. BIOLOGICAL SCIENCES

A Paper

IMPROVING RAINBOW TROUT Oncorhynchus mykiss GROWTH PERFORMANCE THROUGH OPTIMIZATION OF DIET-EPIGENETIC INTERACTIONS.

Khalid Freij, University of Alabama at Birmingham; PEGGY BIGA, University of Alabama at Birmingham; BETH CLEVELAND, National Center for Cool and Cold Water Aquaculture, Agricultural Research Service (ARS-USDA) .

Section I (Biological Sciences) Papers: Thursday AM

The aquaculture industry has vastly expanded in recent years and accounts for half of seafood consumed globally. With this expansion, sustainable shifts in aquaculture must be made to access nutrients essential to human health in response to a decline in marine resources for aquafeeds. Along with shifts in aquafeed composition, selective breeding programs aid in eliminating mortality rates in fish populations aimed for the marketplace. Rainbow trout are a staple aquaculture species 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. The 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.

I. BIOLOGICAL SCIENCES

A Paper

Feeding Response of Zebrafish to a Gel-based Formulated Diet.

Logan Holfelder, University of Alabama at Birmingham; Sophie Chehade, UAB; Nicole Conner, UAB; Michael Williams, UAB; Mickie Powell, UAB ; Stephen Watts, UAB .

Section I (Biological Sciences) Papers: Thursday AM

The zebrafish, Danio rerio, as a high throughput pre-clinical animal model, has led to breakthroughs in understanding human health. The culture of this model has been thoroughly documented and optimization of husbandry requirements continues. In the past, adult zebrafish have been fed formulated, nutrient-dense granulated diets. These diets are proffered multiple times per day by either staff or robotics. Labor or mechanical costs of feeding are high in most laboratories and alternative protocols to reduce feed handling would be beneficial. A gel-based diet has been produced that has a high moisture content mimicking natural live prey, maintains its physical integrity in the water, and with one application can be consumed over the course of 24 hours. We evaluated feeding behaviors including age of consumption and utilization, feed intake rate as related to time of feeding and time of introduction of the feed into the tank, and competition. Adult fish readily consumed the diet and could effectively use the diet (estimated by >75% survival) by 18 days post fertilization (12 days after the onset of feeding). Early fish growth was highest when fed after the period of reported gut maturation (30 days). Feed intake rate was highest when the feed was first introduced into the tank during the light photoperiod and declined dark photoperiod Significant but reduced feed intake was recorded during the dark photoperiod. Feeding rate increased with increasing density of fish in the tank. These data indicate that a gel-based diet may have important application in zebrafish culture.

I. BIOLOGICAL SCIENCES

A Paper

Survivorship of Sea Urchin Lytechinus variegatus Larvae Using Novel Microculture Methods. Sydney Helton, University of Alabama at Birmingham; Sydney Helton, UAB; Sophie Chehade, UAB; Logan Holfelder, UAB; Victoria Gibbs, UAB ; Stephen Watts, UAB .

Section I (Biological Sciences) Papers: Thursday AM

For more than 150 years, sea urchins have been a recognized model to study cell and developmental biology. As deuterostomes, their early embryonic development is comparable to humans. The sea urchin's power as a high throughput model organism is supported via the production of a large number of gametes, external fertilization, and synchronous development of embryos. With the recent advent of CRISPR-Cas9 and other genome editing technologies, there is incentive to develop reliable and highly standardized sea urchin larval microculture husbandry practices for laboratories producing and utilizing transgenic sea urchins. Two important challenges of larval husbandry are microbial contamination and insufficient water agitation leading to poor survivorship. Lytechinus variegatus larvae (24 hours post fertilization; n = 5 tubes of 10 mL volume, 10 larvae per tube per treatment) were placed on a test tube rotator as a novel mechanical method of agitation appropriate for a small number of sea urchins. One treatment was exposed to a combination of 25 µg/mL penicillin and 50 µg/mL streptomycin in the first 24 hours of spawning while the other treatment was unexposed (seawater only). The test tubes had a 1 cm3 air pocket that would move through the water column with inversion and maintain larvae in suspension. Antibiotics did not affect larvae survivorship; however, larvae exposed to antibiotics were significantly smaller in total length (821 µm vs 860 µm total length, respectively). Metamorphosis in both treatments ranged from 30-54 %. These data suggest larvae can be reared effectively using a test tube rotator.

I. BIOLOGICAL SCIENCES

A Paper

Low Protein Diet Improves Early Blastema Formation in the Zebrafish Danio rerio.

Jonathan Flowers, University of Alabama at Birmingham; Jami de Jesus, University of Alabama Birmingham; George Green, University of Alabama Birmingham; Logan Holfelder, University of Alabama Birmingham; Anna Thalacker-Mercer, University of Alabama Birmingham ; Stephen Watts, University of Alabama Birmingham .

Section I (Biological Sciences) Papers: Thursday PM;

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 research has been accomplished on defining the pathways associated with recovery while nutrition's role in this process is limited. Zebrafish provide an efficient high-throughput model for evaluating the nutrients that are important in the regenerative process due to their reproductive capacity, rapid development, cost compared to other animal models and, lastly, their ability for tissue regeneration. Specifically, the caudal fin amputation model is of interest because the regenerative process associated with the blastema can largely be identified with minimal magnification and measured without the need for histological staining. In our pilot experiment we placed zebrafish on either a high (47% dry matter protein) or low (17.5% dry matter) protein diet to observe the effects on blastema formation. We observed a significant difference between diets at 28 hours post amputation and attributed the improved blastema formation of the low-protein diet on both a lower protein:energy ratio as well as the reliance of progenitor and immune cells on aerobic glycolysis.

I. BIOLOGICAL SCIENCES

A Paper

MACRONUTRIENT LIMITATIONS AFFECT BODY METRICS AND THE GUT MICROBIOME IN ZEBRAFISH, DANIO RERIO.

George Green, University of Alabama at Birmingham; George Green, UAB; Michael Williams, UAB; Sophie Chehade, UAB; Jonathan Flowers, UAB ; Casey Morrow, UAB; Addison Lawrence, Texas A&M.

Section I (Biological Sciences) Papers: Thursday AM

A healthy and predictable physiological homeostasis is paramount when using animal models in biomedical research. Proper macronutrient intake is an essential, controllable, environmental factor for maintaining animal health and promoting experimental outcome reproducibility. In this study, we report growth metrics, reproduction, and body composition of zebrafish, Danio rerio, fed a standard reference diet, a reduced-protein diet, or a reduced-fat diet in relation to the gut microbial composition and predictive functional profiles. Diets of reduced-protein or reduced-fat resulted in lower weight gain than the standard reference diet in male and female D. rerio. Females fed the reduced-protein diet had increased total body lipid, suggesting increased adiposity compared to females fed the standard reference diet. In contrast, females fed the reduced-fat diet decreased total body lipid compared to females fed the standard reference diet. The microbial community in male and female D. rerio fed the standard reference diet displayed high abundances of Aeromonas, Rhodobacteraceae, and Vibrio. In contrast, Vibrio spp. were dominant in male and female D. rerio fed the reduced-protein diet while Pseudomonas displayed heightened abundance when fed the reduced-fat diet. Predicted functional metagenomics of microbial communities revealed a 3-,4-fold increase in steroid hormone biosynthesis in both male and female D. rerio fed the reduced-protein diet. Secondary bile acid biosynthesis and synthesis and degradation of ketone bodies was concomitant with a downregulation in steroid hormone biosynthesis in females fed the reduced-fat diet. This study provides insight into nutrient requirements required for metabolic homeostasis, and microbial stability in D. rerio gut ecosystem.

I. BIOLOGICAL SCIENCES

A Paper

Predator Removal Impacts of Diamondback Terrapin Nests in Cedar Point Marsh, Dauphin Island.

Forrest Collins, University of Alabama at Birmingham; Thane Wibbels, UAB; Ken Marion, UAB; Catherine Sirgo, UAB; Andrew Coleman, Talladega College ; Taylor Roberge, Springfield College .

Section I (Biological Sciences) Papers: Thursday AM

The diamondback terrapin, Malaclemys terrapin pileata, is a species of brackish water turtle that is listed as a species of “highest conservation concern” in Alabama. This species is restricted to salt marsh habitats. Monitoring their reproductive biology is a prerequisite to understanding their conservation status. Since 2006, we have been monitoring nest depredation at Cedar Point Marsh, which is a major nesting beach for this species in Alabama. The current study evaluated nest depredation at Cedar Point Marsh after a racoon removal program by the USDA in 2020 and compared those data to previous depredation levels. Beach surveys at 1-to-3-day intervals were conducted throughout the 2021 and 2022 nesting seasons (May – June) in search for depredated nests or signs of terrapin predation after racoon removal. For the two years post racoon removal, no depredated nests, or observations of potential indicators of racoons were found at Cedar Point Marsh. These results were in distinct contrast to historic nest depredation data (as high as 151 depredated nests a single season). This study indicates that racoon removal programs can represent an effective means of decreasing nest depredation on diamondback terrapin nesting beaches. Further monitoring of Cedar Point Marsh nesting beaches will be critical to evaluate potential racoon repopulation and recruitment in the area.

I. BIOLOGICAL SCIENCES

A Paper

The im-PORE-tant Role of Eggshell Pores in Thermal Tolerance of Avian Embryos.

Wonil Choi, Auburn University; Haruka Wada, Auburn University .

Section I (Biological Sciences) Papers: Friday AM

Elevated temperatures due to global warming threaten many organisms' survival. The threat is likely direr for ectothermic animals as metabolic rates increase with surrounding temperature. Avian embryos are unique in that they are ectothermic and rely on microscopic pores that reside on their shell surface for gas exchange, and the number of pores is pre-determined at lay and is fixed for the remainder of development. As metabolic rates increase at higher temperatures, avian embryos may suffer from hypoxia when a limited number of pores are available. We do not fully understand the deleterious effects of the limited gas exchange on embryonic development, and whether pores play a role in the thermal tolerance of embryos. Here, we aimed to understand the specific role these microscopic pores play in embryonic development and survival by physically covering a portion of the zebra finch eggs with beeswax and incubating them in either optimal or high incubation temperatures. We hypothesized that the reduction in pore area will decrease the embryo's hatching success rates. We also predicted that the eggs that are covered in beeswax will lose less water and consume less oxygen throughout their incubation period due to less available gas exchange channels. Our data shows the lowest hatching success rates in the wax-treated group incubated at high incubation temperatures. Additionally, wax-treated individuals lost and consumed less water and oxygen compared to the control groups, regardless of the incubation temperature. These results suggest a lower number of pores decreases thermal tolerance in zebra finch embryos.

I. BIOLOGICAL SCIENCES

A Paper

Oral Supplementation With 1,2,3,4,6-Penta-O-Galloyl-β-D-Glucose Confers Locomotion Advantages in a Drosophila melanogaster Model of Alzheimer's Disease.

Ezaldean Kahil, Samford University; Anisha Jackson, Samford University; Patricia Jumbo-Lucioni, Samford University .

Section I (Biological Sciences) Papers: Thursday AM

Alzheimer's Disease (AD) is the seventh leading cause of death for all adults in the United States. This neurodegenerative disorder, characterized by increased neuroinflammation and oxidative stress, leads to a progressive decline in mobility and cognitive functions. Despite extensive efforts, efficacious therapy remains elusive. In vitro studies have provided evidence that 1,2,3,4,6-Penta-O-Galloyl-β-D-Glucose (β-PGG), a hydrolysable tannin, increases oxidative stress tolerance, reduces inflammation, and has neuroprotective properties. In vivo evidence is limited. This study aimed to demonstrate that β-PGG supplementation preserves physical function in a Drosophila melanogaster model of AD. We used a Drosophila line expressing the human amyloid precursor protein and the human ß-site APP-cleaving enzyme in neurons as AD model. Newly eclosed flies were supplemented or not with 10μM β-PGG. Locomotion was tested via a negative geotaxis assay at 7, 14, 21, and 30 days. The number of flies passing a 2, 4, and 8-cm mark in 10 seconds was recorded by sex, genotype, and treatment. Compared to untreated cohorts, β-PGG supplementation significantly improved locomotion of AD-flies at 7 (0.44±0.03 vs. 0.70±0.03, $p<0.0001$) and 14 days (0.24±0.03 vs. 0.46±0.03, $p<0.0001$), regardless of sex. β-PGG-supplemented males, regardless of genotype, were significantly movement impaired at 21 days compared to unsupplemented males. We continued supplementation for 30 days only in females and found that a higher proportion of β-PGG-supplemented females passed the 2- ($p=0.0193$) and 4-cm ($p=0.0147$) marks independent of genotype. Our findings provide strong evidence that β-PGG supplementation preserves physical function in our pre-clinical AD model in an age-specific manner.

I. BIOLOGICAL SCIENCES

A Paper

Prostate Cancer Disparities: Understanding the Role of Race and Socioeconomic Factors in Alabama.

Anish Boyella, Alabama State University; Ram Alagan, ; Seela Aladuwaka, ; Manoj Mishra, .

Section I (Biological Sciences) Papers: Thursday PM;

Background: Studies underline evidence that socioeconomic status (SES) is closely associated with health care and, notably, prostate cancer (PC) prevalence. Alabama is one of the geographic locations which faces high cancer prevalence. Associating SES status concerning PC prevalence is timely and noteworthy. Alabama is well known for the historical and cultural landscape of Black Belt Counties (BBC), predominantly occupied by African American populations who were systematically undermined in socioeconomic and healthcare aspects. This research explores PC prevalence in the major ethnic groups (African American and White) in Alabama.

Hypothesis/Objectives: PC prevalence is closely associated with SES. In particular, the poor status of SES severely influences PC patients from access to healthcare, healthy food, education, employment, transportation, and screening. Our study hypothesizes the selected SES factors has close association with PC prevalence.

Methods: We utilize Geographic Information Systems to analyze the connection between PC prevalence and SES. This study incorporates county-level PC prevalence and association with SES, such as education, income, employment, and poverty. The research complied data from diverse sources (U.S. Census, State Cancer Profile, Department of Health, American Cancer Society, National Cancer Institute, and published peer-reviewed journals). Integrating geospatial and non-spatial data on PC prevalence with these specified factors will help predict and formulate PC prevention methods and promote health policy formulation.

Conclusions: Alabama is one of the top states concerning the cancer epidemic. The research correlated SES and cancer prevalence using GIS. Data shows a close relation between factors such as SES and more with cancer prevalence.

I. BIOLOGICAL SCIENCES

A Paper

Development of a novel IMTA system containing oysters, sea urchins, and mollies.

Raven Edwards, University of Alabama at Birmingham; Jami de Jesus, University of Alabama at Birmingham (UAB); Michael Williams, University of Alabama at Birmingham (UAB); Stephen Watts, University of Alabama at Birmingham (UAB) .

Section I (Biological Sciences) Papers: Thursday PM;

Integrative multi-trophic aquaculture allows space and resource sharing in aquatic animal culture. In part, IMTA simulate the natural ecosystems of the focus species in a way that promotes healthy interactions and growth. The purpose of this study is to develop a functional recirculating aquaculture system occupied by juvenile oysters Crassostrea virginica (extractive species) and the sea urchin Lytechinus variegatus (fed species) that have been reared in culture. The study also proposed the use of a common aquarium fish species, the molly Poecilia sp. (extractive species), as a detritivore and in predator control of the amphipod Elasmopus sp. found within the IMTA system. The sea urchin L. variegatus (when fed a formulated sea urchin diet) can occupy the same tank with no apparent deleterious effects to either extractive species. In fact, L. variegatus removes biofouling material from the surface of the oysters as well as the vertical sides of the tanks (in long-term offshore cage culture, the presence of sea urchins results in growth benefits to oysters, unpub. data). In the same tank mollies were effective detritivores of sea urchin egesta on the bottom of the tank and efficiently consumed larger amphipods (amphipods are a nuisance species, consuming oyster tissue, and are of no practical value in the current study). Future directions should examine refinement of the IMTA, potentially by adding additional species that act as natural biofilters and/or potential food sources within the system, including primary producers such as algae or secondary consumers such as shrimp.

