designing and developing a faster spatial ALD system. Several prototypes were developed, and flow tests were carried out. To improve the design and the effectiveness of the process, we have designed and developed a metallic prototype with a novel magnetic driving mechanism which can realize the non-contacting driving and wafer movement. The new driving system can enable us to minimize the number of mechanical driving components inside of the reactor chamber, and the system can have a fully closed chamber and proceed to work as an actual faster ALD system without any pressure leak.

20. ***g** Multi- Step Flood Forecasting Using Long Short-Term Memory (LSTM) Neural Network for Coastal Alabama. *Mujungu Lawrence Museru*, Rouzbeh Nazari, Fahad Rabani, and Maryam Karimi, University of Alabama, Birmingham.

Coastal Alabama can experience compound flooding impact from riverine flooding and coastal storm surge. To forecast flooding events in such areas, it is essential to accurately predict both the rainfall-runoff process and storm surge. Different flood forecasting models exist, ranging from physically based conceptual models to fully data-driven models. Recent studies have demonstrated that data-driven models have higher accuracy and efficiency than physically based conceptual models. In addition, LSTM networks proved to be superior to other data-driven models due to their ability to learn long-term dependencies between the input and output variables, which is essential for modeling the hydrological process. In this study, we propose two LSTM models based on sequence-to-sequence learning, which will be used to predict riverine flooding and coastal storm surge. Each model was designed to learn from both the past and forecasted weather observations to provide a forecast of the next 72 hours, which is enough to predict extreme flooding events with sufficient lead time. We also demonstrate the capabilities of LSTM by using the same model for forecasting at other USGS and NOAA stations within Alabama. The models were validated by simulating multiple flood events and calculating statistical measures such as the Nash-Sutcliffe Efficiency, Kling-Gupta Efficiency, and R- Squared. The results indicate that LSTMs efficiently forecast riverine flooding using Precipitation, Potential Evaporation, Temperature, Surface Pressure, Convective Fraction, and Shortwave and Long wave surface Radiation, and coastal storm surge using Wind Speed, Wind Direction, Temperatures, and Surface Pressure with high efficiency by achieving NSE over 70%.

12. ***g** Application of the WRF Model for Accurate Extreme Weather Events Forecasting in Alabama State: How to Perceive the Right Physics Parameters? *Selami Buzluk*, Rouzbeh Nazari and Maryam Karimi, University of Alabama at Birmingham.

    Weather and climate extremes are one of the main challenges on the World Climate Challenge Program's (WCRP) Grand Challenges list. Obtaining a robust forecast, especially for severe weather events, is a challenging and ongoing research topic. The state of Alabama, located in the southeastern United States, is highly vulnerable to extreme weather events. According to NOAA data, the State of Alabama was exposed to 38 severe events between 2010-2021. It is predicted that these numbers will increase even more in the future. Therefore, an accurate forecast of extreme weather events is essential for Alabama State. To obtain accurate forecast outputs, some numerical weather simulation models have been developed. Previous studies have highlighted the Weather Research and Forecasting Model (WRF) which is a physic-based numerical simulation for this case. WRF's dynamic outputs assist us in forecasting characteristics of extreme weather events like probable maximum precipitation (PMP). However, previous studies illustrate that the WRF model calibration is greatly influenced by microphysics and cumulus schemes that are the boundary condition inputs. This study investigated the performance of WRF to predict wind and precipitation outputs using different combinations of microphysics and cumulus schemes in Alabama State. Model is set up with 3 nested domains with spatial resolutions are respectively 27, 9, and 3 km. Validation was made with the observed data of the past extreme weather events in the

region by obtaining weather forecast outputs based on different combinations of the WRF model. Analysis results confirmed that Mellor–Yamada–Janjic, and Grell–Devenyi (GD) Ensemble schemes are the best options with the smallest bias for the study area.

13. ***g** Application of Model-Based Forecasting of Extreme Weather for Development of a Power Failure Risk Index in the City of Birmingham. *Selami Buzluk*, Rouzbeh Nazari, Maryam Karimi and Fahad Rabbani, University of Alabama at Birmingham.

    Weather-related events like severe storms, hurricanes, and wind or rain are the principal causes of the failures of electric grid systems. Obtaining an accurate weather forecast, especially for the power transmission system, is a challenging and ongoing research topic. The tornado that occurred in Jan 2020 demonstrated again how the central parts of the Alabama States are vulnerable to outages. 33,000 houses and businesses in Jefferson County suffered a power outage due to this tornado. This study intends to make an accurate weather forecast and analyze the effect on the electricity distribution system for Birmingham City of Alabama by using a numerical weather forecast model with outputs that include all components of severe weather events such as wind, rainfall. Previous studies have highlighted the Weather Research and Forecasting Model (WRF) which is a physic-based numerical simulation for this case. WRF's dynamic outputs assist us in forecasting characteristics of extreme weather events such as probable maximum precipitation (PMP) and spatial variations of wind speed. Model is set up with 3 nested domains that cover the study area with spatial resolutions are respectively 27, 9, and 3 km. Validation results with the observed data of the past extreme weather events confirmed that Mellor–Yamada–Janjic, and Grell–Devenyi (GD) Ensemble micro-physics and cumulus schemes are the best options for model configuration. Then spatial analysis was performed on the geographic information system (GIS) and a failure index was developed. The index illustrated some of the electric poles should be renewed.

14. Stretchable Sensor Comprising Perovskite and Mechanoluminescence Materials for StructuralHealth Monitoring. *Md Abu Sayeed Shohag*, University of North Alabama.

    In this work, we developed a thin-film intrinsically stretchable sensor through a simple manufacturing method. The sensor is comprised of two primary layers: i) a thin layer of copper-dopedzinc sulfide (ZnS:Cu) and ii) an ultra-thin perovskite layer. The perovskite layer is constructed on a thin layer of poly(3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT:PSS), which is developed on a stretchable polydimethylsiloxane (PDMS) substrate. The use of poly(ethylene oxide) (PEO) polymer matrix in perovskite/PEO composite offers stretchability. The eutectic indium- gallium (EGaIn) is used as an electrode. In this composite structure, the PEO serves as an elastic connector to the brittle and non-stretchable organometal-halide-perovskite ($MAPb(Br_{0.5}I_{0.5})_3$). The non-complex device architecture allows easy sensor fabrication. Here, ZnS:Cu emits lights due tomechanical duress such as pressure, strain, etc. and the perovskite absorbs the light and immediately converts it into electrical current. The output current of the sensor increases with an increase of applied strain. The self-powered sensor may find many applications in foot ulcer detection, artificial electronic skins, and structural health monitoring of large composite structures.

SECTION V. SOCIAL SCIENCES
Paper Session
1:00 PM – 4:00 PM
Waters Hall, Room N 105
Charles Roberts, Presiding

1. 1:00 ***g** An Impact Analysis of the Transition Incentive Program on Beginning Farmers and Ranchers in Rural United States. *Eugene Adjei* and Valentina Hartarska, Auburn University.

   We evaluate the impact of the 2008 Transition Incentive Program (TIP) that was introduced to alleviate land acquisitions problems encountered by beginning farmers and ranchers (BFRs) in the United States. We nest a growth model into a difference–in–difference fixed effect model to determine whether the TIP has attracted additional BFRs in rural counties into agriculture. We determine the impact of the program by analyzing the effect on two groups of BFRs: BFRs in high CRP counties against BFRs in low CRP counties following an approach by Brown et al., (2019) applied to the effect of the conservation reserve program on rural economies: deriving a statistical verdict from a null hypothesis? Given that BFRs are essential in the US farm sector and that the program was introduced to mitigate their land acquisition problems, evaluating the impact of the program after its inception for policy revision and decision–making is very relevant. Another contributing factor for this study stems from the fact that the Conservation Reserve Program (CRP) that supports the TIP undergoes periodic changes that is likely to have a spillover effect on the TIP program. From our results, we find that TIP had an overall positive effect on attracting BFRs and increased the principal BFR numbers by 56 percent. Also, we find that the transition program increased the number of BFRs with less than 3–and–5 years by approximately 33 and 56 percent respectively but decreased the number of BFRs with 5–9 years by 11 percent.

2. 1:20 ***g** Beginning and Female Farmers' Productivity and Access to Credit from Traditional and Nontraditional Lenders. *Valentina Hartarska*, Auburn University.

   The agricultural finance literature has shown that farmer productivity is affected by credit constraints and that beginning farmers and ranchers (BFRs) and women farmers are more credit constrained. While traditional agricultural credit markets remain local, the growth of financial services by non-traditional lenders (NTLs) and online banking may decrease the role of distance and geography and expand access to credit previously confined to local credit markets. Regulatory changes and demand factors have led to consolidation of traditional agricultural lenders and have resulted in multiple closures of bank branches in rural America, which may provide opportunities for the NTLs to supply more credit to agricultural producers and thus potentially influence the productivity of the sector. In this paper, we investigate whether access to local branch infrastructure by the FCS, banks and credit unions (BCUs), and alternative financial services providers (AFS) is related to productivity of BFRs and women principal operators. The results show that there is no association between the choice of traditional or non-traditional lender and the productivity of BFRs or women producers, which suggests that use of NTLs does not seem to either benefit or hurt BFR and women

producers. However, credit constraints may negatively affect productivity because BFRs and female operators with larger number of loans are less productive. This has important consequences for agricultural production and suggests that policies to alleviate credit constrains for BFRs and women farmers remain relevant.

3. 1:40 ***u** Understanding Effective Healthcare Education Media for American College Students. *Carson Caulfield,* Samford University.

College students in the United States are nearing the age where they will need to cover their own healthcare expenses, establish an insurance plan, and find healthcare resources. It appears that some students lack basic knowledge about how to utilize healthcare resources and handle healthcare expenses. Public health education could be better utilized to educate students about these important healthcare topics. Through a comprehensive survey, this study seeks to address this issue of improper messaging of healthcare education. The study begins with asking participants to answer eight short questions that test their healthcare literacy which stretches across different aspects of healthcare. Many of these questions would be recycled from previously existing healthcare literacy tests, such as the Pew Research Center and the Agency for Healthcare Research and Quality. Participants were asked where they believe they are most likely to find this type of information. Options included social media, online modalities, visiting with a provider, and other common places for educational media. Participants were then asked where they would prefer to see these messages. This question was designed to uncover if there are differences between preferred methods of healthcare education communication versus the most typical methods of healthcare education communication. One of the common issues with communicating educational messages is not the message itself, but the avenue and setting in which the message is communicated. Healthcare communication is not immune to this problem, and this study seeks to better understand this issue.

4. 2:00 ***g** The Effect of Gender Identity Threat on Perceptions of Sexual Assault and Coercion. *Linda Pilkington* and John Shelley-Tremblay, University of South Alabama.

Many Americans will experience sexual violence during their lifetime, and the present study investigated this issue. The effect of sexual violence that an individual faces may have a direct effect on their psychopathological outcomes. The present study aims to investigate the personality traits that underlie the tendency to blame a victim for their assault, as well as explore the roles of hostile sexism, rape myth acceptance, and other personality traits in victim-blaming. To explicate this aim, participants were randomly assigned to experience a gender identity threat or confirmation prior to taking a series of personality measures. Four vignettes were presented to participants, and they were asked to assign blame to a victim or perpetrator of a criminal act. Results showed that hostile sexism was the largest predictor of victim blame, while rape myth acceptance did not predict victim-blaming. The present study demonstrates the need for further

investigation of the relationship between rape myth acceptance and victim-blaming.

5. 2:20 Supply Chain Innovations that Foster Brick-and-Mortar Retailer Success: A Literature Review. *Cynthia Lovelace*, Athens State University.

   The local retailer has been struggling of late, for a variety of reasons. The consumer's appetite for shopping-from-the-couch is taking away their opportunities to shop local, along with the livelihoods of their friends and neighbors who work there and (too often) the local tax dollars generated from those sales. Online sales are also impacting the environment, replacing single full truckload deliveries to local stores with many local parcel deliveries, as well as increasing product returns, each of which also require returns shipping. Consumers will not choose local shopping experiences, American goods, or environmentally friendly packaging if the choice requires more effort, less convenience, or inferior product choices. These options must compete for the consumer's business. For the local retailer, this means that they must compete on product selection, availability, and price, all the while building upon their competitive advantages of proximity to customer, concierge customer service, and touch-and-try shopping opportunities. Their ability to compete going forward will be aided by innovative supply chain and inventory management technologies, as well as forward-thinking changes in retail management strategy. This literature survey will demonstrate that there are strategies and technology innovations available to retailers that allow them to preserve the in-store shopping experience for their customers, make a profit while doing so, and contribute to local communities via their retail presence there. Opportunities for future research will also be identified.

6. 2:40 The Benefits of College or University Retirement Communities. *Beverly Myers*, Stillman College.

   The number of Americans age 65 and older is rapidly increasing. By 2034, there will be more adults age 65 and older than children under age 18 years old (U.S. Census, 2018). Many retiring baby boomers want to remain physically active and intellectually stimulated. They want to live in intergenerational environments. As a result, the number of college and university retirement communities is rapidly growing to meet the needs of this aging population. The purpose of this presentation is to explore retirement life at college and university-based retirement communities. The benefits of living on a college or university campus for seniors interested in lifelong learning will be explored. Common features of current college and university retirement communities, such as access to a variety of housing options, academic engagement, transportation services, and access to fitness centers, cultural and sports events, and much more, will be explored in depth.

7. 3:00 ***g** Investigating the Three Factor Model of Avoidant/Restrictive Food Intake Disorder: A Confirmatory Factor Analysis of the Nine Item ARFID Scale. *Emily Ruff*, Hana Zickgraf, and John Shelley-Tremblay, University of South Alabama.

   Avoidant/Restrictive Food Intake Disorder (ARFID) is an eating disorder that has three distinct presentations. These are categorized as sensory sensitivity, a lack of interest in eating or food, and fear of aversive consequences. The present study seeks to confirm the three-dimensional model of ARFID with the Nine Item ARFID Scale, which aims to serve as a clinical diagnostic measure for ARFID. Participants were recruited through a pediatric clinic intake registry after undergoing a mental health screening and retrospective chart analysis. This resulted in n = 328 participants that were given the NIAS scale as well as several other measures to assess parent-child rating, eating behaviors, and anxiety. The ARFID factor structure for the three-dimensional model was confirmed through a confirmatory factor analysis using structural equation modeling.

8. 3:20 ***g** Depression Linked to Inflammation Around the mtDNA. *Cindy Von Ahlefeldt*, Niyooosha Kandezi, Boriana Lassiter, Jack Shelley-Tremblay, and Claire Deming, University of South Alabama.