I. BIOLOGICAL SCIENCES

A Paper

Pinecones, an undescribed habitat for arboreal tardigrades.

Christa Terry, University of North Alabama; Glenn Marvin, ; Paul Davison, .

Section I (Biological Sciences) Papers: Thursday AM

Commonly reported habitats for terrestrial tardigrades are mosses, lichens, and soils. Tardigrades are active in these habitats only when films of free water are present. Most members of the pine family exhibit flexion of cone scales that closes the cone when wet, thus creating enclosed spaces within the cone where capillary films of water occur temporarily. We present preliminary data on tardigrades extracted from pinecones that have shed their seeds but remain attached to tree limbs. Tardigrades were found in all cones studied (n=46) of the following species: Pinus taeda, P. virginiana, P. glabra, P. serotina, and Tsuga canadensis. The number of extracted tardigrades per cone ranged from four to 8789 with an average of 335 and a median of 59. We found significantly more tardigrades in older cones (≥4 years) that were more brittle; more weathered, and often supported observable algae upon the scales and crustose lichens upon the cone scale apophyses. However, younger cones also contained large numbers of tardigrades. Extractions from three regions of the cone (basal rosette of scales, main scales, and central core) of third-year cones of P. taeda, which lacked observable algae and lichens, showed that the core and base harbor significantly more tardigrades than the main scales. We observed tardigrades preying upon rotifers and nematodes that were present in the mix of biota extracted from the third-year cones of P. taeda. The presence of tardigrade eggs in the extractions indicates successful reproduction in the pinecone habitat.

I. BIOLOGICAL SCIENCES

A Paper

Breeding Ecology and Habitat Selection of Cerulean Warblers (Setophaga cerulea) in Bankhead National Forest. Thomas Thompson, Alabama A&M University; Yong Wang, Alabama A&M; Andrew Cantrell, Alabama A&M .

Section I (Biological Sciences) Papers: Thursday AM

In Alabama, Cerulean Warblers (Setophaga cerulea) are designated as a Priority One species of highest conservation concern. Once considered common breeders throughout multiple counties, Cerulean Warbler populations have been negatively impacted by factors such as the loss of mature contiguous deciduous forest. Bankhead National Forest is one of the Cerulean Warbler's southernmost breeding locations in the U.S. and one of only a few breeding locations in Alabama. However, the Bankhead National Forest population has been studied very little and there remains much to be discovered. The objectives of this research project are to 1) assess breeding ecology and population status of Cerulean Warblers in the Bankhead National Forest, 2) study the habitat conditions and relationships with the occurrence of the Cerulean Warblers, and 3) investigate the relationships between Cerulean Warblers and other avian species that share the same habitat.

I. BIOLOGICAL SCIENCES

A Paper

Effect of Rapamycin on the Life Span of Drosophila melanogaster.

Azriel Boles, University of South Alabama; Lauren Jackson, University of South Alabama; Isha Patel, University of South Alabama; Robin Mockett, PhD, University of South Alabama .

Section I (Biological Sciences) Papers: Thursday AM

Rapamycin is an inhibitor of fungal growth and of the TOR signaling pathway that has been reported to extend the life span of flies and mice and is proposed as a potential anti-aging intervention for humans. In this laboratory, rapamycin was previously found unexpectedly to have a drastic life-shortening effect in y w and w1118 Drosophila fly strains on a Torula yeast-based food medium, whereas in another laboratory, it lengthened life span of wDah flies on a Brewer's yeast medium. The goal of the current project was to compare effects of rapamycin on longevity in males and females of all three strains on both media. Life span was increased by 1-8% by rapamycin supplementation on Brewer's medium except in y w female flies and was shortened on Torula food by 8-43% except in w1118 females. In additional groups of wDah flies supplemented with rapamycin in the absence of acids and methylparaben that are normally included as food preservatives, rapamycin decreased the life span of both sexes on both media. In all cases, flies had a shorter mean life span (0.2-29%) on the Brewer's vs. Torula medium. The results show that the effect of rapamycin on longevity depends strongly on the composition of the diet, with harmful effects usually becoming apparent under dietary conditions that would normally favor long life.

I. BIOLOGICAL SCIENCES

A Paper

AFM and the Structure of Conifer Pit Membranes. Roland Dute, Auburn University .

Section I (Biological Sciences) Posters: Thursday PM;

AFM AND THE STRUCTURE OF CONIFER PIT MEMBRANES. Roland Dute, Auburn University.

Bordered pit pairs containing torus-bearing pit membranes connect water-conducting tracheids in woods of conifers. These structures allow passage of the transpiration stream from cell to cell but inhibit passage of air bubbles by deflection (or aspiration) of the membrane. Atomic force microscopy provides a different approach to the study of pit membranes. The atomic force microscope (AFM) uses a vibrating tip, rather than a beam of radiation, to interact with the specimen and create an image. The structure of aspirated and non-aspirated pit membranes was studied in four species of conifers. Using the height image created by the tapping mode of the AFM, the topography of the pit membrane surface could be observed. Using this tool, the following items were addressed: a) interactions between pit membrane microfibrils and warts (found on the pit border) during aspiration; b) presence and structure of plasmodesmata; c) blockage of the pit aperture by the torus of the aspirated pit membrane; and d) the presence of a phase dark surface on some aspirated torus surfaces. Warts did not inhibit complete aspiration in pit membranes of early wood tracheids. When observed, plasmodesmatal openings in the torus had a lining that appeared particulate in surface view. The torus of a few completely aspirated pit membranes was phase dark where it penetrated the pit aperture. This feature was associated with a thin layer of non-fibrillar material on the torus surface in Cunninghamia.

I. BIOLOGICAL SCIENCES

A Paper

Investigating the Dynamic Cross Correlation Results from Molecular Dynamics Simulation: The Story of Two Undergraduates Characterizing Variants of Uncertain Significance.

Cynthia Stenger, University of North Alabama; Sara Cline, Athens State University; Michele Morris, HudsonAlpha Institute for Biotechnology; Luke Terwilliger, University of North Alabama; Camille Greer, Athens State University .

Section I (Biological Sciences) Papers: Thursday PM;

Faculty and students at the University of North Alabama (UNA) and Athens State University (ASU), in partnership with HudsonAlpha Institute for Biotechnology (HAIB), are leading student research through a project called Characterizing our DNA Exceptions (CODE). This project immerses undergraduate researchers at schools throughout Alabama in a crowdsourcing approach to analyze variants of uncertain significance (VUS) using molecular dynamics simulation and other methods. The initiative, employing multi-disciplinary teams, has been and continues to be, an important vehicle to bring scientific research skills to under-served populations at predominantly undergraduate institutions.

One of the tools used by CODE is molecular dynamics simulation (MDS). MDS has emerged as an essential bioinformatics tool to characterize movement or perturbation in a biomolecular system. An important and possibly under-utilized result from MDS is the dynamic cross correlation matrix (DCCM). Here we present the dynamic cross correlation approach and preliminary results from two undergraduate CODE projects at ASU and UNA.

I. BIOLOGICAL SCIENCES

A Poster

Identification of Two Novel Bacteriophages from Freshwater Environmental Samples.

Melissa Walker, University of Alabama at Birmingham; James Jeffrey Morris, University of Alabama at Birmingham .

Section I (Biological Sciences) Posters: Thursday PM;

Screening environmental samples for viable bacteriophages to co-opt for alternative antimicrobials is a common practice, and one that can be leveraged to engage undergraduates in active research in the lab. Undergraduate Mason Anderson and Leica Barnhart, both Morrislab research assistants in the Spring 2022, undertook to do just that. Through the mentorship of both Melissa Walker, graduate student, and Dr. J. Jeffrey Morris, advisor, both Mason and Leica learned how to enrich and then isolate phages from two freshwater samples, one taken from Lay Lake and one from Peterson Creek, AL. They amplified and purified their respective phages and then wrapped up the semester with DNA extractions. The DNA was submitted for whole genome sequencing to the Heflin Genomics Core. Genome assembly and annotation demonstrate two different phages infecting the same host with translational application potentials in both phage therapies and novel biomedical constructs.

I. BIOLOGICAL SCIENCES

A Poster

The H284Y Variant of TCF4 and its Expression in Pitt-Hopkins Syndrome.

Macee Glick, Jacksonville State University; Dr. Jenna Ridlen, .

Section I (Biological Sciences) Posters: Friday AM

TCF4 is a gene that is presumed to give rise to the rare genetic disorder, Pitt-Hopkins Syndrome. This syndrome is characterized by severe intellectual disability, developmental delays, breathing problems, recurrent seizures (epilepsy), and distinctive facial features. The specific variant of TCF4, H284Y was studied in order to determine the pathogenicity of the variant and its expression in Pitt-Hopkins Syndrome. By utilizing various databases and algorithms such as NCBI's Clinvar, Uniprot, and PolyPhen-2, the pathogenicity of the H284Y variant could be inferred. Homology modeling and other dynamic simulations were then run to better understand changes in the way the wildtype protein and the variant interacted with their environment.

I. BIOLOGICAL SCIENCES

A Poster

Effects of a long-term chronic Methionine restriction (MR) diet feeding in the Gut Microbiota composition and physiology in male mice.

Akash Nagarajan, University of Alabama at Birmingham; Liou Sun, UAB; Tate Lasher, UAB; Casey Morrow, UAB .

Section I (Biological Sciences) Papers: Thursday AM

Methionine restriction (MR) diet feeding has been consistently found to delay aging and extend lifespan in various model organisms including mice and rats. In our study, we have examined the long-term effects of MR diet feeding in genetically heterozygous male mice with the diet starting at 6 months of age. MR diet feeding has been known to produce improved metabolic homeostasis in the animals apart from delayed aging. We have observed similar results, MR mice have reduced body weight with increasing lean mass and reduced fat mass along with improved glucose tolerance and increased insulin sensitivity. Indirect calorimetry was performed on these animals, and they showed reduced expiratory exchange ratio (RER) with an increased oxygen consumption and increased CO2 production after controlling for their body weight. They also exhibited increased energy expenditure (EE) compared to the control diet (CD) fed mice. Longitudinal 16S rRNA amplicon sequencing was performed on fecal samples of mice collected after 1 week, 12 weeks and 57 weeks of the experimental diets feeding. For alpha diversity metrics, faith's phylogenetic diversity and observed features was analyzed and we found no differences overall between diet groups, but we found differences between the different timepoints. For beta diversity metrics, Unweighted Unifrac and Jaccard distance metrics were analyzed and similarly we found no differences between the diet groups but we found differences between the different timepoints. LEfSe was utilized to determine the bacterial taxa differentially represented among the experimental groups. We observed dietary changes at 1 and 12 weeks of diet for various bacterial taxa but none at 57 weeks. Overall, we found that age had a bigger impact on the microbiota compared to experimental diet feeding.

I. BIOLOGICAL SCIENCES

A Poster

Examining the presence and distribution of a potent neurotoxin in Rock Rattlesnakes (Crotalus lepidus).

N. Jade Mellor, University of Alabama at Birmingham; Rhett Rautsaw, Clemson University; Edward Myers, Clemson University; Mark Margres, University of South Florida; Kenneth Wray, Florida State University ; Darin Rokyta, Florida State University; Christopher Parkinson, Clemson University.

Section I (Biological Sciences) Posters: Thursday AM,

Snake venoms range from having hemorrhagic to neurotoxic effects. Hemorrhagic venoms have low toxicity and high expression of snake venom metalloproteinases, while neurotoxic venoms have high toxicity and low expression of snake venom metalloproteinases. Rattlesnake species have been broadly classified as either having a hemorrhagic or neurotoxic venom, however population-level variation in venom phenotype has been increasingly documented in several species. Crotoxin is a highly toxic neurotoxin and a driver of neurotoxic venom phenotypes. Population-level variation of crotoxin and its homologs has been studied in many large-bodied rattlesnakes (like Mojave and Timber Rattlesnakes) and suspected in small-bodied rattlesnakes but not genetically confirmed. We used genetic and expression data to confirm the presence of crotoxin in the small-bodied Rock Rattlesnake (Crotalus lepidus), examine crotoxin's distribution across 104 samples, and evaluate the crotoxin's origin within the species. We confirmed the presence of crotoxin in 17 individuals without association geographic variables and identified climatic variables that were associated with expression. Our study adds to the growing body of literature focusing on crotoxin presence/absence, adding additional context to the potential selection pressures. Additionally, we support previous findings of an ancestral origin of crotoxin in Crotalus, followed by independent lineage sorting. Future studies should focus on examining the ecological circumstances that contribute to the population-level maintenance of crotoxin across species and further investigate the presence of crotoxin in under-studied small-bodied rattlesnakes.

I. BIOLOGICAL SCIENCES

A Poster

Using species distribution models to predict genetic isolation of a high-elevation stream specialist damselfly (Odonata, Calopterygidae: Hetaerina vulnerata Hagen in Selys, 1853) in the southwestern U.S..

Austin Biddy, University of Alabama at Birmingham; Nancy McIntyre, Texas Tech University .

Section I (Biological Sciences) Posters: Thursday PM;

Aquatic animals in high-elevation streams of the southwestern U.S. are potentially isolated by distance (IBD) or environment (IBE). The Canyon Rubyspot damselfly (Hetaerina vulnerata) is an insect that inhabits shaded mountain streams in the American southwest. Past and current spatial separation of habitat and limited dispersal capacity of H. vulnerata may cause population isolation and genetic differentiation; projected climate change may exacerbate isolation, restricting distribution and movement. MaxEnt was used to construct species distribution models (SDMs) based on H. vulnerata occurrences and environmental variables, characterizing the species' niche; from this SDM, we inferred seven potential population clusters isolated by intervening unsuitable habitat. The models indicated some habitat contiguity in past conditions and habitat fragmentation in future scenarios. DNA from 78 H. vulnerate individuals was extracted for ddRADseq representing six of the seven clusters. Sequences were filtered, cataloged, and aligned with the Stacks pipeline. Principal coordinate analysis resolved the presence of five subpopulations based on genetic distance, partially corroborating the SDM. IBD was significant; IBE was not significant. FST values were low for nearby populations, and high for distant populations. Heterozygosity values displayed a south-north gradient. Genotype-environment association determined that 84 SNPs were locally adapted to tree canopy coverage. These results indicate that H. vulnerata populations are likely separated and undergoing genetic isolation and local adaptation. Integrating SDMs with landscape genomics combines techniques to indicate populations that are separated by distance and unsuitable habitat, providing explanations for patterns in the genome.

I. BIOLOGICAL SCIENCES

A Poster

Investigating the Impact of Mining Effluence and Beaver Activity on Settlement Ponds at Camp McDowell (Winston County, AL).

Liz Beaumont, Samford University; Riley Lovejoy, Samford University .