   The purpose of this study is to contribute to the literature in determining the link between inflammation surrounding the mtDNA and MDD. MDD is a mood disorder that is an important public health problem affecting 350 million people, with treatments only 30-60% effective, but newer evidence suggests that impaired mitochondrial bioenergetics can contribute to the pathophysiology of MDD. This can be seen through pathways such as inflammation. Inflammation is important for cell health as well as protecting cells from further damage. Inflammation in previous research has been linked to depression and we see inflammation around the mtDNA when a person becomes stressed. When exposed to stressors mtDNA releases proteins to protect cells from damage, this is important for cell health, but if we are overexposed to stressors and inflammation stays surrounding the mtDNA this can lead to mtDNA mutations, that can lead to a dysfunction in cells. We established a study to better understand the links between DAMPS and depression. The study will consist of self-report measures that measure depression and anxiety. It will also consist of a stressor and a control condition. We intend to determine the link between the stressor and inflammation. We hope to find that physical pain as induced by the algometer will cause the release of damps and lead to a significantly higher level of damps than the SHAM stressor control condition. Psychological risk factors mediate the relationship between physical pain and the release of damps, and that anxiety will be a positive mediator between physical pain and damps. Depression will be a positive mediator between physical pain and damps. Lastly, participants who score higher on the PCS scale will have a shorter trial length on the pain test and will show a higher level of DAMPS.

9. 3:40 ***u** Health Disparities Among Immigrants in the United States: Developing an Equitable Policy Initiative. *Mikiah Dumas* and Mary Parker, Samford University.

Access to affordable healthcare in the United States can depend on an immigration status outside of prospective citizens' control. This can have a detrimental impact on immigrants in America. The public charge policy surrounding immigrants applying for legal permanent residency makes immigrants hesitant to use healthcare, limiting their access and having negative effects on their health. A public charge is someone who uses public benefits typically reserved for citizens, despite not being legal citizens (Lowrey, Van Hook, 2021). Past public charge rules determined an immigrant's likelihood of being a public charge by taking into account several factors, including age, health, income, contribution to the economy, public benefits use, and English fluency. The newest public charge policy issued by the Trump administration formalized this rule and took into account an immigrant's use of health care services in the past added to their presumed future use, as well as past and present use of federal food and housing assistance (Lowrey, Van Hook, 2021). This policy scares immigrants from using public benefits even if they qualify for them and restricts their access to healthcare without consequence. Our policy involves warning against a public charge rule that takes into account English fluency, the need for immigrants to prove they are more or less likely to be a public charge in the future, and the use of public healthcare in the past or future as grounds to be inadmissible, especially for DACA users or illegal immigrants.

SECTION VI. ANTHROPOLOGY
Paper Session
10:00 AM – 11:00 AM
Waters Hall, Room N 105
Jason Heaton, Presiding

1. 10:00 Primates, Not Pets: A Review of Research on Imagery Negatively Influencing Wild Primate Populations. *Sherrie Alexander*, University of Alabama at Birmingham.

   Because of their behavioral and physical similarities to humans, nonhuman primates are often sought as pets around the globe. The purchase of primates as pets is often influenced by misleading imagery of humans in close proximity to these animals. Such images create the perception that these animals are suitable as pets or may be abundant in the wild. However, because primates have highly specialized needs, they often have a poor quality of life and diminished physical health when kept as pets. Moreover, over 65% of all wild primate species are endangered according to the IUCN Red List; thus, it is critical to address the pet trade threatening wild primate species and the underlying conditions fueling it. As a result, an increasing number of researchers have demonstrated a definitive link between imagery of humans in close contact or proximity to primates to the demand for these animals as pets. Additionally, the IUCN Primate Specialist Group Section for Human-Primate Interactions has generated guidelines for professionals and institutions working with nonhuman primates in various capacities. It is critical that the public and professionals alike take action to reduce the demand for these animals as pets through education and promotion of primate-friendly imagery.

2. 10:20 ***u** Duration of Breastfeeding Among Alabama Mothers (2011-2018). *Reilly Vought* and Jason Heaton, Birmingham-Southern College.

   In western societies, the rate of breastfeeding, and its duration, are considerably lower than that typically observed among hunter-gatherers (e.g., duration = ~3 years). Research suggests that decreases in breastfeeding duration may have adverse outcomes for the mother (e.g., postpartum depression or PPD). Though breastfeeding patterns must be assessed before associations of duration and outcomes can be considered. Within the US, considerable regional variation makes comparisons difficult. This pilot study aims to determine Alabama's breastfeeding rates over ten years (2009-2018). The percentage of mothers breastfeeding at 3, 6, and 12 months was obtained from the Centers for Disease Control and Prevention's (or CDC's) National Immunization Survey (NIS). Data also included whether breastfeeding was supplemented with formula. Like other studies, our analysis indicates that average breastfeeding rates across all categories are significantly ($p < 0.01$) lower in Alabama than nationally (e.g., the initial rate in 2018 = 70.6% to 83.9%, respectively). During 2011-2018, the

percentage of Alabama infants receiving any breastmilk rose slower than the national average ($r2 = - 0.577$, $p = 0.019$). Yet, the national and Alabama averages of infants breastfed exclusively at three and six months rose together ($r2 = 0.929$, $p < 0.001$). Interestingly, the percentage of exclusive feeding experienced a sharp increase in Alabama, nearly doubling during this interval (2011 = 13.2% to 2018 = 23.6%). This increase was greater than that observed nationally (2011 = 18.8% to 2018 = 25.6%). With the patterns established, future research will assess levels of PPD among Alabamian mothers.

SECTION VI. ANTHROPOLOGY
Poster Session
10:40 AM – 11:00 AM
Sandridge Student Center, Ballroom/Annex
Jason Heaton, Presiding

3. ***u** Cross-Cultural Comparisons of Breastfeeding and Weaning Among Traditional Hunter-Gatherers. *Mary Katherine Stewart* and Jason Heaton, Birmingham-Southern College.

The brevity of breastfeeding has been suggested to contribute to increased postpartum depression (PPD) among western cultures. However, as many supplement breastfeeding with formula, it is difficult to determine an 'evolutionarily' relevant estimation of the ancestral weaning age. For this analysis, we collected information on traditional hunter-gatherer populations from the Human Relations Area Files (eHRAF). Our search included the terms 'breastfeeding' and 'weaning'. The results were filtered for "hunter-gatherers" and were not geographically restricted. Thirty ethnographies, spanning the years of 1903-2010, were recovered. Less than half reported quantitative values for the age at weaning, with most providing qualitative observations (e.g., after the birth of another child). Based on our limited sample ($n =13$), our estimation for the average weaning age among hunter-gatherers was 30 months ($SD = 17.3$; range: 12-72). Shorter breastfeeding periods were observed in higher latitudes (e.g., the arctic and subarctic), while 87% of those breastfeeding beyond three years ($n = 7$) were located within the tropics. Though, the negative correlation of latitude and breastfeeding age was not significant ($r2 = -0.32$, $p = 0.15$). Over half (54%) of the samples employed negative practices, such as placing bitter substances on the breast when weaning. Our preliminary analysis suggests that the average age at weaning is considerably longer among traditional hunter-gatherers and may be ecologically influenced.

SECTION VII. STEM EDUCATION
Paper Session
10:00 AM – 12:00 Noon
Waters Hall, Room S 105
J. Jeffrey Morris, Presiding

1. 10:00 Engaging Students in a Genetics Course-based Undergraduate Research Experience (CURE) Exploring Disease Utilizing Bioinformatics and in Hybrid Learning. *Ashley Tu*rner and Natalie Forte, Jacksonville State University; Anil Challa, University of Alabama at Birmingham; and Katelyn Cooper, Arizona State University.