Section I (Biological Sciences) Posters: Thursday PM;

Though mining effluence and beaver activity are both recognized for their potential impacts on aquatic communities, their concurrent influence on ponds remains largely unexplored. Ticky Branch Coal Mine, bordering Camp McDowell in Winston County, Alabama, was operational in the 1980's and early 1990's. During that period, a single settling pond existed for treatment of effluence. However, camp administration noticed a decline in macroinvertebrates in St. Christopher's Canyon downstream of the mine. Soon after the mine's closure, high iron levels were readily observable in the St. Christopher's Canyon waterfall and stream, as well as in several nearby springs. Reclamation resulted in the addition of three more settling ponds in the area. Though the settling ponds are thought to have largely stabilized, iron levels remain visibly high. Additionally, a new mining operation was begun further upstream in 2004 and, more recently, beaver activity has resulted in the damming of multiple settling ponds. In partnership with the McDowell Environmental Center, this project aims to investigate the influence of both mining effluence and beaver activity on settling ponds using unaffected man-made ponds on camp property as reference sites. GIS analysis has been employed to determine mine land borders, land use/land cover, and hydrologic network structure of the surrounding area. Water quality, in addition to plankton and macroinvertebrate community composition and structure, will also be investigated. The results of this project will not only serve to inform camp personnel on pond water quality, biodiversity, and community structure, but will also provide insights into the joint influence of mining effluence and beaver activity on pond ecosystems.

I. BIOLOGICAL SCIENCES

A Poster

Exploratory Analysis of Cancer Clinical Samples using the new Web-based SEAS Software.

Samuel Bharti, University of Alabama at Birmingham; Thanh M Nguyen, University of Alabama at Birmingham; Zongliang Yue, University of Alabama at Birmingham; Christopher D Willey, University of Alabama at Birmingham; Jake Y Chen, University of Alabama at Birmingham .

Section I (Biological Sciences) Posters: Thursday PM;

Embedding techniques have gained popularity in visualizing the high-dimensional gene expression profiles of patient samples yet the systematic extraction of sample set composition based on shared labels instead of shared embedding neighbourhood remains a major challenge. SEAS can be used to perform exploratory analysis of embedded cancer sample data by focusing on the “clinotypes” of selected sample sets.

Clinotypes are referred to as the clinical/phenotypical features of a sample. Examples of clinotype are age group, sex, cancer subtype, radiation status, overall survival, etc. Traditional analysis often lacks clinotype exploration and enrichment analysis before any downstream analysis leading to a selection of less influential clinotype in the study. Here, we showed two of the many ways a user can perform the SEAS analysis to make a better decision in choosing appropriate clinotypes which explain their datasets and perform clinical feature enrichment analysis (CFEA). For our first case study, we selected a cohort of 192 GBM cancer samples who didn’t receive additional chemotherapy out of the 434 total population.

We found 50 discrete and 5 continuous clinotypes co-enriched and significant survival differences between cohort and population suggesting GBM cancer patients who didn’t receive additional chemotherapy died earlier. In another brief case study, we demonstrate how researchers can identify a clinotype showing a high association with sample embedding using 617 COPD (Chronic obstructive pulmonary disease) sample embedding. We found that COPD patient transcriptomes were more highly influenced by gender differences than the originally studied smoking status. To conclude, the SEAS web-based software allows users to perform essential functions such as exploratory data analysis to find sample clinotype(s) showing better association with embedding clusters to advance research such as CFEA by selecting a cohort from the sample population and finding enriched clinotypes with survival differences.

The SEAS web-based software is freely accessible from http://discovery.informatics.uab.edu/SEAS/.

I. BIOLOGICAL SCIENCES

A Poster

Protein O-GlcNAcylation is Important for Vascular Calcification in Diabetes.

Yong Sun, University of Alabama at Birmingham; Chang Hyun Byon, Pathology; Jack M Heath, Pathology; Xia Mao, Pathology; Xinyang Zhao, Biochemistry ; Hui Wu, Dentistry; Yabing Chen, Pathology.

Section I (Biological Sciences) Papers: Thursday AM

Our previous studies have shown that increased vascular protein O-linked GlcNAc modification (O-GlcNAcylation) promotes vascular calcification in diabetes. In this study, with a loss-of-function approach, we determined whether O-GlcNAcylation is essential for diabetic vascular calcification, and uncovered a novel molecular mechanism underlying O-GlcNAcylation-mediated calcification of vascular smooth muscle cells (VSMC).

A new mouse model with inducible SMC-specific deletion of the O-GlcNAc transferase (OGT) was generated by breeding the OGT floxed mice with the inducible SMMHC Cre transgenic mice. Smooth muscle cell (SMC)-specific OGT deletion significantly inhibited protein O-GlcNAcylation and vascular calcification in diabetic mice induced by low-dose streptozotocin. Increase vascular expression of Runx2, the essential osteogenic regulator for vascular calcification, was observed in the diabetic mice, which was markedly inhibited by SMC-specific OGT deletion. With VSMC from OGT deficiency mice, we further demonstrated that OGT deletion downregulated on Runx2 expression and Runx2-induced VSMC calcification. A direct O-GlcNAc modification on Runx2 was uncovered by immunoprecipitation analysis, which was abolished in the OGT-deficient VSMC. OGT modification on Runx2 Threonine 412 (T412) was identified with a serial of Runx2 truncation mutants and point mutations on putative O-GlcNAcylation sites. Importantly, inhibition of Runx2 O-GlcNAcylation on Runx2 T412 abolished Runx2-induced VSMC calcification, which was associated with inhibition on Runx2 transcription activity and Runx2 binding with its key co-factors.

In summary, our studies have demonstrated a novel causative link between protein O-GlcNAcylation and VSMC calcification, which is important for vascular calcification in diabetes. With an array of comprehensive biochemical, molecular and cellular approaches, we have uncovered an essential role of O-GlcNAc modification on Runx2 in promoting Runx2 osteogenic transcriptional activity and Runx2-induced VSMC calcification.

I. BIOLOGICAL SCIENCES

A Poster

Observation of endogenous gene activity in cells without direct tagging in C. elegans.

Matthew Thomley, University of South Alabama; Ryan Littlefield, University of South Alabama .

Section I (Biological Sciences) Papers: Thursday AM

To observe protein expression in cells, scientist use translational reporters that directly tag the protein of interest with a fluorescent protein (FP) or transcriptional reporters that express the FP using an exogenous copy of the promoter. Both techniques have limitations because direct tagging may alter the performance of protein of interest and exogenous promoters may not accurately represent the endogenous expression pattern. Here, we use CRISPR-Cas9 gene editing and bicistronic tagging and severing (BiTS) within the model organism C. elegans to co-express green fluorescent protein (GFP) from the endogenous rpl-13 and rpl-39 genes, which code for large ribosomal protein subunits. For both components, GFP co-expression occurs extensively through all the cells within all different stages of development beginning at early embryogenesis and continuing through adulthood. We observed reduced levels of GFP co-expression in starved dauer worms. At some stages, some individual cells showed significantly higher GFP intensities suggesting that they were more translationally active and expressed more ribosomal components. Use of this new technique will allow molecular biologist to overcome previous obstacles that occur with direct tagging methods and faithfully report the endogenous gene expression pattern within individual cells.

I. BIOLOGICAL SCIENCES

A Poster

Molecular Characterization of Potential Bioelectricity-Producing Bacteria from Sediments Microbial Fuel Cell.

Katrina Vance, Auburn University in Montgomery; Meghan Frazier, Auburn University at Montgomery; Daveenyah Primm, Auburn University at Montgomery; Olivia Taylor, Auburn University at Montgomery; JoAnna Sheffield, Auburn University at Montgomery ; Joy Odoms, Auburn University at Montgomery; Benedict Okeke, Auburn University at MontgomeryAuburn University at Montgomery.

Section I (Biological Sciences) Posters: Friday AM

Bioelectricity is the electrical current produced by living systems. The production of electricity through the use of microbial metabolism has gained increasing research attention. In a microbial fuel cell (MFC) electrochemically active microorganisms catalyze the catabolism of nutrients releasing electrons that flow from the anode to the cathode generating electrical current. Protons move to the cathode where the electrons reduce oxygen to water. In this study, we utilized the MudWatt MFC to examine lagoon sediments for bioelectricity production and then selected and characterized potential bioelectricity-producing microorganisms. Bacterial isolates which grew aerobically and anaerobically were selected for DNA-based characterization. Genomic DNA was extracted and the 27f and 1492r primers were used for PCR amplification of their 16S rRNA gene sequences. GenBank Blast was used for homology searches. The isolates were TLP-3 (97.71% similar to Pseudomonas stutzeri strain KGS-2), TLP-6 (96.76% similar to an uncultured bacterium clone AFEL2), TLP-8 (97.96% similar to Bacillus megaterium), FLP-2 (96.56% similar to Bacillus sp. strain RBG4), FLP-3 (98.50% similar to Bacillus sp. strain IC-1C2), FLP-4 (98.82% similar to Lysinibacillus sp strain GU), FLP-5 (94.41% similar to Bacillus sp. strain SPC8), FLP-7 (96.90% similar to Bacillus megaterium strain E71CS3) and FLP-8 (92.39% similar to Bacillus megaterium strain MKVA1). Further studies will focus on the examination of a consortium of isolates in the sediments MFC for bioelectricity production.

I. BIOLOGICAL SCIENCES

A Poster

Investigation of BMAA modulation of Aβ-mediated neurodegeneration in transgenic Caenorhabditis elegans.

Tanner Vandever, Jacksonville State University; Alexis Petty, Jacksonville State University; Elise Patrick, Jacksonville State University; Ashley Turner, Jacksonville State University .

Section I (Biological Sciences) Posters: Thursday PM;

β-N-methylamino-L-alanine (BMAA) is a nonprotein amino acid and neurotoxin originally isolated from seeds of a cycad plant in Guam and produced by blue-green algae or cyanobacteria. BMAA has also been shown to bioaccumulate through food chains. Alzheimer's disease (AD) is a progressive neurological disorder characterized by the deposition of amyloid beta (Aβ) in the brain. Recent studies suggest that chronic exposure to BMAA might trigger neurodegenerative diseases in susceptible individuals, including AD. In this study, we aim to examine the potential neurotoxic modulation of BMAA on Aβ-mediated neurodegeneration in transgenic Caenorhabditis elegans. We propose to utilize a C. elegans AD strain with pan-neuronal human Aβ1-42 expression that displays neuromuscular defects, shortened lifespan, and age-dependent behavioral dysfunction. Neuromuscular function and lifespan will be measured utilizing a thrashing assay (n = 20 per group) and solid agar lifespan assay (n = 100 per group). Experimental groups will include N2 wildtype control, transgenic Aβ1-42 expressing strain, and the transgenic control. Each experimental group will be treated with BMAA or vehicle control. This study proposes to gain more insight into the effect of BMAA on Aβ-mediated neurodegeneration in a C. elegans AD model. It is important to begin to unravel and understand the potential impact of environmental toxins on complex neurological disorders.

I. BIOLOGICAL SCIENCES

A Poster

Investigation of Gene Transfer Between Environmental and Clinical Bacterium.

Isabella Parkhurst, University of Alabama at Birmingham; Anuradha Goswami, University of Alabama at Birmingham; J. Jeffrey Morris, University of Alabama at Birmingham .

Section I (Biological Sciences) Papers: Thursday AM

Due to continuous exposure of antibiotics to pathogenic bacteria, antibiotics are becoming less effective, causing diseases to become far harder to treat effectively. A surge in antibiotic-resistant bacteria causes a growing need to understand both resistant genes (RGs) and their ability to disseminate from one bacterium to another in the environment. Despite genomics studies that can identify RGs in isolated cultures, studying genes' dissemination in metagenomes is still a challenge due to the sample complexity. We aim to establish a laboratory method to identify genes in an environmental sample that can be transferred to a commensal bacterium (E. Coli). The method developed as part of this research (filter-top method) gives evidence that can be used to infer resistance mechanisms and how they transfer naturally in the environment. The major mechanism used to investigate this phenomenon is Horizontal Gene Transfer with a focus on bacterial conjugation. In Horizontal Gene Transfer, an organism, in this case, bacteria, transfers genetic material to another organism of the same kind without the second organism being its offspring. Bacterial conjugation specifies that this happens via a bacterial cell transferring genes to another bacterial cell. To encourage conjugation between the two bacteria, they are grown in close contact with one another to encourage the transfer of plasmids. The experiment has thus far monitored changes that occurred when close contact was allowed between antibiotic-resistant bacteria and laboratory-cultured bacteria with no antibiotic resistance. This was done by growing the two bacteria on top of each other with a piece of glass filter paper (0.2 μm pore size) separating them, however allowing pilus formation for conjugation through filter pores. During the first run-through of the experiment, the method was validated when transconjugant bacteria (initially with no antibiotic resistance) grew on Kanamycin spiked media. The study will further deploy environment samples such as wastewater, to replicate the conjugation experiment using a filter-top method. The results will develop a cost-effective protocol to study the mobilizable genetic elements in different environments contributing to the dissemination of antibiotic resistance genes.

I. BIOLOGICAL SCIENCES

A Poster

Taxanomic Composition of the Phycosphere Microbiome In Diverse Phytoplankton Stock Cultures.

Saleh Aljalal, University of Alabama at Birmingham; Kellen Cowen, University of Alabama at Birmingham .

Section I (Biological Sciences) Posters: Thursday PM;

Bacteria and phytoplankton have complex interactions that are influenced by the species of bacteria and phytoplankton present. The goal of this study was to determine the relationships between bacteria and phytoplankton, with a focus on how bacterial colonies affect phytoplankton growth. In this experiment, the interactions between a single bacterial isolate and a phytoplankton species, multiple combinations of bacterial species and a phytoplankton species, and the same phytoplankton species without any bacteria present were observed and growth curves were recorded. Multiple species of phytoplankton were tested as they grew under similar conditions. The aim was to understand the interactions between bacteria and phytoplankton and identify which bacterial colonies promote optimal growth of each phytoplankton species tested.

I. BIOLOGICAL SCIENCES

A Poster

Taxanomic Composition if the Physcosphere Microbiome In Diverse Phytoplankton Stock Cultures.

Kellen Cowen, University of Alabama at Birmingham; Salah Aljalal, UAB .

Section I (Biological Sciences) Papers: Thursday AM

Bacteria and phytoplankton have complex interactions that are influenced by the species of bacteria and phytoplankton present. The goal of this study was to determine the relationships between bacteria and phytoplankton, with a focus on how bacterial colonies affect phytoplankton growth. In this experiment, the interactions between a single bacterial isolate and a phytoplankton species, multiple combinations of bacterial species and a phytoplankton species, and the same phytoplankton species without any bacteria present were observed and growth curves were recorded. Multiple species of phytoplankton were tested as they grew under similar conditions. The aim was to understand the interactions between bacteria and phytoplankton and identify which bacterial colonies promote optimal growth of each phytoplankton species tested.

I. BIOLOGICAL SCIENCES

A Poster

A preliminary developmental toxicity comparison of Methylene Blue and Phloxine B to Xenopus embryos.. Kritika Maharjan, Jacksonville State University; Dr.James Rayburn, Jacksonville State University .

Section I (Biological Sciences) Papers: Thursday AM

Chemical dyes are one of the most utilized chemical substances in our daily life, as they are found in food, textiles, and medications, resulting in high environmental exposure. Methylene blue (MB) and Phloxine B (Ph B), which are both used in textiles, food, and even pharmaceuticals, will be tested for teratogenic effects in this investigation. Methylene blue is most commonly used as a bacteriologic stain and indicator, whereas Ph B is usually utilized as an agar plate stain. Methylene blue has been demonstrated in recent research to produce severe central nervous system toxicity, as well as nitrogen and ammonia poisoning. Ph B is also an effective photosensitizer of cellular membrane damage, meaning skin exposure to the dye and sunshine or artificial light may result in phototoxicity. To better understand the adverse developmental effects of MB and Ph B, the Frog Embryo Teratogenesis Assay – Xenopus (FETAX) was performed to assess the developmental toxicity. FETAX is a 96-hour test that measures the potential of chemicals to induce death, deformity, and growth inhibition in developing embryos using early-stage embryos of the South African clawed frog (Xenopus laevis). The objective of this study is to determine the potential developmental toxicity of MB and Ph B. To assess the photoactivity, the Ph B trials were carried out in both light and dark settings. Fertilized embryos were separated for the studies and allowed to develop in test solutions. The LC50 (mortality), EC50 (malformation) for MB and Ph B (in light and dark) were determined using probit analysis. The Teratogenic Index (96-hr LC50 / 96-hr EC50) was calculated to determine the risk to amphibian embryos. Overall, the results indicate these dyes have the potential to cause malformations and risk to amphibian embryos.