   With the intent to explore disease utilizing the Caenorhabditis elegans model, we developed a course-based undergraduate research experience (CURE) in a hybrid learning environment. Using a combination of bioinformatics and 'wet lab' tools, students analyzed the conservation of genes and structure-function analysis of clinical variants of unknown significance (VUS). The CURE was offered three consecutive semesters and included a series of tutorials and research and 'wet lab' sessions. Each student selected a disease of interest and worked with a set of tools and series of methods to identify a disease-associated human ortholog gene in the C. elegans genome and conserved VUS. Students took identified conserved VUS into 'wet lab' to design and test a PCR-based assay to serve as a downstream genotyping test. Discussions, responsible conduct of research training, electronic lab notebooks, iterative project reports, quizzes, and group oral presentations were assessed for mastery of learning objectives and research progress. We assessed the impact of the CURE on students' cognitive and emotional ownership using a closed-ended survey administered at the end of the semester. We also examined to what extent students' reasons for choosing their disease of interest influenced their cognitive and emotional project ownership. We found that students developed notably high cognitive and emotional ownership, comparable with CUREs taught in-person. Analyses also suggest that students with more personal reasons for disease selection demonstrate higher cognitive and emotional ownership compared to students without a personal reason for disease selection. CUREs can be effectively offered in hybrid learning across varying modalities.

2. 10:20 ***g** Takeoff Killer - As-Loaded Stall Speed. *Len Naugher* and J. Wayne McCain, Athens State University.

   A statistically significant number of fatal aircraft accidents occur during takeoff and landings, and a large percentage of these are related to unintentionally stalling the aircraft at relatively low altitude. This study briefly examines the accident history of stall fatalities during takeoff and landings. It is hypothesized that some of these accidents are caused by pilots maneuvering to a 'aircraft handbook' derived stall speed, or their 'normal' stall speed, without taking into consideration changes due to the weight loading situation (e.g. stall speed increases proportional

to gross weight). Some accident statistics are presented along with a simple and straight-forward method for adding the 'as loaded stall speed' to a pilot's checklist. Such considerations before taking flight, could make a pilot better prepared and more successful in mitigating the risks associated with stall-related accidents.

3. 10:40 ***u** Amateur Radio in STEM Education. *Roy Nagle* and J Wayne McCain, Athens State University.

   Amateur (Ham) Radio has been a contributor to education and learning since it's inception in the early 1900's. Today it involves motivating school-aged students to learn more science, technology, engineering, and math (STEM) skills by giving them an example of a 'hands-on' application. From Ohms Law to radio wave propagation, Amateur Radio is pertinent to it all. This paper will present the history of Ham Radio in education and the modern-day endeavors such as Moon-bounce and small satellite communications. It will also show how students may become licensed to operate their own Ham Radio station. The Athens State Amateur Radio Station (call sign W4CQD) will also be featured.

4. 11:00 Your Future is Now - The New Bachelor of Aerospace Systems Management. *J. Wayne McCain* and Jim Kerner, Athens State University.

   Athens State University has offered a Aviation Management minor to its Management of Technology Degree since 2006 for primarily students having a two-year degree in the field (e.g. Wallace State and Calhoun). This past year, the College of Business completed development and approval of a new bachelor degree in Aerospace Systems Management for Alabama's workforce seeking an online program to further their aviation and space career paths. The new Bachelor of Aerospace Systems Management (BS-ASM) degree provides a two-plus-two degree opportunity for students hoping to lasso their career to the dynamic and expanding field of aviation and space systems management. This paper will document the degree development and illustrate its appeal to career-minded Alabama (and world-wide for that matter) students at a point in time where these two areas of endeavor are expanding at an exponential rate! Details of the degree curriculum will also be presented. Even though the degree is offered as a 100% distance learning program, it will employ many 'hands-on' educational experience for students such as the STEM-SAT1 spacecraft launch and experimental aircraft build projects now underway.

5. 11:20 STEM-SAT1 Procceding To Launch in 2023. *J. Wayne McCain* and Michelle Rosh, Athens State University.

   The STEM-SAT1 Radio Astronomy CubeSat project has been under development since 2018. The project seeks to launch into Earth orbit a 3-Unit CubeSat that will receive Very Low Frequency radio signals that are normally blocked by Earth's atmosphere and re-transmit these data to ground-based receiving stations worldwide. A milestone was met when in Summer of last year (2021), an Agreement was signed by Vaya Space of Cocoa, Florida and Athens State

University to launch the spacecraft on a Vaya Dauntless vehicle in the 4th Quarter of 2023. Detailed design and development of the craft is underway by a collaborating group of educational institutions and STEM students throughout the State and even around the world! This paper updates the STEM-SAT1 Mission Plan and provides the latest design details.

6. 11:40 Spaceflight Mission Control Simulations for STEM Students. *Gael Mariani*, J. Wayne McCain, and Michelle Rosh, Athens State University.

When Gene Kranz was hired by NASA's Christopher Kraft in the early 1960's, little did he know that he would go on to be the Flight Director for Apollo 11, which successfully landed humans on the Moon in NASA's first attempt, July 1969. His earlier years saw him, along with Kraft and others, form the backbone of the Mercury, Gemini, and finally Apollo programs - the function of Mission Control. This paper presents a description of Athens State's Mission Operations and Communications Center (MOCC) being developed to support the Aerospace Systems Management degree program in such related courses as the ASM 482 'Mission Planning, Control, and Communications'. The MOCC has already been used to simulate Falcon Heavy launches from Cape Canaveral and the Entry, Descent, and Landing of a crewed mission on Mars. Presenter Gael Mariani (Wales, UK) has a Mission Support background from the Mars Society and has contributed to development of the MOCC. Mission simulations and training has been a major contributor to NASA's overall mission success and is a valuable tool for student 'experiential learning'.

SECTION VII. STEM EDUCATION
Poster Session
1:00 PM – 2:30 PM
Sandridge Student Center, Ballroom/Annex
J. Jeffrey Morris, Presiding

7. Accessing Student Perceptions of Emotional Benefits of Cadaveric Dissection in Graduate Anatomy Education. *Katelynn Corder*, Camryn Pierce, Amanda Howard, Mark Caulkins, and Katelynn Corder, Samford University.

Due to a global increase in computer use, technological advancements, and software which has become available in recent years, the idea of replacing cadaver dissection and traditional lecture halls in anatomy classes with these new technological options has become a common topic of discussion. While many studies have shown the great benefits of online learning with virtual dissection options, others stand firm in supporting traditional learning methods with in-person, hands on cadaver dissections. For practical, educational, social, and other reasons, cadaver dissections continue to gain support from

anatomy learners and teachers alike. Ethical and emotional worries may be a deciding factor when choosing the mode of teaching. In this study, we surveyed students in three health-related graduate programs with a required cadaver-based anatomy course and evaluated perceptions of increased confidence and fostering of a healthy balance between objectivity and empathy for future patients.

8. Impact of Journal Clubs on Measures of Evidence-based Practice. *Kelly Atk*ins and Nick Washmuth, Samford University.

   Evidence-based practice (EBP) involves integrating research findings, clinical expertise and patient preferences to optimize patient care. EBP knowledge and skill acquisition is emphasized in a variety of health science fields, and journal clubs (JC) involving active critical literature analysis and clinical applicability discussion are one method to foster EBP skills. Despite their popularity as a teaching tool, little quantitative evidence supports their effectiveness in the allied health field. This study aimed to assess the impact of student-led journal clubs on measures of EBP skills of physical therapy students. 72 physical therapy (PT) students at Samford University led and/or participated in JC throughout 2020-2021. Student objectives were to select timely research articles covering diverse topics related to PT, critically analyze study design and methodology, and discuss clinical application of results. The Evidence-Based Practice Profile questionnaire (EBP2) was used to quantify EBP skills across 5 EBP domains and was administered upon completion of journal club activities each semester. On average, students scored highest in EBP relevance (88.9-91.1%), terminology (70.8-83.7%) and confidence domains (66.8-79.7%) and lower in sympathy (65.8-72.3%) and practice domains (52.5-52.9%). Significant improvements were observed in EBP terminology, practice, and confidence domains across semesters. Although future research is warranted to optimize JC design and strategy, these findings suggest that involvement in the JC activities reported here can improve skills related to EBP. Importantly, JC activities are relevant to a growing number of fields and can easily be utilized in a variety of educational settings and disciplines.