I. BIOLOGICAL SCIENCES

A Poster

The Structural and Functional Effects of Four Missense Variants, L154P, L161R, D162N, and D162G, Among The LEP Protein of The Leptin Gene Within Humans.

Madeleine Ash, Birmingham-Southern College; Kevin Drace, BSC .

Section I (Biological Sciences) Posters: Friday AM

Leptin is an essential hormone used to regulate satiation, without Leptin, or even with an improper amount of Leptin, one may become at risk for obesity or type 2 diabetes. This information on the variants is important to study because obesity and either type of diabetes can be life-threatening diseases. To perform this research, numerous databases, such as ConSurf, Ensembl, and UniProt, were used to collect quantitative and qualitative data on the Leptin gene and the effects of missense variants on the protein. It was hypothesized that the 4 missense variants focused on for this research would have a significant impact on the structure and function of the LEP protein. Throughout the study, the data collected did not support this hypothesis because all 4 variants studied did not have detrimental effects on the structure and function of the LEP protein due to very low RSMD values indicating high structural similarity between the wildtype protein and each variant. This research is important to aid in preventing deaths from obesity and type 2 diabetes.

I. BIOLOGICAL SCIENCES

A Poster

The Distinction of Homologous miRNA-Binding Sites Between Human Oncogenes and Human Cellular Entry Receptor Genes. Summer Weeks, Troy University; Summer Weeks, Troy University; Robert Kaltenbach, Troy University; Jahnavi Raval, Troy University; Siegfried B. Harden, Troy University ; Alexander Kofman, Troy University .

Section I (Biological Sciences) Posters: Thursday AM,

The evolution of microRNA (miRNA) target sites is not well understood. Some studies suggest that a large number of 3' UTRs of protein-coding genes might be under selective pressure to maintain complementarity to the corresponding miRNAs, The homologous miRNA-binding sites (HS) are suggested to act cooperatively to enhance the effect of the single miRNA. At the same time, the HS may serve as the backup if one of the sites is disrupted by genetic polymorphism. We compared the presence and the qualities (the number of HS per specific miRNA, the distance between the HS, the density of HS in the mRNA sequences, and the structural types of the HS) in the human oncogenes (n=164) and the human genes encoding cellular entry receptors (n=30). We found the statistically significant ($P<0.002$) difference in the density of HS between the oncogenes and cellular entry receptors and the statistically significant difference ($P<0.01$) for 7mer-m8 and ($P<0.009$) for 7mer-1A structural site variants. The ongoing work is aimed to address the possible evolutionary aspects of miRNA-binding sites by studying the differences in HS between the large groups of genes.

I. BIOLOGICAL SCIENCES

A Poster

Investigating the Potential Roles for the Parkinson Disease Risk Gene CD38 In The Brain.

Louis Ramirez, University of Alabama at Birmingham; Laura McMeekin, UAB; Rita Cowell, UAB; Alana Colafrancesco, UAB; Michelle Olsen, UAB ; Jamil Saad, UAB; Frances Lund, UAB.

Section I (Biological Sciences) Posters: Thursday PM;

Controversies exist regarding the contribution of glial cell dysregulation and inflammation to the pathogenesis of Parkinson Disease (PD). Signs of inflammation have been detected in postmortem tissue of PD patients, and recent evidence suggests that mutations in genes associated with familial PD can influence the function of astrocytes and microglia. These findings, together with the existence of mutations in the HLA locus in PD patients, have led investigators to propose an etiological role for inflammation and glial dysfunction in PD. However, direct evidence is lacking for mechanistic links among inflammation, glial dysregulation, and the neuronal loss characteristic of PD. To identify potential cell-autonomous mediators of PD-relevant processes in glia, we used a bioinformatics strategy to identify PD GWAS genes enriched in glial cells of the mouse brain. Interestingly, a small subset of genes exhibits enrichment of expression in astrocytes. PD-linked single-nucleotide polymorphisms in one of these genes, CD38, are associated with a ~45% reduction in CD38 transcript expression in the human brain. Previous work has demonstrated a role for CD38 in peripheral immune cells, where it serves to regulate REDOX balance in both intra- and extra-cellular compartments; the roles for CD38 in the brain have only recently been explored. Preliminary experiments from our laboratory have shown that CD38 expression is enriched in astrocytes of the human and mouse brain, NAD/NAM balance is disrupted in various regions of the CD38 knockout mouse brain, and inflammation and CD38 deficiency synergistically interact to influence motor function. In this presentation, we will discuss the experimental plan for this currently funded grant and present our ideas related to the potential interplay between glia and neurons in the control of REDOX balance in the substantia nigra.

I. BIOLOGICAL SCIENCES

A Poster

Genetic analysis of a hereditary gingival fibromatosis associated SOS-1 missense variant of uncertain significance in Caenorhabditis elegans.

Himani Patel, Jacksonville State University; Ashley Turner Ph.D., Jacksonville State University .

Section I (Biological Sciences) Posters: Thursday PM;

Hereditary gingival fibromatosis (HGF) is a disorder that leads to fibrous gingival overgrowth in the mouth. Researchers have identified that genetic mutations in the SOS-1 gene can be responsible for HGF. The goal of this study is to examine the potential impact of an HGF associated SOS-1 missense variant of uncertain clinical significance (VUS). Studies in C. elegans have revealed the nematode ortholog sos-1 which allows comparative studies. We examined the evolutionary conservation of missense SOS-1 variants across human, C. elegans, and other species. A SOS-1 VUS was identified through ClinVar to be conserved across human, C. elegans, and other species. Multiple sequence alignments were carried out using Benchling. The conserved missense VUS occurs at SOS-1 c.3793T>G (p. Ser1265Ala). The VUS leads to an amino acid class change from polar serine to nonpolar alanine that might result in a change in the encoded protein structure. Current bioinformatic experiments underway include a gene mutational analysis, PolyPhen-2 analysis, and protein modeling to explore the potential pathogenicity of the VUS. If these findings support further investigation, we will examine the VUS in vivo through C. elegans. Future experimentation would include designing primers to amplify the VUS region in C. elegans sos-1 using polymerase chain reaction (PCR) and a CRISPR RNA guide to target sos-1, microinjection of CRISPR-Cas9 reagents to generate the VUS-sos-1 C. elegans model, and screening and phenotyping of the identified VUS model. This study aims to provide an assessment of the HGF associated VUS shedding light on its clinical significance.

I. BIOLOGICAL SCIENCES

A Poster

Honey and Cinnamon: An Investigation of Their Antimicrobial Activity.

Johana Villavicencio, Birmingham-Southern College .

Section I (Biological Sciences) Papers: Thursday AM

In this study we investigated the antimicrobial activity of bacterial isolates obtained from honey and cinnamon. As bacteria become resistant to antibiotics, the need to find an alternative for antibiotics only grows further. Bacteria samples from honey and cinnamon were characterized via gram staining, spore testing, and 16S PCR. These samples were tested against Pseudomonas aeruginosa (ATCC 10145), Staphylococcus spp. (ATCC 12600), Enterobacter cloacae (ATCC 13047), Enterococcus faecium (ATCC 19434), and Acinetobacter baumannii (ATCC 19606) to determine antimicrobic activity. Bacteria isolates obtained from honey and cinnamon tested gram-positive and spore forming. PCR sequencing results supported these characterizations. Bacteria in honey showed resistance to Enterobacter cloacae and Acinetobacter baumannii. Bacteria in cinnamon also showed resistance to both as well as Enterococcus faecium. Understanding the antimicrobial activity of bacteria samples from honey and cinnamon, help us determine which of the two would be a better alternative for antibiotic treatment.

I. BIOLOGICAL SCIENCES

A Poster

Do herbivores lead to the maintenance of ‘isomorphic’ algal life cycles?.

Alexis Oetterer, University of Alabama at Birmingham; John Lewis, Virginia Institute of Marine Science Eastern Shore Laboratory; Charles Amsler, University of Alabama at Birmingham; April Blakeslee, East Carolina University; Amy Fowler, George Mason University ; Stacy Krueger-Hadfield, University of Alabama at Birmingham .

Section I (Biological Sciences) Posters: Thursday AM,

Eukaryotic life cycles alternate between more than one free-living stage. If stages differ in form and function, then these types of life cycles will be evolutionary stable. However, the differences among ‘isomorphic’ stages in macroalgal haploid-diploid life cycles have remained puzzling as they are often thought to be ecologically equivalent. This similarity might be more imagined than real as theoretical modeling has shown ‘isomorphic’ stages need only subtly differ for these life cycles to be evolutionary stable. Yet, detecting slight phenotypic differences has remained somewhat elusive. In the haploid-diploid, red alga Gracilaria vermiculophylla, sites with abundant hard substratum are composed of haploid gametophytes and diploid sporophytes. Whereas, at free-floating sites, in which thalli fragment and drift, sporophytes dominate and gametophytes are largely absent. We investigated the role of herbivory as one ecological driver of the disruption of the life cycle during the invasion of soft sediment habitats. We subjected two common amphipod consumers – Ampithoe valida and Gammarus mucronatus – to live tissue assays. In preliminary trials, Ampithoe consumed thalli, while Gammarus did not consume any thalli. These data may hint at one mechanism underlying sporophytic dominance under certain ecological conditions in G. vermiculophylla. More broadly, herbivory may play an important role in the maintenance of the haploid-diploid life cycle. Understanding the genetic and ecological forces maintaining eukaryotic life cycle diversity is key to resolving the riddle of sex.

I. BIOLOGICAL SCIENCES

A Poster

Acquisition and Subsequent Rapid Loss of Antibiotic Resistance in a Probiotic.

Brad Bennett, Samford University; Olivia Love, Samford University; Bryce Pierce, Samford University; Nicholas Hammond, Samford University; Kwadwo Antwi-Fordjour, Samford University ; Drew Hataway, Samford University .

Section I (Biological Sciences) Posters: Thursday AM,

Probiotics, live microbes in certain foods such as yogurts, interact in a mutualistic way with humans. They provide a myriad of benefits including barrier protection against pathogens. Little is known of the effects associated with exposure of probiotics to sublethal concentrations of commonly prescribed antibiotics. We performed an adaptive laboratory evolution (ALE) experiment to determine if the fitness of the probiotic Lactobacillus plantarum is altered by exposure to sublethal concentrations of doxycycline. Replicate cultures of L. plantarum were continuously grown for 1000 generations (~5 months) in media containing sub-lethal antibiotic at either 0.1X MIC or a significantly lower environmental concentration based on a global average of surface water values. Fitness tests were periodically performed to examine if the inhibition profile changed over time as this could establish acquisition of resistance. An exponential decay model was fit to the data to determine precise inhibition values. Cultures exposed to higher sub-lethal antibiotic levels (0.1X initial MIC) showed a modest increase (~4-fold) in the inhibitory concentration values, especially IC50. To investigate whether resistance is reversible, we continued culturing of resistant strains with the selection pressure removed (no doxycycline) to 1200 generations. Resistance was lost rapidly, in ~100 generations, with IC50 at 1200 generations being essentially the same between experimental and control cultures. This suggests that resistance, once acquired, is not fixed; the mechanism by which resistance is acquired and subsequently lost is under investigation. This result could have implications for antibiotic/probiotic synergy treatments and microbial evolution.

I. BIOLOGICAL SCIENCES

A Poster

Genetic assessment of Familial Hemiplegic Migraine Type 1-associated CACNA1A variants of uncertain significance in C. elegans.

JoAnna LaPoint, Jacksonville State University; Ashley Turner, .

Section I (Biological Sciences) Posters: Thursday PM;

General migraine disorder is one of the most common neurologic disorders, affecting more than 1 billion individuals each year across the world. The exact cause of the underlying migraine can be complex and multifactorial with both genetic and environmental factors at play. Familial hemiplegic migraine type 1 (FHM1) is a rare but very severe form of migraine with patient symptoms including photophobia, hyperacusis, unilateral weakness, mental retardation, epilepsy, and cerebellar degeneration. FHM1 is caused by pathogenic mutations in the CACNA1A gene. The CACNA1A gene encodes for the alpha protein subunit of voltage-gated calcium channels. We examined evolutionary conservation analysis of FHM1-associated missense variants of uncertain significance (VUS) in human (CACNA1A) and nematode, Caenorhadbitis elegans (unc-2). Using Benchling, 12 VUS obtained from ClinVar were examined through multiple sequence alignments and 2 were identified to be conserved across all species. Poly-Phen 2 analysis also revealed I1707T to be likely pathogenic (HumDiv score 0.988). Primers were designed to amplify the VUS region in C. elegans unc-2. Future experimentation includes polymerase chain reaction (PCR) experiments to optimize the primer pair, CRISPR RNA guide design to target unc-2, CRISPR-Cas9 microinjection to generate the VUS-unc-2 C. elegans model, and phenotyping the VUS model. If the VUS does impact function of unc-2, then it is expected to impact nematode movement and sensitivity to light and sound. This study will provide in vivo assessment of this FHM1-associated VUS shedding light on its potential clinical significance for humans.

I. BIOLOGICAL SCIENCES

A Poster

An Exploration Into the Sex-Based Venom Variation in the Texas Brown Tarantula (Aphonopelma hentzi). Jorjia Elmore, University of South Alabama; Jason Strickland, .

Section I (Biological Sciences) Posters: Thursday AM,

Sexual dimorphism is a common occurrence throughout the animal kingdom and evolves in response to sex-based differences in reproductive success, parental investment, and niche parameters such as diet. Sex-based differences occur frequently in invertebrates including arachnids, and can sometimes manifest in the venom of venomous animals. Sexually dimorphic venom has been observed in venom yield, gene expression, and biological activity in centipedes, scorpions, spiders, and snakes. The Texas Brown Tarantula (Aphonopelma hentzi), has been shown to exhibit a large number of sexually dimorphic traits. The large difference in size, age, and mating activity in these spiders make them an optimal species to text for sex-based venom variation. To test for sexual dimorphism in the venom, we converted mRNA to cDNA from the venom gland and sequenced the RNA-seq libraries on an Illumina NovaSeq 6000. Using these data, we generated the first venom gland transcriptome for A. hentzi. Our preliminary samples were all females and we found that there were many protein families in the venom. We will be conducting additional fieldwork in May to complete sampling and obtain males to test for sex-based differences in gene expression. Based on previous studies on this species and other arachnid venom studies, we predict that females will have more complex venom composition.

I. BIOLOGICAL SCIENCES

A Poster

Socioeconomic Status and Available Healthcare in Rural Alabama and their Effects on Time of Diagnosis and Mortality in Breast Cancer Patients.

Allison Stegall, Huntingdon College; Ram Alagan, Alabama State University; Seela Aladuwaka, Alabama State University; Manoj Mishra, Alabama State University .

Section I (Biological Sciences) Posters: Thursday PM;

Background: Research shows that low socioeconomic status (SES) correlates directly with breast cancer (BC) prevalence. BC is the top second health epidemic after prostate cancer in Alabama (American Cancer Society, 2022). This study aims to find how the time of diagnosis and mortality are related to low and high SES, especially in the rural communities of Alabama. The Alabama Black Belt Counties (ABBC) are underserved regarding education, healthcare, food quality, and the economy. The population in ABBC is predominantly African American, with 26% of the population of state demography, which leads us to believe that disparities that may be found in this study could be race related.

Hypothesis/Objective: SES directly affects the time of diagnosis and mortality for BC patients. Some factors that could cause late diagnosis and, in turn, mortality are transportation to healthcare facilities, insurance that is taken at the facilities, copay upon arrival, and ultimately the cost of procedures. We believe that these factors could lead citizens to wait longer to get screened for BC and are less likely to be treated if diagnosed.

Methods: Secondary data from federal and state-level cancer statistics, the census department, and published peer-reviewed journals employed. We used statistical methods, SES, and the time of diagnosis and mortality for BC patients correlated within the ABBC.

Conclusions: Data suggests the SES factors correlate with the high prevalence of late diagnosis of BC and the higher mortality rate. Bringing awareness could help initiate effective policy planning to reduce healthcare and SES disparities in these areas.

I. BIOLOGICAL SCIENCES

A Poster

Acorn Weevils Do Not Vary In Size From Red Oak to White Oak Sections.

F. Joseph Kelly, Samford University; Micah Gaddy, Samford University; Jacob Compton, Samford University; John Eric Herrington, Samford Univeristy; Malia Fincher, Samford University .

Section I (Biological Sciences) Posters: Thursday AM,

Acorn weevils have a parasitic relationship with Quercus Oak species, where the weevil larvae feeds on the contents of the developing acorn. The role of size in influencing host choice by weevils and weevil growth is not clear in the literature, with some studies showing that weevils select and perform better in larger acorns, while others demonstrate that weevils do not show any preference based on acorn size. In this experiment, we collected acorns from six different Oak species across six different sites in Birmingham, Alabama and measured weevil mass and average acorn mass, to test the hypothesis that larger weevils would be associated with larger acorn sizes. Although there is variation in acorn size and weevil mass among the six different Oak species, this experiment ultimately found no correlation between acorn size and weevil larvae mass. Physical and chemical defense mechanisms such as tannin/lipid content and masting rate could influence larval size.

I. BIOLOGICAL SCIENCES

A Poster

Red vs White: A Scientific Review on Weevil Infestation Rates Among Different Species of Acorns.

Luke Dart, Samford University; Jacob Ginn, Samford University; Nour Tayara, Samford University; Henry Alperin, Samford University; R. Malia Fincher, Samford University .

Section I (Biological Sciences) Posters: Thursday AM,

Abstract:

Oak tree acorn germination and survival are threatened due to a wide array of predators, most notably, the acorn weevil (Curculio spp.). Female acorn weevils lay their eggs in growing acorns and the larvae develop inside the acorn, consuming its embryo and destroying its ability to germinate. Acorns contain tannin, a bitter plant compound that can be harmful if ingested in large quantities. Oaks in the red oak section tend to have more tannin and more lipids, whereas oaks in the white oak section tend to have less tannin and less lipids. Acorn weevils have the ability to tolerate tannin, and because red oak acorns have more lipids than white oak acorns, the researchers proposed that red oaks will have more weevil infestation than white oaks. We collected acorns in fall 2022 from 230 oak trees of 6 species in 6 sites in the Birmingham area and measured the number of acorns produced and the number of weevil holes in each acorn. Red oak acorns and white oak acorns showed no difference in weevil infestation. Because fall 2022 was a non-masting year for most oaks, where few acorns are produced, it is possible that with limited acorn availability, the weevils are not looking for the most nutritious acorns, but rather laid eggs in any available acorn. Tracking the relationship between weevil infestation and masting in future masting cycles may reveal whether weevils have more strict host preferences in years when acorns are more abundant.

I. BIOLOGICAL SCIENCES

A Poster

The Role of MeCP2 in Motor Learning in a Mouse Model of Rett Syndrome. Kian Kolahdouzan, University of Alabama at Birmingham

.

Section I (Biological Sciences) Posters: Thursday AM,

Methyl CpG binding protein 2 (MeCP2) is an X-linked methylated DNA-binding transcriptional regulator that plays a role in the epigenetic regulation of many genes.

The loss of regulation due to the lack of MeCP2 is involved in many Rett syndrome (RTT) symptoms including motility deficit, epileptic activity, and cognitive dysfunction. However, the effect of MeCP2 in motor learning is not well defined. We hypothesize that knocking out MeCP2 in mice interferes with motor learning capabilities.

This hypothesis will be tested by performing the following experiments: (1) I will use transgenic MeCP2-knockout mice to determine the pellet-reaching capability and compare these results to a wildtype control group of mice; (2) I will use pharmacological, optogenetic, and immunofluorescent approaches to examine the behavioral and cellular consequences of knocking out MeCP2. Motor learning paradigms will be performed, including accelerating rotarod and single pellet reaching tasks. These results will provide novel information regarding the role of MeCP2 in motor learning, uncovering fundamental brain mechanisms involved in the processing and integration of motor learning capabilities in the motor cortex. The results from the proposed experiments will expand our understanding of neurodevelopmental diseases and many other disorders that affect motor learning, including Parkinson's disease, Huntington's disease, Rett syndrome, and Tourette syndrome.

I. BIOLOGICAL SCIENCES

A Poster

Effect of Lifelong Methylmercury on Circulating Estrogen Levels in a Model Songbird. Cara Brittain, Auburn University; Mary Mendonca, ; Dan Cristol, William & Mary; Haruka Wada, .

Section I (Biological Sciences) Papers: Thursday AM

While most work has explored the neurotoxic effects of methylmercury (MeHg), MeHg exposure has also been shown to decrease reproductive success in multiple ways across taxa. Specifically, MeHg has been linked to alteration of timing of reproductive hormone release in humans, increased reproductive disorders in cattle, induction of polycystic ovary syndrome-like features in rats, and reduced clutch sizes in some species of birds. We exposed zebra finches (Taenopygia castanotis) to environmentally relevant levels of methylmercury throughout their lives and quantified circulating estrogen concentrations, hypothesizing that MeHg disrupts estrogen signaling. We predicted birds exposed to MeHg will have decreased estrogen levels compared to controls, but we found no significant difference in average concentration of estradiol between groups. However, when looking at mercury-exposed birds independently, there was a significant negative correlation between concentrations of blood MeHg and estradiol. This preliminary study shows that more work is needed to understand the effects of MeHg in the endocrine systems of songbirds to uncover mechanisms behind reduced reproductive success.

I. BIOLOGICAL SCIENCES

A Poster

Characterizing the reproductive system of Fucus vesiculosus along the Eastern Shore of Virginia.

Sarah Thornton, University of Alabama at Birmingham; Stacy Krueger-Hadfield, University of Alabama at Birmingham .

Section I (Biological Sciences) Posters: Thursday AM,

The reproductive system describes the relative rates of sexual and asexual reproduction and therefore partitions genetic diversity within and among populations. Population persistence is thus influenced by the prevailing reproductive mode. However, as compared to angiosperms, we know much less about reproductive system variation in the ocean. To date, one of the most well studied genera is the brown macroalga Fucus. Fucus spp. are also well known for forming 'ecads', or free-living thalli with morphological variability linked to persistence in estuaries and salt marshes. We are exploring the prevailing reproductive mode in Fucus vesiculosus populations along the Eastern Shore of Virginia (ESVA). Many thalli are fixed to oysters or mussels by holdfasts but have variable morphology with few vesicles and spiraling. First, we will confirm that thalli in ESVA marshes are F. vesiculosus using a combination of rbcL sequencing and microsatellite genotyping. If there is hybridization, then this molecular approach will allow us to determine the polarity of interspecific crosses. Second, we will use temporal sampling to determine the relative rates of sexual versus asexual reproduction. We will also determine the relative connectivity of populations sampled along the ESVA. These data will enhance our knowledge about macroalgae in the Chesapeake for which in-depth studies broadly across taxa are generally lacking. We will also further our understanding of this genus – an emerging model of reproductive biology. Finally, these data are integral to conservation efforts in ecosystems where macroalgae are important ecosystem engineers.

I. BIOLOGICAL SCIENCES

A Poster

The Reproductive System of a Cryptogenic Macroalgal Invader in the Papahānaumokuākea Marine National Monument.

Taylor Williams, University of Alabama at Birmingham; Stacy Krueger-Hadfield, University of Alabama at Birmingham; Kristina Hill-Spanik, College of Charleston; Randall Kosaki, Papahānaumokuākea Marine National Monument; Solenn Stoeckel, Université de Rennes ; Heather Spalding, College of Charleston .

Section I (Biological Sciences) Posters: Thursday AM,

The Northwestern Hawaiian Islands are a 1,931-km chain of remote and nearly pristine atolls within the Papahānaumokuākea Marine National Monument (PMNM). A new macroalga was found acting invasively at Manawai (Pearl and Hermes Atoll) which lies within the PMNM. Chondria tumulosa is a mat-forming, red macroalga found in high abundance across Manawai's shallow subtidal reefs. It was first recorded in low abundance in 2015, but by 2019 formed large mats that smothered native corals and algae, reducing the diversity and abundance of reef organisms on the scale of thousands of meters squared. We hypothesize that the rapid establishment of C. tumulosa is aided by its capacity for asexual reproduction via vegetative fragmentation, a common phenomenon in macroalgal invasions. Only 20% of thalli were visually reproductive at the time of sampling and microsatellite genotyping confirmed that all thalli were tetrasporophytes. We observed in situ thallus fragmentation that was supported genetically by the presence of 17 repeated genotypes and variable, but largely negative, FIS values. Additionally, we found genotypic signatures suggesting rapid expansion, which coupled with thallus fragmentation and tetrasporophytic dominance, is consistent with other red macroalgal invaders studied to date. Chondria tumulosa has the potential for rapid spread, but the absence of the gametophyte stage raises questions about the eco-evolutionary dynamics of this alga at Manawai and more widely throughout the PMNM. Future work is required to both determine the geographic origin of this alga and to expand our understanding of the population genetics of partially clonal taxa.

I. BIOLOGICAL SCIENCES

A Poster

Amplicon sequencing to detect a microscopic life cycle stage.

Sarah Shainker-Connelly, University of Alabama at Birmingham; Morgan Vis, Ohio University; Guido Bonthond, University of Oldenburg; Michael Crowley, University of Alabama at Birmingham; Stacy Krueger-Hadfield, University of Alabama at Birmingham .

Section I (Biological Sciences) Papers: Thursday AM

Many eukaryotes exhibit life cycles with haploid and diploid stages that can prove challenging for biodiversity, systematics, and reproductive biology studies. Freshwater red algae of the order Batrachospermales have heteromorphic diploid and haploid stages. The diploid stage, called "Chantransia", is microscopic and perennial, producing macroscopic, ephemeral haploid gametophytes through vegetative meiosis. Alternatively, Chantransia can produce asexual spores to generate new Chantransia. Systematics and biodiversity studies have focused on the macroscopic gametophytes, largely because they can easily be collected and identified. Yet, this ephemeral stage is seasonal so can be easily missed. Studying the Chantransia stage would be more informative of the presence and diversity of Batrachospermalean taxa. To survey Chantransia, we developed and tested primers to amplify a portion of the rbcL gene that will differentiate among species in the Batrachospermales using next-generation Illumina sequencing. We then collected environmental DNA (eDNA) by scraping rocks from streams and ponds. We verified the presence of Chantransia through microscopic observations, after which eDNA was extracted and rbcL fragments were amplified and sequenced using Illumina MiSeq. Using microscopy and sequencing, we detected Chantransia in several streams where gametophytes were absent, indicating that either we sampled outside of the gametophyte season or the Chantransia reproduce asexually and bypass the gametophyte stage. The ability to detect Chantransia of one or multiple species has implications for improved understanding of the distribution of freshwater red algae and environmental conditions under which the life cycle is completed and those where the Chantransia are recycled without gametophytes.

I. BIOLOGICAL SCIENCES

A Poster

Investigation of TCOF1 Variations: An Insight to Treacher Collins Syndrome.

Hunter Ballard, Jacksonville State University; Alyssa Jones, .

Section I (Biological Sciences) Papers: Thursday AM

Treacher Collins Syndrome (TCS) is a genetic disease in which the development of facial bones and tissues is affected. It is very rare, affecting approximately one in every 50,000 people. TCS is caused by a mutation in one of three genes: TCOF1, POLR1C, or POLR1D. Although it can occur in all three of these, the TCOF1 gene accounts for 81 to 93 percent of cases. Why a mutation in these genes causes TCS revolves around the fact that these proteins aid in the production of ribosomal RNA (rRNA), which helps assemble amino acids into new proteins. A mutation causes the amount of rRNA produced to decrease, which then triggers some facial-building cells to destroy themselves (apoptosis). Symptoms of TCS are primarily physical, so it typically has no effect on mental stability or intelligence. Unfortunately, there is no cure for Treacher Collins. However, some of the symptoms can be treated by means of genetic counseling classes, physical aids such as hearing aids, or various surgeries that may be able to lessen the effects of this disease. In this project, two different mutations of the TCOF1 gene are studied to determine the pathogenicity of each. Both missense mutations, F39L and E621V, are of uncertain significance. The pathogenicity, structure, and the conservation of variants across species are under investigation via multiple public databases and molecular prediction software including Simple Clinvar, PolyPhen 2, AlphaFold, Uniprot, and YASARA. Through these tools, a conclusion will be formed about the likely pathogenicity of each variant, and any patterns discovered will be noted and shared with the greater scientific community.

I. BIOLOGICAL SCIENCES

A Poster

Natural Genetic Variation and Sex Regulate Diet-Dependent Lifespan Extension Under Methionine-Restricted Conditions in Drosophila melanogaster.

Joshua Smith, University of Alabama at Birmingham; Steven Austad, University of Alabama at Birmingham; Jessica Hoffman, University of Alabama at Birmingham .

Section I (Biological Sciences) Papers: Thursday AM

Caloric restriction (CR) has long been extensively studied as an intervention in the aging process for its ability to extend lifespan and improve several measures of health in a broad range of animal models. Increasingly, research suggests that other factors such as amino acid content play a significant role in longevity and other age-related phenotypes and that restriction of a single amino acid, such as the essential amino acid methionine, is sufficient to robustly increase life and healthspan. However, prior studies have generally used only one or a few genetic backgrounds to examine the effects of methionine restriction and the degree to which the pro-longevity and geroprotective benefits of this intervention are genotype and sex-dependent is unclear. To address this, we have characterized the impact of a methionine restricted diet on lifespan and age-dependent changes in physical activity in D. melanogaster utilizing the natural genetic variation of the Drosophila Genetic Reference Panel. Interestingly, we find that a MetR diet can uncouple longevity extension from a common measurement of Drosophila healthspan, climbing ability. Additionally, we show that sex and genotype regulate diet-dependent changes in lifespan under MetR conditions. Altogether, our study highlights the complex role that genetic variation and sex have in determining the response of age-related traits to amino acid restriction.

I. BIOLOGICAL SCIENCES

A Poster

Characterizing the reproductive system in two invasive Avrainvillea populations.

Brinkley Thornton, University of Alabama at Birmingham; Melissa Harris, University of Alabama at Birmingham; Heather Spalding, College of Charleston; Rachael Wade, University of British Colombia; Stacy Krueger-Hadfield, University of Alabama at Birmingham .

Section I (Biological Sciences) Posters: Thursday AM,

Reproductive systems are the key life history trait influencing the partitioning of genetic diversity within and among populations. For many invasive species, uniparental reproduction can facilitate initial colonization and subsequent range expansion. In Hawai‘i, the invasive green alga Avrainvillea lacerata was first documented from intertidal and subtidal depths in the 1980s. While field observations suggest populations are solely reproducing asexually through thallus fragmentation, there are no molecular data clearly demonstrating clonality and an absence of sexual reproduction. We sampled two populations on O‘ahu – ‘Ewa Beach and Maunalua Bay – over several successive summers (2018, 2019, 2021). Here, we discuss the microsatellite development and preliminary analyses on the prevailing reproductive mode. This work will add to the body of literature on the evolutionary ecology of A. lacerata, providing one of the first datasets for green algal population genetic patterns that incorporates novel population genetic tools to assess reproductive system variation. These data will also provide important evolutionary predictions for invasive species management.