9. ***u** Aviation in STEM Education. *Amelia McCain*, Faith Hooper, and J. Wayne McCain, Athens State University.

   Aviation is 'taking off' again and there are shortages in all careers from pilots to mechanics, including managers and other skilled workers. Women are also playing a major role in these endeavors at all levels - a trend started by Amelia Earhart in the 1930's. Amelia also started the first women's aviation organization, the 99's, which is alive and well today and actively promoting STEM. This poster will present a brief history of Aviation as it relates to STEM education, including the contributions and opportunities by/for women. Athens State's new Aerospace Systems Management degree program (both aviation and space systems) will be featured along with the Athens AIAA (American Institute of Aeronautics and Astronautics) Student Branch.

10. ***g** STEM-SAT1 - Radio Astronomy CubeSat Project. *Brandi Wheeler*, Michelle Rosh, and J. Wayne McCain, Athens State University.

This poster will depict an overview and limited details on the on-going STEM-SAT1 cubesat project scheduled to launch in 4th quarter, 2023 on a Vaya Space, Dauntless launch vehicle. Student participation will be illustrated along with a timeline of the STEM-related, This Radio Astronomy spacecraft that will monitor and re-transmit Very Low Frequency (VLF) signals from space that are normally blocked by Earth's atmosphere.

11. ***u** Light in the Sky, *Harmonie Wildharber*, University of North Alabama.

Light pollution from city lights affects the ability of Astronomers to clearly view the night sky. Sky Quality Meters scan an area of night sky and record the amount of light found in that area, giving an accurate measure of light pollution present in the area. Using the mean of each set of recordings, a map can be made detailing how much light pollution is present in areas around the city. Charting these readings give scientists an idea of where light pollution is strongest, helping them know where to concentrate efforts to preserve wildlife, set up observatories, and monitor the pollution’s effect on a global scale.

SECTION VIII. ENVIRONMENTAL AND EARTH SCIENCE
Paper Session
1:00 PM – 1:20 PM
Waters Hall, Room N 201
Jonghwa Oh & Shaoyang Liu, Presiding
Session

1. 1:00 ***g** Inkjet-Printed Plasma-Functionalized Polymer Based Capacitive Sensor for Polycyclic Aromatic Hydrocarbon from Water. *Renjith Rajan Pillai*, Kiran Adhikari, Surya Sunilkumar, Shruti Sanas, Steven Gardner, Haider Mohammed, and Vinoy Thomas, University of Alabama at Birmingham.

   Inkjet printing technology is utilized to foster conducting layers, interconnections, and other features on different substrates and the success greatly depends on the surface properties of the substrates. In this work, we report the usage of low-temperature plasma treatment for tailoring the surface properties of PET-polymer and subsequent inkjet printing of the capacitive sensor design using silver nano-ink. We have systematically investigated the use of organic monomers as plasma precursors, and oxygen plasma for improving the surface hydrophilicity and subsequent adhesion of silver nano-ink on PET. We hypothesized that the plasma surface modification of PET could provide a better interface for inkjet printing of nano-ink, which leads toward the fabrication of a better sensing platform. Systematic characterizations such as FTIR, XPS, AFM, SEM, and contact angle measurements, were performed to validate this hypothesis. Conclusive evidence for increased surface wettability of plasma treated PET is obtained from water contact angle studies. The SEM and AFM imaging was used for characterizing the surface features and nanoscale roughness of the PET surface. The capacitive sensor is fabricated using silver nano-ink and utilized to sense the amount of polycyclic aromatic hydrocarbons (PAHs) in water. The capacitance measurement results for a series of different PAH concentrations have demonstrated a linear response of capacitance with increased concentration. The sensor has demonstrated excellent sensitivity for PAH concentration up to 0.1 ng mL-1. Taken together these results have clearly suggested the good futuristic potential of this device for pollutant sensing applications.

SECTION VIII. ENVIRONMENTAL AND EARTH SCIENCE
Poster Session
1:30 PM – 2:30 PM
Sandridge Student Center, Ballroom/Annex
Jonghwa Oh & Shaoyang Liu, Presiding

2. ***g** Air Pollution Exposure in Alabama as it Relates to Demographic Associations and Proximal Pollution Sources. *Sharee Small*, Rouzbeh Nazari, and Maryam Karimi, University of Alabama at Birmingham.

   Air pollution, a major contributor of health disparities, disabilities, and mortality is considered to be the fifth and fourth health risk globally. Around the world, more than 85% of the population is exposed to PM2.5 concentrations greater than that recommended by the WHO guidelines. The current National Ambient Air Quality Standards for PM2.5 is 12μg/m3 and 10μg/m3 according to the WHO. There has been evidence to show that total suspended solids (TSP) and ozone concentrations coupled with offensive weather have contributed to increased mortality in the Birmingham, AL area. The increased exposure to high levels of pollutants attribute to the increased health disparities, therefore increasing the financial and economic stress on individuals. The study will develop a data platform that links the demographic data (race, income, education, age, marital status, and seasonal differences), primary air pollutant data (PM2.5, SO2, NOx, and Ozone), and possible pollution sources for the state of Alabama. The information gathered will strive to answer the question of how does the demographical information of a person and their primary domicile geographical locations correlate to the exposure of increased concentrations of air pollutants and consequently the adverse health effects caused by them. The study will extract data from the GitHub repositories, American Community Survey (ACS) as well as other models and databases. The expected outcomes will correlate with previous research results that there are lower pollution concentrations in areas of higher income households and predominantly white neighborhoods and that the higher pollutant concentrations will be in the geographical locations that are in the neighborhoods with lower socioeconomic statuses, lower education attainment, single family households, and during the warmer (summer) months of the year.

3. ***u** Investigation of Chemical Composition of Post-Consumer Recycled Polypropylene with Spectrometric Methods. *Amber Johanson*, Jarome Amos, Taylor Chambers, and Shaoyang Liu, Troy University.

   Polypropylene (PP) is a semi-crystalline thermoplastic with low material density, good mechanical property, and excellent chemical resistance. It has been widely used in packaging and other areas, which results in a huge amount of PP waste and raises serious environmental concerns. Recycling is an effective way to reduce PP pollution. However, sorting of complicated post-customer recycled plastics is challenging. Since polyethylene (PE) has similar density of PP, it is difficult to separate the two materials. As a result, PE is often a major contaminant of post-consumer recycled PP and affects the quality of the

recycled plastic products. The compositions of three post-customer recycled PP samples were investigated in this work to evaluate the contamination level in the recycled feedstock. The recycled PP samples were downsized and washed, but not pelletized. Raman spectrometry was firstly used to sort the samples. The portion that was unable to be identified via Raman spectrometry were further sorted using Infrared spectrometry. The first sorting via Raman spectrometry yielded 76.7 ± 8.6, 11.7 ± 1.9, and 11.6 ± 6.7 wt% of PP, PE, and unidentified materials, respectively. The unidentified portion was then analyzed via IR spectrometry and yielded 56.6 ± 6.3, 26.0 ± 9.8, and 17.4 ± 12.5 wt% for PP, PE, and unknown samples, respectively. The overall percent weights after sorted with both Raman spectrometry and IR spectrometry were 83.7 ± 4.4, 13.7 ± 2.7, and 2.6 ± 2.1 for PP, PE, and unidentified plastics, respectively. The results demonstrated that PE was the major contaminant in the post-customer recycled PP, and about 3wt% of other contaminants were found. This research would help the recycling industry better understand their feedstock compositions and ensure their product quality.

4. ***g** Cooling Potential of Different Vegetation Covers in a Heat-Stressed Underserved Community, North Birmingham, AL. *Samain Sabrin*, Rouzbeh Nazari, and Maryam Karimi, University of Alabama at Birmingham.

   Adding green covers is one of the strategies to improve street-level thermal-comfort due to their heat mitigating properties. This study quantifies the effects of different green covers including shade-trees, grass, and shrubs on microclimate in an industry-driven residential area of North Birmingham, Alabama. For the hottest days of 2020 summer in Birmingham, we observed the role of existing build environment with different vegetation covers on the canopy-level thermal comfort. Human biometeorological parameters (mean radiant temperature, Tmrt; physiological equivalent temperature, PET; universal thermal climate index, UTCI) were evaluated as a measure of thermal comfort by employing a CFD-based microclimate model, ENVI-met. Result shows that tree types and their characteristics determine the level of thermal comfort pedestrians feel in the daytime, which is measured in terms of Tmrt, PET and UTCI. The study will provide insights on effective green cover scenario to maintain a more comfortable pedestrian environment to be utilized for future intervention.

5. ***g** Noise Exposure during Backpack Blower and Grass Trimming Operations: A Pilot Study. *David McMahan*, Andrew Spivey, Jonghwa Oh, Claudiu Lungu, University of Alabama at Birmingham.

   Gas-powered backpack blower (GBB) and grass trimmers (GGT) can cause adverse health effects such as noise-induced hearing loss. This pilot study aimed to evaluate short-term personal noise exposures from a GBB and GGT operated under controlled laboratory conditions.
   Experiment conducted using a CR:110A doseBadge Noise Dosimeter (Cirrus Research plc. North Yorkshire, UK). Dosimeter worn on subject's shoulder to measure noise levels in A-weighted equivalent continuous sound level (LAeq) and average sound level (Lavg) near worker's ear. Threshold level and exchange rate were set at 80 dB(A) and 5 dB(A).

A commercial-grade GBB and GGT (BR 350, 430, and FS 91 GST STIHL, Inc.) were used. Study participants (n=2) simulated 3 types of GBB, GGT operations- cranking, idling, full-throttle. For both simulations, initial cranking noise measured until engine started, idling noise was measured for 5-minutes without movement. For full-throttle the GBB and GGT were swung side to side for 5-minutes at 1 to 1.5-second intervals. This was repeated in triplicate.

GBB participants 1 and 2, reached 98.3 ± 0.9 dB(A) and 98.6 ± 0.9 dB(A) for Leq, and 98.4 ± 0.9 dB(A) and 98.7 ± 0.9 dB(A) for Lavg, respectively. GGT participants 1 and 2, reached 96.6 ± 1.1 dB(A) and 98.8 ± 1.1 dB(A) for Leq, and 96.7 ± 1 dB(A) and 98.8 ± 1 dB(A) for Lavg, respectively. Findings indicate GBB and GGT operator would be exposed above OSHA AL of 85 dB(A) if operating the tool for an entire 8-hour shift, requiring inclusion in the hearing conservation program.

6. ***g** Mass Recovery of Diffusively Sampled Volatile Organic Compounds via Photothermal Desorption. *Jacob Shedd*, University of Alabama at Birmingham; Evan Floyd, University of Oklahoma; and Jonghwa Oh and Claudiu Lungu, University of Alabama at Birmingham.

Volatile organic compounds (VOCs) are common sources of occupational exposure due to their commonplace usage in a variety of industries. To protect the health of exposed personnel, field hygienists must conduct compliance sampling. In efforts to improve upon analytical sensitivity and time-to-knowledge of existing VOC exposure assessment methods, the industrial hygiene research group at UAB has developed an emerging, pre-analytical technique known as photothermal desorption (PTD), which uses pulses of high-energy light to desorb analytes from thermally conductive, carbonaceous sorbents. Since PTD's inception, the theoretical framework and advances in sorbent fabrication have been investigated, however, further work is needed to produce a field-ready sampling device for use with PTD. As such, the present work focuses on development and characterization of a PTD compatible, prototype, diffusive sampler. The objectives of this study were two-fold: design and manufacture a prototype sampler and determine the percent analyte mass recovered by PTD of toluene and n-hexane collected by the sampler in a dynamic sampling chamber. In executing these objectives, the percent mass recovery of toluene and n-hexane were found to be 6.0 ± 0.8% and 33 ± 3% per PTD pulse, respectively. The observed differences in toluene and n-hexane desorption are likely attributed to the varying types of weak intermolecular forces acting on aromatic rings and aliphatic chains. The early-stage, prototype characterization data presented in this study, demonstrates the promising nature of PTD used with passive air samplers and provides a solid foundation for future development of the pre-analytical technique and accompanying sampling devices.

7. ***g** Hand-transmitted Vibration (HTV) Exposure from Hand-held Power Tools. *Nathan Chen*, University of Alabama at Birmingham; Charles Boyd, Lockheed Martin Missiles and Fire Control; Jonghwa Oh, University of Alabama at Birmingham.

Hand-Arm Vibration Syndrome (HAVS), the complex of vascular, neurological, and musculoskeletal disorders, is induced by long-term, excessive exposure to hand-arm vibration (HAV). However, vibration exposure assessment among groundskeepers is very limited in the U.S. and the effects of gloves on vibration levels have not been adequately considered in exposure assessment. In this study, a laboratory assessment of HAV exposure from grounds maintenance equipment operation was performed. The effects of wearing general-purpose safety gloves were also examined.
HAV exposure assessment was conducted by two right-hand dominant operators during five-minute operations of a gasoline-powered grass trimmer, backpack blower, and chainsaw under controlled laboratory conditions (IRB approval obtained). Vibration total value (ahv) was collected using vibration dosimeters (SV103, Svantek SP. Z O. O., Warszawa, Poland). The effects of wearing leather work gloves (Condor, W. W. Grainger Inc., Lake Forest, IL, U.S.) were assessed by calculating percent differences in ahv between when gloves were worn (G) and when gloves were not worn (NG) during the grass trimmer and blower operations. The simulation of tool operations was repeated three times, and the results were averaged.
ahv was 3.5~7.2, 1.1~2.3, and 3.0~3.6 m/s2 during the operations of the grass trimmer, backpack blower, and chainsaw, respectively. 11.0~31.2 and 8.3~12.1% differences between G and NG were observed for the grass trimmer and backpack blower, respectively.

Grass trimmer operation resulted in the highest vibration levels among the three vibrating tools examined in this study. The vibration attenuation effect of gloves was observed.

8. ***g** Evaluation of a Portable Gas Chromatograph (GC) at Various Toluene Concentrations. *Seunghyeon Yang,* University of Alabama at Birmingham; Gottfried Kibelka, CMS Field Products; Edward B. Overton, Louisiana State University; Jeffrey Wickliffe, Claudiu. T. Lungu and Jonghwa Oh, University of Alabama at Birmingham.

   Recent analytical trend favors the use of portable GC due to its capabilities of quick and in-situ analysis. The purpose of this study was to evaluate a prototype portable GC with flame ionization detector (FID) by comparing its performance with a conventional, laboratory GC. The portable GC/FID was calibrated at 2.5, 10, and 25 ug/ml according to the manufacturer's instructions and the traditional GC/FID (Agilent 6850) was calibrated using 6 calibration points (0.5-20 ug/ml). Four theoretical toluene target concentrations (1-9 ppm) were generated in a stainless-steel chamber using a syringe pump injecting liquid toluene into an air flow rate of 38.0 L/min. The challenge atmosphere was directly connected to the portable GC/FID sampling inlet with tubing while for the Agilent GC/FID the challenge atmosphere was sampled with sorbent tubes (Anasorb CSC 226-01) from the sampling ports of the chamber. Three replicate tests were performed at each target concentration, and for each replicate 5 consecutive measurements were made by the portable GC and two sorbent tubes were used for analysis with the traditional GC using NIOSH method 1501. The analysis with the portable GC/FID showed 1.0, 2.2, 4.6, 8.8 ppm and with the Agilent GC/FID showed 1.0, 2.1, 4.2, 8.8 ppm at target

concentrations of 1.1, 2.3, 4.5, and 9.0 ppm, respectively. R^2 of the portable GC/FID and traditional GC/FID was 0.997. The portable GC had comparable performance with the conventional method at the test conditions, along with the added benefit of a shortened sampling/analysis time (i.e., minutes vs. hours).