I. BIOLOGICAL SCIENCES

A Poster

12-oxophytodienoic acid is a key hormone signal priming induced systemic resistance in plants against a range of microbial pathogens and insect pests.

Ashna Adhikari, Auburn University; Sang-Wook Park, Auburn University .

Section I (Biological Sciences) Papers: Thursday AM

In plants, trade-offs between growth and defense have appeared as a major pitfall in genetically engineering/improving defense capacity. To understand if and/or how plants could coordinate growth and defense responses, we here exploit the role and mode of plant growth-promoting rhizobacteria (PGPR)-mediated 'induced systemic resistance (ISR)', a phenomenon capable of priming a broad-spectrum disease resistance without the usually accompanied growth penalty. Here, we i) Screened and isolated the ISR-inducible PGPR strains, Bacillus subtilis and Pseudomonas oryzahabitans, as well as a negative PGPR strain, Paenibacillus polymyxa. and ii) Surveyed the expression of different PGPR-responsive genes to delineate the circuitry of hormone, such as jasmonate and salicylic acid (SA), signal transductions in local and systemic tissues during ISR activations. When plant roots were inoculated with B. subtilis and P. oryzahabitans, they induced jasmonate, but not SA, biosynthesis, and in turn activated jasmonate, both 12-oxophytodienoic acid (OPDA) and jasmonate-isoleucine (JA-Ile), signaling. The local defense then conveyed a mobile, long-distance signal to systemic leaf tissues where it can activate OPDA signaling, but not produce JA nor activate JA-Ile signaling, suggesting that a ISR signal is OPDA or its precursor. On the other hand, both inoculated and naïve tissues upregulated the expression of Pathogenesis-related Protein1 (PR1) and PR4, molecular markers for SA signaling, although they could not stimulate SA biosynthesis, indicating that ISR requires SA-independent PR1 gene pathways. In line with this scenario, OPDA application can directly induce the accumulation of PR1 transcripts without affecting the cellular level of SA. Together, we propose that ISR requires in local tissues the accumulation of OPDA that move to systemic tissues where activate OPDA response defense gene and SA-independent PR1 gene pathways.

I. BIOLOGICAL SCIENCES

A Poster

Understanding How the HA-CD44 Pathway Alters Chemoresistance in Response to Mechanical Stimulation.

Allyson Criswell, University of Alabama at Birmingham; Maranda Tidwell, Department of Biomedical Engineering; Mary Kathryn Sewell-Loftin, Department of Biomedical Engineering .

Section I (Biological Sciences) Papers: Thursday AM

Ovarian cancer is the deadliest gynecological cancer with a demonstrated 50% 5-year survival rate. The CD44 receptor has been associated with worse prognoses in ovarian cancer and is responsible for increases in metastatic behaviors. Additionally, increases hyaluronic acid (HA), the ligand for the CD44 receptor, is tied to worse clinical outcomes. The CD44-HA pathway is implicated in increases in proliferation, potentially through downstream factors in the MAPK, ankyrin, and ERM pathways. My project investigates how mechanical stimulation alters HA-CD44 signaling in epithelial ovarian cancer cells to understand how these forces drive disease growth and alter response to chemotherapeutic treatments. We hypothesize that a more mechanically active tumor microenvironment (TME) and HA will alter CD44, pCD44, and CD44v6 expression and in turn increase levels of ERM and Ankyrin. Our preliminary data displays that a monolayer of both wildtype OVCR8 cells and modified OVCAR8 cells when stimulated with cyclical strain via a FlexCell for 24 hours display higher protein levels of CD44 when HA is included as a coating on the substrate versus untreated controls or when HA is added to the media as a soluble factor. This suggests that the CD44 pathway may be regulated by the combination of mechanical strain and HA in the matrix. Future studies will investigate how levels of activated CD44 (pCD44) are altered by HA and/or strain treatment.

I. BIOLOGICAL SCIENCES

A Poster

Investigation of E200G, R612H, Y657H, H1286Y, and A2108P on F8 Protein.

Olivia Morris, University of North Alabama .

Section I (Biological Sciences) Papers: Thursday AM

As part of a large-scale project that is dedicated to the classification of variants of uncertain significance (VUS), this project focuses on variants of the Coagulation Factor VIII F8 gene. Mutations on the F8 gene are linked to the presentation of the sex-linked disorder Hemophilia A. Hemophilia A is transmitted in a recessive manner on the X chromosome. Five variants were researched in this project. These variants were E200G, R612H, Y657H, H1286Y, and A2108P. These variants were evaluated through the "sequence-to-structure-to-function" workflow model. These variants are compared to all of the F8 variants compiled from the Simple ClinVar database. These variants were also assessed through the mutation assessment sites including PANTHER, Condel, Provean, SIFT, and PolyPhen-2. YASARA modeling including slow homology and molecular dynamics simulations were used to determine the variants' effect on the F8 gene sequence. The results showed that Y657D was a benign variant while E200G and R612H caused small changes to the protein. A2108P caused the most significant change to the protein. The results for H1286Y are still being processed.

I. BIOLOGICAL SCIENCES

A Poster

Recognizing Eating Disorders in Collegiate Athletes with Stress-Related Bone Injuries.

Jessica Cushing-murray, Alabama College of Osteopathic Medicine; Ronda Carter, Alabama College of Osteopathic Medicine; Julia Alexander, Alabama College of Osteopathic Medicine .

Section I (Biological Sciences) Papers: Thursday AM

Introduction:

Female collegiate athletes are among the highest at-risk population for eating disorders (EDs). Despite research demonstrating that one-third of Division I female athletes have symptoms of anorexia nervosa, the number clinically diagnosed remains low.

Case Presentation:

We present a 19-year-old female NCAA DI Cross Country athlete, with no past medical history, who first presented with left thigh pain. Physical exam revealed a positive fulcrum test, and an MRI showed an area of edema within the medullary femur. Patient was diagnosed with a left femoral shaft stress fracture.

Patient returned six months later with pain in the right thigh. A similar procedure was followed, and patient was diagnosed with a right femoral shaft stress fracture. Over the next year, the patient had three other stress-related bone injuries in the femur, tibia, and navicular.

Discussion:

The patient eventually saw a psychiatrist on her own accord, and was diagnosed with anorexia nervosa, specific to binging/purging subtype, with excessive exercise as method of purging. Throughout the patient's athletic career, the team physician never investigated dietary habits as a possible cause of the continued stress fractures. Patient's BMI was <18.5 during this time.

Conclusions:

This report aims to raise awareness to the prevalence of eating disorders in the collegiate athlete population, highlight the physical consequences of an ED, and reiterate the difficulty of recognizing eating disorders for physicians outside the scope of psychiatry. Authors encourage future providers to broaden their differential diagnoses in collegiate athletes with repeat bone injuries.

I. BIOLOGICAL SCIENCES

A Poster

Consequences of Both Common and Uncommon Complications of Uncontrolled Hypertension.

Jessica Cushing-murray, Alabama College of Osteopathic Medicine; Erika Haviland, Alabama College of Osteopathic Medicine; Evans Kyei-Nimako, North Alabama Medical Center .

Section I (Biological Sciences) Papers: Thursday PM;

Introduction: Though hypertension is one of the most prevalent and universal medical diagnoses, approximately 50% of patients do not achieve adequate BP control. Uncontrolled HTN has many known complications, such as heart failure, stroke, kidney disease, and myocardial infarction. However, there are far fewer incidences of GI complications, such as GI bleed, relating to uncontrolled HTN.

Case Presentation: We present a 63-year-old male poor historian with history of HTN and noncompliance with medication, presenting with episodes of confusion and recurrent falls. He had been to the ER the day prior to admission with BP 195/145 after being found on the floor due to a fall, laying in his own urine and feces; however, he left AMA without a complete work-up. Family then brought him back to the hospital for similar disorientation and inability to care for himself. Family confirmed he takes no medications at home. His CBC revealed Hb 5.8 and Hct 16.9%. Brain MRI showed cerebral atrophy with prior chronic brainstem infarcts.

During his hospitalization, he required multiple investigations. First, on day 4 of hospitalization, patient became unresponsive/pulseless in PEA, and required 15 minutes of CPR before successful ROSC, intubation, and ICU transfer. Subsequent ECG revealed STEMI, so Cardiology performed heart catheterization with multiple unsuccessful PCI attempts and no reflow distally. Second, his original presentation with recurrent falls and the low H&H on admission suggested an upper GI bleed. EGD was performed, revealing multiple ulcers in the stomach and duodenum, one required clipping to prevent continued bleeding.

Diagnosis: Patient was diagnosed with hypertensive encephalopathy due to medication noncompliance, complicated by acute GI bleed secondary to gastric and duodenal ulcers.

Management/Outcome: Patient received multiple PRBC transfusions, antibiotics, volume repletion, anticoagulants, and antihypertensives. His GI bleed without H. Pylori diagnosis or NSAID use suggested that his uncontrolled HTN caused gastroduodenal ischemia leading to bleeding peptic ulcers—a rare complication. Though this was able to be treated, his many years of noncompliance presented

subsequent organ dysfunctions throughout his hospital stay that could not be reversed. Ultimately on day 17, patient expired due to STEMI after family agreed to make him DNI/DNR.

II. CHEMISTRY

A Paper

Study of near infrared spectroscopy as a quantitative method for monitoring polyethylene content in recycled polypropylene. pixiang wang, Troy University; shaoyang liu, troy university Troy University.

Section II (Chemistry) Papers: Thursday AM

Recycled polypropylene (rPP) often contains a small amount of polyethylene (PE) due to the ineffectiveness of current sorting technologies. Since PP and PE are not compatible, the presence of PE compromises the performance of the material and needs to be monitored. In the current work, near-infrared (NIR) spectrometry was investigated to analyze PE content in rPP. Spectrum pretreatment methods, including multivariate scatter correction (MSC), standard normal variate transformation (SNV), smoothing, and first derivative, were investigated to improve the spectrum quality and accuracy of the analysis. Principal component regression (PCR) and partial least square (PLS) modeling methods were compared. The results showed that PCR was more accurate than PLS method for predicting PE content in recycled plastics, with smaller component number and higher R2. The best model of SNV-SG-FD by PCR method had a R2 of 0.9992 and a root-mean-square error of prediction (RMSEP) of 0.1486 PE wt% in independent validation with 2 components. The models were further validated with non-colored rPP samples, where the MSC-SG-FD model obtained an R2 of 0.9638 with the component number of 2, significantly better than the prediction results of all PLS models with 2 latent variables. This work would help quality assurance of recycled PP materials.

II. CHEMISTRY

A Poster

Improving the Photovoltaic Performance of Dye-Sensitized Solar Cells using Ni-doped MoSe2/GO Counter Electrode.

Abbey Steadman, University of North Alabama; Md Abu Shohag, University of North Alabama; Md Humayun Kabir, University of North Alabama University of North Alabama.

Section II (Chemistry) Papers: Thursday PM

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. For industrial applications, Pt counter electrodes need to be replaced with Pt-free counter electrode because of their limited sources and cost. The purpose of this experiment is to introduce Ni-doped MoSe2 nanoplates (NiMoSe2) as an alternative practical counter electrode which has an excellent electrochemical activity to enhance the light harvesting efficiency of a DSSC. 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 graphene oxide- NiMoSe2 hybrid (GO- NiMoSe2) for counter electrode preparation and the fabrication and characterization of N719 dye for photoanode. The photocurrent density–voltage (J–V) characteristics, electrochemical impedance spectroscopy, powder X-ray diffraction (PXRD), UV-vis spectroscopy, and scanning electron microscopy (SEM) were used to analyze electrode materials and photoelectrochemical performances of the cell.

II. CHEMISTRY

A Poster

4-methyl-dihydropyridine Diels Alder Reactiom. maranda thomas, Jacksonville State University; Stephen S Slauson, .

Section I (Biological Sciences) Posters: Thursday PM;

This research aims to address the issue of lack of non-addictive analgesics for pain management by exploring the potential of nicotinic acetylcholine receptors, which provide pain relief without the risk of addiction. A homoepibatidine derivative substituted at the 4 position is being developed as a potential probe to understand the molecular mechanisms of nicotinic receptors and identify compounds that can selectively activate them to provide effective non-addictive pain management. N-carbomethoxy-1,2-dihydropyridine was prepared from 4-methylpyridine and purified by column chromatography. After being analyzed using TLC and NMR, the dihydropyridine was ran through the Diels-Alder reaction. Current progress towards this goal will be presented.

II. CHEMISTRY

A Poster

Synthesis and Characterization of Fatty Acid Methyl Ester Biodiesel Fuels from Acorn Biowaste.

Alexander Waller, University of North Alabama; Md Humayun Kabir, University of North Alabama

University of North Alabama.

Section II (Chemistry) Papers: Thursday PM

Energy demand is one of the most critical challenges facing humanity today. Combustion of fuels provides the energy that sustains our modern way of life. The demand for alternative energy sources is increasing as the demand for energy and the environmental impacts of fossil fuels have increased. Biofuels have attracted increasing interest in the recent decades as an alternative to fossil fuel. Biodiesel fuels are produced via transesterification of a triacylglycerol with alcohol in presence of a catalyst. In this work, acorn nuts were used as a source of triacylglycerol for the synthesis of biodiesel fuels. The oil extracted from the endosperm of acorns was then subjected to base-catalyzed and acid-catalyzed transesterification reactions with methanol to produce acorn kernel oil fatty acid methyl ester. The biodiesel products obtained from the different experiments were characterized and analyzed using FTIR spectroscopy, NMR spectroscopy, iodine value, acid value, cloud point, and viscosity. This work compares biodiesel derived from vegetable oils and biodiesel obtained from acorn kernel oil in light of fuel properties. The yields of biodiesel fuels and their fuel properties will be presented at this meeting.

II. CHEMISTRY

A Poster

Homoepibatidine Derivatives: Exploring the 3-Position.

Evan Hester, Jacksonville State University; Christian Sears, ; Donna Perygin, ; Stephen Slauson, Jacksonville state university.

Section II (Chemistry) Posters: Thursday AM

Addiction is a major concern throughout the world and if a certain chemical could bind to nicotinic receptors without increasing feelings of addiction or causing health problems it would be beneficial in the fight against addiction and the opioid epidemic. Epibatidine is found on the epidermal layer of an Ecuadorian poison frog Epipedobates tricolor. The goal of the research is to manipulate R groups found on Epibatidine and determine the effects of the binding to the nicotinic receptors. The 3-carbon position on Homoepibatidine is the target of this research. Grignard reactions were utilized to form dihydropyridine intermediates. After the formation of the intermediates, they were placed under a Diels-Alder reaction to form the Homoepibatidine scaffolds.

II. CHEMISTRY

A Poster

Nitrile Homoepibatidine: A Possible Solution to the Opioid Crisis.

Noha Al-Saadi, Jacksonville State University; Donna Perygin, JSU; Stephen Slauson, JSU .

Section II (Chemistry) Posters: Thursday AM

Addiction is a leading cause of death worldwide, and according to the World Health Organization, overdose of pain relievers accounts for more than 70 percent of those deaths. Those inflicted with chronic pain yearn for an effective pain reliever without being put at risk of developing a fatal addiction to the prescription. Epibatidine, an alkaloid found on the epidermal layer of the Ecuadorian Poison Frog, Epipedobates tricolor, may be the solution. Epibatidine targets the nicotinic-acetylcholine receptors (nAChRs), serving as an analgesic. Attributable to the nAChRs are several nicotinic sub-types. Any slight alteration to the chemical structure may constitute a change in binding and expression. This experiment aimed to develop a structure-activity relationship (SAR) of derivatives to nicotinic subtype selectivity. Scaffolds were developed to distinguish between the receptor's alpha and beta binding sites. The nitrile-homoepibatidine derivatives were synthesized through Diels-Alder reactions. Adding a nitrile group is intended to increase selectivity at the binding site. We expect partial or full agonist activity from this derivative, resulting in analgesic effects. We docked this derivative into the nAChR receptor in MOE, a molecular-modeling software program, to study potential ligand-receptor interactions. Additionally, the structures were confirmed by NMR, and results show the presence of 4 distinct isomers. Through results obtained, a nitrile-homoepibatidine based drug seems to be synthesizable, having the potential to alleviate the ongoing opioid crisis.

III. PHYSICS AND MATHEMATICS

A Paper

Calculating the Effects of Longitudinal Magnetic Field Gradient on Electron Spin.. Ashik Kannan, Troy University; James Sanders, Troy University .

Section III (Physics and Mathematics) Papers: Thursday PM

The interaction between an electron's spin and the longitudinal magnetic field gradient will cause electrons with a certain spin value to gain kinetic energy and those of other spin values to lose kinetic energy. We know that electrons along with other spin-half particles such as protons, neutrons, neutrinos, and quarks are either spin-up or spin-down. The purpose of this project is to calculate the spins of electrons subjected to a given longitudinal magnetic field gradient by determining the difference in turning radii for both cases when placed in a separate magnetic field (e.g. from a mass spectrometer). Currently, we have measured the magnetic field produced by a solenoid that satisfies the longitudinal magnetic gradient criterion. We then use GNU-OCTAVE to calculate the expected turn radii for each electron spin value given an initial energy and spectrometer field value.

III. PHYSICS AND MATHEMATICS

A Paper

The Sun and a Tale of Two Eclipses. Mitzi Adams, Marshall Space Flight Center .

Section III (Physics and Mathematics) Papers: Thursday AM

The Sun and a Tale of Two Eclipses is about characteristics of our closest star, the annular eclipse that will happen on October 14, 2023 (it will be partial in Alabama), the total eclipse that will happen on April 8, 2024 (also partial in Alabama), and the safe ways to observe them.

III. PHYSICS AND MATHEMATICS

A Paper

Role of Fear in an Eco-Epidemiological Model. Sarah Westmoreland, Samford University; Kwadwo Antwi-Fordjour, Samford University; Kendall Bearden, Samford University .

Section III (Physics and Mathematics) Papers: Thursday AM

In this talk, an eco-epidemiological model with species aggregation and disease in prey subject to fear of predators will be discussed. We assume that the reproduction of the susceptible class of the prey population is affected by fear induced by the predators. We present some basic mathematical results such as positivity, boundedness, and local stability. The coexistence of the species at the endemic state is possible for our proposed model via numerical simulations. This coexistence equilibrium can be destroyed by increasing the strength of fear of predators. We will show that the strength of fear can create and destroy the coexistence equilibrium. In some cases, we will show that the strength of fear can drive a stable endemic state into extinction in finite time. We will also present some interesting and rich bifurcation behaviors revealed by our model.

III. PHYSICS AND MATHEMATICS

A Paper

Hubbard U Parameters for Rare-Earth Metals from First Principles.

Logan Burnett, University of Alabama at Birmingham; Cheng-Chien Chen, University of Alabama at Birmingham .

Section III (Physics and Mathematics) Papers: Thursday PM

Calculating the properties of rare-earth metals using ab-initio methods is an important component in understanding strongly correlated materials. Traditional density functional theory (DFT) calculations are insufficient in describing their properties and phase transitions due to the electronic correlation effect. On the other hand, the DFT+U approach is a more robust method for obtaining experimentally-consistent electronic and magnetic structures. One critical question, however, is how to determine the Hubbard value from first-principles. Here, we employ the linear response approach to calculate the effective U for various rare-earth metals. We study how the U value of Cerium and Terbium evolves as a function of unit cell size and structure type. The pressure evolution of the Hubbard U is calculated using both experimental unit cell and DFT relaxed crystal structures. The resulting U values provide important input information for DFT+U calculations to understand the behavior of rare-earth materials and their applications in extreme pressure environments.

*The research is supported by the DOE-BES Award No. DE-SC0023268.

III. PHYSICS AND MATHEMATICS

A Paper

Pulses of Josephson Junctions and Superconducting Quantum Computers. Tianxi Zhang, Alabama A&M University; Cornelius Salonis, Alabama A&M university; Maria Dudley, Alabama A&M university .

Section III (Physics and Mathematics) Papers: Thursday AM

The Josephson junction is a device, formed by separating two superconductors with a thin insulating barrier. It can be used to construct three types of quantum bit (qubit) for a superconducting quantum computer. Recently, IBM has created a 127-qubit superconducting quantum computer, which is the largest ever and doubles the size of that made by Google. Electromagnetic pulses generated by Josephson junctions have many technology applications such as digit control, switches, modulators, and so on. Studying of their generation, property, and control plays an important role in developing stable and controllable quantum computers. In this study, we have analyzed the electromagnetic properties and pulses of Josephson junction. The results obtained from our analysis and calculations have shown that perturbations of the two superconductors can initiate strong superconducting pulses. The electric field and potential developed in the junction periodically oscillate and pulsate. The strength of the Josephson pulse increases with the differences of super-electron density and phase rate between the two superconductors. The pulse can be stronger in strength and narrower in width when one superconductor has lower density but higher rates of density and phase than another superconductor. As light or electromagnetic waves can perturb the superconductivities of superconductors, one can use them to control the pulses of Josephson junctions. This research is supported by the IBM-HBCU Quantum Center via the awarded project.

III. PHYSICS AND MATHEMATICS

A Paper

Optical trapping with a new optical tweezers using a water-immersion objective lens. Hung Lam, University of North Alabama; D. Brian Thompson, University of North Alabama .

Section III (Physics and Mathematics) Papers: Thursday AM

An optical tweezers consists of a laser beam focused through a high-numerical-aperture microscope objective lens, creating an optical trap at the beam's focal spot. Here, we constructed a new tweezers that uses a water-immersion objective lens arranged in an inverted orientation. This objective lens provides several advantages over an oil-immersion objective lens that we've used previously. Rather than assembling the tweezers by placing optical elements in individual mounts, we aligned each element within a cage system. This cage system ensures precise optical alignments. With the new tweezers, currently we are measuring the maximal force exerted by the optical trap to hold microbeads with diameters ranging between 0.7 - 15 µm. We compare these measurements with theoretical predictions of maximal force.

III. PHYSICS AND MATHEMATICS

A Paper

Statistical Analysis and Modeling of Success of 'Saturday Night Live' Sketches. Merritt Cahoon, Samford University; Mingwei Sun, Samford University .

Section III (Physics and Mathematics) Papers: Thursday PM

'Saturday Night Live' (SNL) enjoys great popularity as a live television sketch comedy and variety show joined by celebrity hosts and an award-winning ensemble cast. In this paper, a quantitative analysis is implemented to investigate what factors significantly affect the success of an SNL sketch. A new success indicator of an SNL sketch is introduced. A statistical model is proposed to fit and predict the success of SNL sketches using new variables, including the type of sketch, whether the host is involved, what cast members are involved, how the sketch is recorded, and if there are any cameos. Background of the comedy

sketch show is provided along with media criticisms about how the show has become "too political." In addition, this paper analyzes the density of political sketches to determine if the show has become more political over the last nine seasons or if the criticisms are based on political bias. While there is existing research about the comedy sketch show, there are currently no statistical studies on how sketches are and can be successful on the show.

III. PHYSICS AND MATHEMATICS

A Poster

Semi-Supervised Process for Analysis of the Big Five Personality Traits.

Callie Ware, Samford University; Mingwei Sun, Samford University .

Section III (Physics and Mathematics) Posters: Thursday AM

The Big Five personality traits, also known as the five-factor model (FFM) and the OCEAN model, was the model to comprehend the relationship between personality and academic behaviors via classifying personality traits into different groups. In this research, a new semi-supervised process that combines supervised and unsupervised learning methods is developed for the analysis of a large Big Five personality traits dataset. Not only can the new process group the observations into desired clusters, for instance, the big five personality variables, but it is also able to perform variable selection which can further reduce the data dimension. The proposed method can be easily extended to the analysis of other datasets without response variables.

III. PHYSICS AND MATHEMATICS

A Poster

Investigating Optimal Polyvinylidene fluoride (PVDF) Concentrations for its Applications as Efficient Smart Material.

Angela Davis, Alabama A&M University; Dr. Padmaja (Paddy) Guggilla, .

Section III (Physics and Mathematics) Posters: Thursday AM

Demand for thin films of various functional materials is increasing due to the miniaturization of electronic devices to nanometer scales. Nano sized thin films can be defined as a thin layer of material, where the thickness is less than 109 nm in at least one dimension and based on the specific characteristics it exhibits naturally they are categorized as SMART materials. As the material gets to the size of a nanometer, the characteristics will behave completely different from bulk size for example, color, electrical and optical properties etc. Partially fluorinated polymers such as PVDF have the flexibility and some are classified as smart materials. The study being conducted will help to shine light on what concentration of PVDF is required to exhibit higher polarity and consequently improved mechanical properties. Under the current investigation, PVDF thin films are fabricated with various concentrations of PVDF and characterized for their electrical, optical properties for their use as smart materials.

III. PHYSICS AND MATHEMATICS

A Poster

Black Holes Quantum Unruh Effect and Blackbody Radiation. Maria Dudley, Alabama A&M University; Tianxi Zhang, Alabama A&M University .

Section III (Physics and Mathematics) Posters: Thursday AM

When most think of black holes, images from science fiction movies and shows are the only information that most people know about black holes. Black holes are mysterious; however, thanks to the ever-advancing technological tools, scientists are now able to observe the universe like never before. Black holes are important because they help explain the universe. Objects around the black hole can escape the crushing might of the singularity in the event horizon unless it falls in; objects are not sucked in, they fall into black holes. Black holes can have a large mass with very little volume. Black holes give off radiation also known as Hawking Radiation and Unruh Effect. In this study there will be an explanation that analyzes the blackbody radiation of a gravitational object involving the black hole with the consideration of both the Unruh Effect and the principle of equivalence to find the total energy of the blackbody radiation. In addition, calculate the results of the entropy and compare the results with hawking radiation. What's the significance of this radiation? Is this radiation affecting our atmosphere and is there any way to harvest this radiation to help supply energy to other planets? Scientists are working diligently to discover more characteristics of black holes and observe what human eyes cannot see even with the newest of technology.

III. PHYSICS AND MATHEMATICS

A Poster

The Importance Of Complex Hilbert Spaces and Their Application In Quantum Physics and Quantum Computing. Matthew Edwards, Alabama A&M University; Albert Osei, Oakwood University Is Listed Above.

Section III (Physics and Mathematics) Papers: Thursday PM

The pure states of a system of isolated quantum particles are manifested in what are known as positive square-integrable functions in continuous position or momentum space descriptions or state vectors in discrete analysis. In each, we are using Hilbert spaces that allow the description of the systems, including time evolution, via the Schrodinger equation. Additionally, in each, the inner product is defined and represents the core aspect of operations in Hilbert spaces. Here, we have described Hilbert spaces ranging from the typical Cartesian Coordinate space to complex variable spaces, where the latter gives the probability of individual outcome from a measurement. For the continuous functions, the four required conditions on state functions have been described, and the uncertainty principle and the commutation relationship are expressed. Regarding the discrete state, specifically in the ½-spin particle states, we give the description of the generalized arbitrary spin momenta states and the corresponding non-commuting operators, where Hermitian and positive semi-definite operators, and the trace equal 1 exist. Regarding quantum computing, quantum gates have become the equivalent of dynamic operators. We have observed that a state that indicates a broad spread of possible outcomes in a given single measurement could require a narrow spread in another case. Also, we have presented the use of Hilbert spaces in the Schrodinger picture versus that of the Heisenberg picture, in composite states with tensor product analysis, and in two particle entangled states.

III. PHYSICS AND MATHEMATICS

A Poster

A comparative study of europium doped materials for white light generation. Yannik Palmer-Tesema, Alabama A&M University; Rami Bommareddi, .

Section III (Physics and Mathematics) Posters: Thursday AM

Now-a-days there is a great demand for LED bulbs which are replacing incandescent light bulbs. LED bulbs are compact, rugged, and free from pollution. Diodes emit a single wavelength. However, phosphor coated diodes generate white light on exposure to blue or violet light. Global research is ongoing to design phosphor coatings which emit high intensity in a broad spectral wavelength region. We are also investigating different phosphor materials to address this issue. We are investigating the suitability of europium doped crystals and glasses for this purpose. Crystals used for this study were procured from commercial sources and the glasses were made in our laboratory. Appropriate quantities of the chemicals were measured, ground and then mixed for an hour. The chemicals were poured into an aluminum crucible and heated in a box furnace above the melting point for an hour. The resulting melt was poured into a mold and allowed to cool to room temperature, naturally. The glass samples were polished with sand papers of different grades. Detailed spectroscopy measurements were performed to characterize the materials. Absorption spectral measurements of the materials were performed using a Cary 3E spectrophotometer. Emission was stimulated from the samples by exposing them to blue diode lasers. Sample glow was white for blue laser excitation, along the beam path. A compact spectrometer was used for fluorescence spectral measurements. Emission spectral data and lifetime measurements were used for unambiguous spectroscopic assignments. From the emission spectral measurements color co-ordinates and color temperature were derived. All these results will be presented in detail.

III. PHYSICS AND MATHEMATICS

A Poster

Quantum Modeling for Diproton Decays of Radioactive Proton-Rich Heavy Nuclei. Cornelius Salonis, Alabama A&M University; Tianxi Zhang, Alabama A&M University .

Section III (Physics and Mathematics) Posters: Thursday AM

The nucleus 2He is an isotope of Helium which consists of only two protons, and hence is adequately referred to as diproton. Diprotons can be formed in nature and in labs by the following two physical processes: (1) combining two separate protons and (2) decaying from radioactive proton-rich nuclei. In the core of the Sun, every second about 3.6 x 1036 protons fuse to produce α-particles via quantum tunneling of the electric Coulomb barrier. Majority of the formed diprotons, due to their unbound states, rapidly separate back into two separate protons. Only very few parts of the formed diprotons fuse into Deuterons with emissions of nuclear energy that powers the Sun. In laboratories, scientists have found that radioactive nuclei, if proton-rich, can also emit diprotons. Typical examples of diproton decay in proton-rich or neutron-poor isotopes include Neon (15Ne), Iron (45Fe), and Krypton(67Kr). This study investigates this specific decay type from radioactive proton-rich heavy nuclei in accordance with the nucleus decay model the Gamow developed based on the quantum theory. We will analyze and calculate the transmission probability and lifetime for these isotopes. The results obtained will be quantitatively compared with recent measurements in laboratory experiments. This presentation will show the details of scientific background and consistency of comparison with measurements. This quantum science study is supported by the IBM Quantum Center and NSF HBCU-UP awarded projects.

III. PHYSICS AND MATHEMATICS

A Poster

Modeling Allee Effect in an Aggregated Eco-epidemiological Model.

Zachary Overton, Samford University; Dylan Lee, Samford University; Kwadwo Antwi-Fordjour, Samford University .