SECTION IX. HEALTH SCIENCES
Paper Session
10:00 AM – 12:00 Noon
Waters Hall, Room S 104
Mark Caulkins, Presiding

1. 10:00 ***u** Factors in Rates of Early Diagnoses of Critical Congenital Heart Defects. *Luke Bice* and Courtney Haun, Samford University.

   Congenital heart defects (CHDs) are any heart defects presented at birth which are a result of the improper formation of the heart. Critical congenital heart defects (CCHDs) are classified as CHDs which are incompatible with life and require surgical or procedural intervention in the first year of life. In 2013, 29.5% of infants born with non-syndromic CCHDs were undiagnosed through at least 3 days of life, meaning that these infants with severely low blood-oxygen levels, known as birth asphyxia, were left without the treatment they critically needed until they were diagnosed. Previous research has shown that newborn deaths caused by CCHDs dropped by 33% in 8 states after they implemented mandatory pulse-oximetry screenings in the first 24-48 hours of life. However, estimates of the potential effects of the expansion of mandatory pulse-oximetry screening throughout all 50 states are unknown, as are the potential effects of mandating other CCHD-detecting measures, such as fetal echocardiograms. In this study, we use current data from *Association of US State Implementation of Newborn Screening Policies for Critical Congenital Heart Disease with Early Infant Cardiac Deaths* on lives saved through newborn pulse-oximetry measurement mandates to extrapolate estimates on the economic and life-costs of the expansion of this mandatory measure in the United States. With increasing levels of mandatory CHD detection measures, passing of legislation to support interventions, and increases in CHD research funding, knowledge and care are trending upwards. The groundwork has been laid out to save lives and improve the outcomes for those with CHDs, but more research must be completed to further substantiate this evidence to result in real improvement.

2. 10:20 A 6-CpG Validated Methylation Risk Score Model for Metabolic Syndrome: The HyperGEN and GOLDN Studies. *Bre`Minniefield*, Bertha Hidalgo, Amit Patki, Rikki Tanner, Ryan Irvin, Hemant Tiwari, University of Alabama at Birmingham; and Donna Arnett, University of Kentucky.

   There has been great interest in genetic risk prediction using risk scores in recent years, however, the utility of scores developed in European populations and later applied to non-European populations has not been successful. The goal of this study was to create a methylation risk score (MRS) for metabolic syndrome (MetS), demonstrating the utility of MRS across two race groups using cross-sectional data from the Hypertension Genetic Epidemiology Network (HyperGEN, N=614 African Americans (AA)) and the Genetics of Lipid

Lowering Drugs and Diet Network (GOLDN, N=995 European Americans (EA)). To demonstrate this, we first selected cytosine-guanine dinucleotides (CpG) sites measured on Illumina Methyl450 arrays previously reported to be significantly associated with MetS and/or component conditions in more than one race/ethnic group (CPT1A cg00574958, PHOSPHO1 cg02650017, ABCG1 cg06500161, SREBF1 cg11024682, SOCS3 cg18181703, TXNIP cg19693031). Second, we calculated the parameter estimates for the 6 CpGs in the HyperGEN data (AA) and used the beta estimates as weights to construct a MRS in HyperGEN (AA), which was validated in GOLDN (EA). We performed association analyses using a logistic mixed models to test the association between the MRS and MetS, adjusting for covariates. Results showed the MRS was significantly associated with MetS in both populations. In summary, a MRS for MetS was a strong predictor for the condition across two race groups, suggesting MRS may be useful to examine metabolic disease risk or related complications across race/ethnic groups.

3. 10:40 Diet, Anxiety and GI Quality of Life: Is There a Link? *Mickie Powell*, Kathleen Harris, Amandiy Liwo, Bijal Bashi, Rosianna Gray, Alan Whitehead, Christopher Grahm, James A. Bibb, Chandler M. McLeod, Stephen A. Watts, and Gregory D. Kennedy, University of Alabama at Birmingham.

   College life can be stressful, especially for freshman students living away from home for the first time. Students are often making food choices on their own and many of the fast and convenience foods they consume are high in calories, fat, sugar, and salt. Studies have shown that under stress students gravitate to foods high in sugar, salt, and caffeine. As college instructors we have observed an apparent increase in self-reported student anxieties due to stress and gastrointestinal (GI) issues. Could the combination of stress and poor diet in college students manifest itself in the form of gastrointestinal issues? To better understand how diets and perceived student stress, and/or depression, are impacting student GI health we have developed a survey for students in our introductory biology labs. This survey is designed to measure lifestyle factors such diet, stress, anxiety, and depression that may contribute to GI quality of life. Initial data from this survey suggests that students consuming chips, snacks and sweets have an increase in bowel pain that negatively impacts their daily activities. This same trend was also observed in students who reported experiencing increased mental distress and anxiety. Students with gastrointestinal pain scored lower on the GI quality of life index. The results of this initial survey suggest that diet and stress may be important targets for intervention to help students improve their GI quality of life.

4. 11:00 Surgical Implants Found in Student Cadaver Dissection. *Mark Caulkins*, Nick Washmuth, William Scogin, Brad Cantley, and Kathleen Caulkins, Samford University.

Implants are often found in cadavers that students dissect. Common reasons for implants are they may be post-traumatic (orthopedic hardware); they may be due to arthritis (joint replacement); they may be functional (heart valves, pacemakers); they may be cosmetic (breast implants). When they are found, they give the class the opportunity to discuss the rationale and function of these implants. The students also discuss surgical approaches to place these implants, and how the surgical trauma may affect the patient.

5. 11:20 Anatomic Variants in Student Cadaver Dissection. *Mark Caulkins*, Nick Washmuth, William Scogin, Brad Cantley, and Kathleen Caulkins, Samford University.

   Cadaveric dissection allows appreciation of three-dimensional structure and textures of the human body. It is particularly useful in the education of future clinicians who such as surgeons, physician assistants, physical therapists, occupational therapists, and nurse practitioners. Studying cadavers allows exposure with different anomalies that are found in every human body. We present some of the interesting anomalies found in the Samford University Cadaver Lab.

6. 11:40 Virtual Young Teen Asthma & Wellness Camp: A School-Based Expansion to Rural Underserved Counties. *LaBrenda Marshall*, Alabama State Department of Education, and Natalie Tidwell and Ellen Buckner, Samford University.

   In 2021 the Virtual Young Teen Asthma & Wellness Camp (VYTAWC) was expanded using a school-based model. An interprofessional team provided asthma self-management education and wellness activities to youth in three rural Alabama counties—Dallas, Greene, and Perry. School nurses led school-based teams of nurses, counselors, nutrition managers, coaches, and students from three rural schools. Geospatial data show the level of asthma burden, high-risk status due to poverty, minority populations, low educational levels, and health disparities. The high prevalence of asthma and its disproportionate harms are a significant public health issues in these communities.
   The camps were held simultaneously using Zoom. There was time for asthma self-management education using music, games, and team activities, breakout small group sessions, and big group sessions. There were designated times for wellness with exercise and cooking classes. There were 40 enrolled/registered for the camp and 22 successfully completed it.
   Lessons learned included the importance of community-based recruitment and camper/parent engagement. Technology (internet connections) proved more problematic than anticipated. The program will be sustained in future years through grant funding. Desired outcomes include reductions in missed school days and better overall asthma control. Teams found their knowledge of asthma and collaboration increased substantially during program implementation. The

Virtual Young Teen Asthma & Wellness Camp demonstrated a new model for asthma self-management education in the time of Covid-19 pandemic.
Acknowledgements: Funding was provided by the Alabama State Department of Education (ALSDE) for personnel and supplies. Support from superintendents and lead nurses was critical to program implementation.

7. 12:00 ***g** Testing the Three-step Model of Suicide: Factor Structure and Predictors of the Painful and Provocative Events Scale. *Boriana Lassiter*, Cindy Von Ahelfeldt, Niyoosha Kandezi, Jack Shelley-Tremblay, and Phillip Smith, University of South Alabama; William Billette, University of South Alabama Health System; and Mark Gillespie, University of South Alabama.

As the 10th leading cause of death in the U.S., suicide is a significant public health concern. Two influential models of suicide are the Interpersonal Theory of Suicide and the Three-step Theory of Suicide. Both assert that for suicidal ideation to progress into attempt, a person must have experienced painful and/or provocative events. The need to quantify and operationalize these kinds of events has become increasingly important.
The Painful and Provocative Events Scale (PPES) assesses how often an individual has experienced painful or provocative events throughout their lifetime. This measure has been used in several studies, but only few studies have examined the psychometric properties and factor structure of this measure. Forrest et al. (2019) developed the PPES-Revised, which contained a two-factor structure of the PPES consisting of Actual or Potential Injuries and Self-harm.
We investigated the factor structure of the PPES-R in a college student sample, as college students are at significant risk for depression and suicide. We sought to identify predictors of PPES using common measures of depression and anxiety. Undergraduates at a Southeastern U.S. university (n =190) completed the Generalized Anxiety Disorders Questionnaire (GAD-7), the Patient Health Questionnaire (PHQ-8), and a demographic questionnaire. Results indicated a 6-factor solution comprised of Antisocial/Extreme Behavior, Violence/Lawbreaking, Risky/Injurious Activities, Sexual Abuse Experience, Body Modification, and Thrill Seeking. This 6-factor structure may be more appropriate, because these factors correlate uniquely with depression and anxiety.

12:20 BUSINESS MEETING [Elect Vice-Chair with term 2023-24]

SECTION IX. HEALTH SCIENCES
Poster Session
1:00 PM – 2:30 PM
Sandridge Student Center, Ballroom/Annex
Mark Caulkins,Presiding

8. ***g** COVID-19 Vaccination Status & Hesitancy among Hospitalized patients in a Rural Community Hospital. *Lindsey Oleary*, Alabama College of Osteopathic Medicine.

   Vaccination rates for Alabama (49.9%) are lower than the national average (64.7%). This is a two-part study that aims to identify: 1) common reasons for COVID-19 vaccine hesitancy and 2) correlations of vaccination status with mortality and length of stay (LOS). Data was collected on 480 COVID-positive patients that were admitted to a rural community hospital in Alabama between 7/1/2021 and 11/1/2021, a timeframe suggestive of the COVID-19 delta variant. Upon presentation, these patients were surveyed by the infectious disease physician about vaccination status to identify common themes for not getting vaccinated. Additionally, data was retrospectively reviewed to look at discharge status (alive or passed away) and LOS to see if a correlation exists with vaccination status.
   80% of patients were unvaccinated, 7% were partially vaccinated, and 12% were fully vaccinated. The population was primarily White patients (75%), followed by Black (23%) patients, and other races (Hispanic <2%, Asian <1%). Of the 480 patients, 130 passed away due to COVID. There was no statistical significance between odds of vaccination in patients who lived versus died (OR: 0.85, 95% CI 0.51-1.44). Of the patients who were discharged, the difference in LOS was 8.4 days for vaccinated individuals and 9.8 days for unvaccinated individuals. 220 Responses were recorded for vaccine hesitancy. The most cited reasons for not obtaining the COVID-19 vaccine were medical concerns of obtaining the vaccine (21%), anti-vaccine sentiments (12%) and being too busy (10%).

9. ***g** Does Gross and Fine Motor Skills Predict Academic Achievement. *Derek Kemp* and John Shelley-Tremblay, University of South Alabama; and Julie Cwikla and Alen Hajnal, University of Southern Mississippi.

   The present study is investigating preschool-aged children's gross and fine motor skills to see how they predict academic achievement. The participants were 23 preschoolers ages 4 to 5 in Southeastern public schools. Gross motor skills were assessed using three different balancing conditions- both feet with eyes open, dominant foot with eyes open, and both feet with eyes closed- measured on a balance board that can assess Center of Pressure (COP). The Grooved Pegboard Task assessed fine motor skills. Finally, mathematical tasks were assessed on pencil and paper and reading skills were measured using Dynamic Indicators of Basic Early Literacy Skills (DIBELS). The study will investigate how fine and gross motor skills predict academic achievement in preschool-aged children.

10. Surgical Implants Found in Student-Dissected Cadavers. *Mark Caulkins*, Nick Washmuth, William Scogin, Brad Cantley, Katelynn Corder, Heather Hallman, and Paul Harrelson, Samford University.

    Implants are often found in cadavers that students dissect. Common reasons for implants are: they may be post-traumatic (orthopedic hardware); they may be due to arthritis (joint replacement); they may be functional (heart valves, pacemakers); they may be cosmetic (breast implants). When they are found, they give the class the opportunity to discuss the rationale and function of these implants. The students also discuss surgical approaches to place these implants, and how the surgical trauma may affect the patient.

11. Anatomic Varients in Student Cadaver Dissection. *Mark Caulkins*, Nick Washmuth, William Scogin, Brad Cantley, Katelynn Corder, John Hurt, and Wes Johnson, Samford University.

    Cadaveric dissection allows appreciation of three-dimensional structure and textures of the human body. It is particularly useful in the education of future clinicians who such as surgeons, physician assistants, physical therapists, occupational therapists, and nurse practitioners. Studying cadavers allows exposure with different anomalies that are found in every human body. We present some of the interesting anomalies found in the Samford University Cadaver Lab.

12. ***g** Iliotibial Band Anatomical Variation: Expansive Vastus Lateralis Insertion. *Elizabeth Brogden*, Virginia Farrar, Sarah Prince, Katelyn Riant, Mark Caulkins, Will Scogin, and Nick Washmuth, Samford University.

    The iliotibial tract (or iliotibial band) is a fundamental structure in the mechanism of action for both the hip and the knee joints. The tendon fibers of the tract originate from the tensor fascia lata (TFL) of the anterolateral thigh and insert near the lateral tibial condyle (Vieira et al 2007). The majority of the distal fibers of the gluteus maximus blend in the iliotibial tract likewise. Traditionally, the iliotibial tract has been considered a separate, fascial layer that courses over vastus lateralis muscle (Flato et al 2017). Through cadaveric dissection in a graduate anatomy course at Samford University, we have discovered an anatomical variation in the iliotibial tract that, to our knowledge, has never been previously reported. Dissection revealed an iliotibial tract whose primary insertion was into the fibers of the vastus lateralis muscle. Separation of the vastus lateralis from the iliotibial tract is performed regularly during cadaveric dissection. However, the blended fibers between the iliotibial tract and vastus lateralis found bilaterally in this cadaver made separation impossible. No other cadavers in our lab displayed this anatomical variation, and the prevalence of this anomaly is unknown. Furthermore, the functional implications of an iliotibial tract with continuous insertion into the vastus lateralis are unknown.