Section I (Biological Sciences) Papers: Thursday AM

A continuous predator-prey model subject to the Allee effect, prey aggregation, and infectious disease in the

prey population is considered. We assume that the prey population grows logistically in the absence of predator

species. We split the total prey population into two distinct classes: infected prey and susceptible prey. Mathematical

preliminaries such as positivity and boundedness are investigated. The analysis of the dynamical behaviors of the

proposed model centers on the numerical simulations in which the Allee threshold and disease transmission rate of

the prey are the primary parameters. In addition, the biologically feasible equilibrium points are analyzed.

III. PHYSICS AND MATHEMATICS

A Poster

A comparative study of europium doped materials for white light generation. Yannik Palmer-Tesema, Alabama A&M University; Dr. Rami Bommareddi, Alabama A&M university .

Section III (Physics and Mathematics) Posters: Thursday AM

Now-a-days there is a great demand for LED bulbs which are replacing incandescent light bulbs. LED bulbs are compact, rugged, and free from pollution. Diodes emit a single wavelength. However, phosphor coated diodes generate white light on exposure to blue or violet light. Global research is ongoing to design phosphor coatings which emit high intensity in a broad spectral wavelength region. We are also investigating different phosphor materials to address this issue. We are investigating the suitability of europium doped crystals and glasses for this purpose. Crystals used for this study were procured from commercial sources and the glasses were made in our laboratory. Appropriate quantities of the chemicals were measured, ground and then mixed for an hour. The chemicals were poured into an aluminum crucible and heated in a box furnace above the melting point for an hour. The resulting melt was poured into a mold and allowed to cool to room temperature, naturally. The glass samples were polished with sand papers of different grades. Detailed spectroscopy measurements were performed to characterize the materials. Absorption spectral measurements of the materials were performed using a Cary 3E spectrophotometer. Emission was stimulated from the samples by exposing them to blue diode lasers. Sample glow was white for blue laser excitation, along the beam path. A compact spectrometer was used for fluorescence spectral measurements. Emission spectral data and lifetime measurements were used for unambiguous spectroscopic assignments. From the emission spectral measurements color co-ordinates and color temperature were derived. All these results will be presented in detail.

III. PHYSICS AND MATHEMATICS

A Poster

A comparative study of europium doped materials for white light generation. Yannik Palmer-Tesema, Alabama A&M University; Dr. Rami Bommareddi, Alabama A&M University .

Section I (Biological Sciences) Papers: Thursday AM

Now-a-days there is a great demand for LED bulbs which are replacing incandescent light bulbs. LED bulbs are compact, rugged, and free from pollution. Diodes emit a single wavelength. However, phosphor coated diodes generate white light on exposure to blue or violet light. Global research is ongoing to design phosphor coatings which emit high intensity in a broad spectral wavelength region. We are also investigating different phosphor materials to address this issue. We are investigating the suitability of europium doped crystals and glasses for this purpose. Crystals used for this study were procured from commercial sources and the glasses were made in our laboratory. Appropriate quantities of the chemicals were measured, ground and then mixed for an hour. The chemicals were poured into an aluminum crucible and heated in a box furnace above the melting point for an hour. The resulting melt was poured into a mold and allowed to cool to room temperature, naturally. The glass samples were polished with sand papers of different grades. Detailed spectroscopy measurements were performed to characterize the materials. Absorption spectral measurements of the materials were performed using a Cary 3E spectrophotometer. Emission was stimulated from the samples by exposing them to blue diode lasers. Sample glow was white for blue laser excitation, along the beam path. A compact spectrometer was used for fluorescence spectral measurements. Emission spectral data and lifetime measurements were used for unambiguous spectroscopic assignments. From the emission spectral measurements color co-ordinates and color temperature were derived. All these results will be presented in detail.

III. PHYSICS AND MATHEMATICS

A Poster

A Piezo-Pyro-Photoelectric Power Harvesting Flag using Smart Materials.

James Sampson, Alabama A&M University; Ashok Batra, Alabama A&M University; James Sampson, Alabama A&M University; Amari Williams, Alabama A&M University; Destinee Simmons, Alabama A&M University ; F. Coggins, Alabama A&M University; Mohan Aggarwal, Alabama A&M University.

Section I (Biological Sciences) Papers: Thursday AM

Flags are not just flown to display patriotism but can be used to generate electric energy from wind, light, and heat from the Sun. Efforts have been made to develop a prototype flag to generate wind electricity using piezoelectricity, pyroelectricity, and photovoltaics principles via smart materials. The prototype novel 'Flag' was developed as part of a research effort to create cheap and sustainable energy-harvesting solutions that can be deployed and left to generate electric energy with little or no maintenance. Most importantly, train STEM undergraduate students in cutting-edge energy harvesting technology. The Flag uses flexible piezoelectric and pyroelectric strips and flexible photovoltaic cells panel. The piezo-pyro- simultaneously generates power through movement and heat, respectively, while the photovoltaic cells harvest solar energy to produce electric power. The beauty of this flag is to develop power day and night depending on the energy sources available. The basic concept will be presented and validated by laboratory experiments with controlled airflow, light, and infrared heat. The maximum voltage generated was 60 mV when the flag was simultaneously exposed to low-level wind, thermal and light energies. NSF-INSPIRE and MAKERS project funding partially supported this work.

III. PHYSICS AND MATHEMATICS

A Poster

Time Acceleration: An Illustrative Understanding of the Change in Velocity of Time. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will explain the concept of time acceleration through the use of diagrams and Hall's Omega Real Number Multidimensional Gravitational Electromagnetic Spacetime Graph.

III. PHYSICS AND MATHEMATICS

A Poster

Gravity Demystified: An Explanation and Understanding of Gravity via Its Components. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will illustrate and explain what gravity is using pictorial dimensional analysis of its components derived from Hall's Omega Real Number Multidimensional Gravitational Electromagnetic Spacetime Graph. The presenter will also explain the reasoning behind gravitational waves.

III. PHYSICS AND MATHEMATICS

A Poster

A Revelation of Hall's Omega Real Number Multidimensional Gravitational Electromagnetic Spacetime Graph. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will reveal Hall's Omega Real Number Multidimensional Gravitational Electromagnetic Spacetime Graph. This graph has the potential to digitally model all things physical and energetic; their interplay, and all systems created as we currently know them. The limitations of this graph depend upon the knowledge and understanding of the user.

III. PHYSICS AND MATHEMATICS

A Poster

An Understanding of Hall's Omega Real Number Multidimensional Electromagnetic Spacetime Graph. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will reveal the tool and explain the significance, mechanisms, and capabilities of Hall's Omega Real Number Multidimensional Electromagnetic Spacetime Graph.

III. PHYSICS AND MATHEMATICS

A Poster

An Explanation and Understanding of Why Spacetime has 6 Dimensions Instead of the Previously Believed 4 Dimensions. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The Presenter will illustrate and explain the 6 dimensions of spacetime. Spacetime is made from 3 dimensions that make up space and 3 dimensions that make up time.

III. PHYSICS AND MATHEMATICS

A Poster

A Graphical Explanation and Understanding of Time Bubbles. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will graphically illustrate and explain intratessellational and intertessellational time bubbles.

III. PHYSICS AND MATHEMATICS

A Poster

A Quantum Understanding of the Butterfly Effect; Entanglement Through Tessellations. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will illustrate via diagrams the connectedness/oneness and dynamics of a system and it parts through tessellations.

III. PHYSICS AND MATHEMATICS

A Poster

An Understanding of the 1080 Dimensions of Time. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will explain and illustrate the 1080 dimensions of time via drawings, information gathered via Hall's Omega Real Number Multidimensional Spacetime Graph, and electromagnetic field spectrum charts.

III. PHYSICS AND MATHEMATICS

A Poster

An Understanding of the 780 Dimensions of Time. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will explain and illustrate the 780 dimensions of time via drawings, information gathered via Hall's Omega Real Number Multidimensional Spacetime Graph, and electromagnetic field spectrum charts.

III. PHYSICS AND MATHEMATICS

A Poster

An Understanding of Six Dimensional Time Relative to Three Dimensional Time. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will explain via drawings the appearance of Five Dimensional Time as envisioned by the observer in a three dimensional time framework. This apparently envisioned five dimensional time is housed in the framework of six dimensional Time.

III. PHYSICS AND MATHEMATICS

A Poster

Time Velocity: An Equation and Understanding of the Mechanisms that Increase and Decrease the Speed of Time. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Papers: Thursday AM

The presenter will present the equation for Time Velocity and explain the mechanisms via illustrations that determine the speed of time. The presenter will include information gathered from Hall's Omega Real Number Multidimensional Spacetime Graph.

III. PHYSICS AND MATHEMATICS

A Poster

An Exercise in Graphing Tessellations; How to Graph Any System Inclusive of Micro and Macro Components. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Papers: Thursday AM

The presenter will share an illustration and graphing methodology for intertessellational systems.

III. PHYSICS AND MATHEMATICS

A Poster

The Tuskegee Time Equation: The Fundamental Nonredundant Definition of Time in Three Dimensions. Paul Hall, Tuskegee University

.

Section III (Physics and Mathematics) Papers: Thursday AM

The presenter will illustrate Time given in one, two, and three dimensions. The presenter will present the three dimensional time equation that does not include distance/velocity as a fundamental component of time, but distance as it relates to order/position.

III. PHYSICS AND MATHEMATICS

A Poster

A Deductive Argument for Why the Speed of Light is Slower than the Total Velocity of its Corresponding Electromagnetic Wave. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will use pictures, diagrams, and charts to show the difference in the linear speed of light versus the total velocity of the electromagnetic wave. It is the understanding of the presenter that the linear speed of electromagnetic waves is constant through the spectrum of Electromagnetic waves. However, the total velocity of electromagnetic waves along the spectrum is not constant.

III. PHYSICS AND MATHEMATICS

A Poster

A Clarification of the Mechanism that Creates the Ever-Present Aurora Borealis and Aurora Australis.

Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will explain through the use of illustrations how the ever-present northern and southern lights are created via the interaction of the earth, the global magnetic field, and the solar magnetic field which results in the generation of voltage at the poles of the earth.

III. PHYSICS AND MATHEMATICS

A Poster

An Illustrative Understanding of the Electromagnetic Field That We Call Time. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will illustrate the components of time and explain how time, evidenced by motion, is an electromagnetic field resulting from the actions of its components.

III. PHYSICS AND MATHEMATICS

A Poster

How Eonic Time Travel May Alter Relative Size. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will illustrate and explain how the relative size of a time traveler may vary via far reaching time travel. The concepts presented are based on observations of nature.

III. PHYSICS AND MATHEMATICS

A Poster

An Understanding of the Grand Scale of Time, Inclusive of Time Lines, Time Spirals, and Convergence. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will illustrate and explain the continuity of time. The illustrations and mechanisms are taken from the patterns exhibited in nature.

III. PHYSICS AND MATHEMATICS

A Poster

A Graphical Explanation and Understanding of the Mechanism of Quantum Entanglement (Spooky Action at a Distance). Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will explain the mechanism of spooky action at a distance through the use of Hall's Omega Real Number Multidimensional Spacetime Graph and coaxial equiparallel cuboids.

III. PHYSICS AND MATHEMATICS

A Poster

The How to of Constructing Hall's Omega Real Number Multidimensional Spacetime Graph. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will illustrate and explain the components that make up Hall's Omega graph, and how they come together to form the graph.

III. PHYSICS AND MATHEMATICS

A Poster

A Revelation of the Seven Hierarchical Levels of Dimensions. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

The presenter will illustrate and explain the seven hierarchical levels of dimensions with graphs, drawings, and verbal analogies. This presentation will theoretically encompass all possible physical realities.

III. PHYSICS AND MATHEMATICS

A Poster

A Graphical Understanding of How to travel Backwards in time; and How Going Backwards in Time May Lead to a New Future in a Parallel Spacetime Dimension. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Papers: Thursday AM

The presenter will use components of Hall's Omega Real Number Multidimensional Time Traveler's Graph coupled with observations from nature to explain how traveling to the past is possible and what happens as a result of time traveling to the past . Hall's Omega Time Traveler's Graph is a 4,323 dimensional tool. Hall's Omega Time Traveler's Graph utilizes an additional 1,080 dimensions when compared to Hall's Omega Multidimensional graph which is not inclusive of time.

III. PHYSICS AND MATHEMATICS

A Poster

How to Plot Points in Time and Space Using a 4 Dimensional Graph.

Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Papers: Thursday AM

The presenter will explain how to construct a four dimensional graph. The presenter will explain the procedure for plotting in four dimensions. Four dimensional graphs will be distributed to audience members for a hands on lab of plotting spacetime points using (x,y,z,t) dimensions.

III. PHYSICS AND MATHEMATICS

A Poster

The How to of Plotting Hall's Omega Graph. Paul Hall, Tuskegee University .

Section III (Physics and Mathematics) Posters: Thursday AM

Hall's Omega Graph is a real number multidimensional tool used for visualizing and plotting objects in multiple unique spatial dimensions. The Omega Graph is a 3,243 dimensional tool that may be used to plot greater than 5 billion unique spatial dimensions per tessellation. The Omega Graph at 3,243 dimensions differs from the cartesian three dimensional system as the Omega Graph is able to plot three dimensional spaces; compared with the Cartesian system that is able to plot points. The Omega Graph may be used to plot greater than 5 billion unique spatial dimensions. The Cartesian system may be used to plot points within one spatial dimension.

III. PHYSICS AND MATHEMATICS

A Poster

Lithospheric location closest to the center of the Earth. Arjun Tan, Alabama A&M University .

Section III (Physics and Mathematics) Posters: Thursday AM

Due to the oblateness of the Earth, it is unlikely that the deepest part of the world ocean would be the closest location of the solid lithosphere to the center of the Earth. But the question of ascertaining the latter location is seldom discussed in the literature and no definitive answer can be found. In this study, a method for calculating the distance of a lithospheric location from the Earth's center is presented. It is found that whereas this distance is largely dependent on the geographical latitude of the location, the ocean depth becomes important for locations having comparable latitudes. Six candidate locations were considered: (1) Molloy Deep, the deepest point of the Arctic Ocean; (2) Litke Deep, the second deepest point of the Arctic Ocean; (3) North polar depth; (4) Factorian Deep, the deepest point of the Southern Ocean; (5) Meteor Deep, the deepest point of South Atlantic Ocean; and (6) Denman Glacier channel, the deepest point of the Antarctica coastline. The results crown Litke Deep as the closest location of the solid lithosphere to the center of the Earth, followed closely by Molloy Deep, Factorian Deep, Meteor Deep and Denman Glacier Depth, in that order.

III. PHYSICS AND MATHEMATICS

A Poster

Investigative analysis of Russia's direct-ascent Anti-satellite test against its orbiting Cosmos 1408 satellite. Arjun Tan, Alabama A&M University

.

Section III (Physics and Mathematics) Posters: Thursday AM

Russia's direct-ascent anti-satellite (ASAT) test on its Cosmos 1408 satellite on 15 November 2021 is investigated in this study by analyzing the orbital elements of the fragments produced and also calculating the velocity perturbations and angular distribution of the fragments. This test differed from the ASAT tests of the United States, China and India of the past in at least two distinct ways. First, the Russian ASAT actually attained orbital trajectory prior to the impact; and second, the Russian ASAT hit its target generally from behind instead of from the side or almost head-on. Consequently, a distinct ASAT cloud was produced, not witnessed in the earlier ASAT tests. Besides the ASAT cloud, high-energy 'ricochet fragments' were produced similar to those observed in the Solwind breakup event and the Delta-180 collision experiment in space. The angle of encounter between the target and the ASAT was calculated from which the condition of ricochet formation was seen to be met. The fragments spread in the orbital plane displayed a beautiful 'butterfly pattern' seen before only in the Ariane rocket fragmentation event. If the latter breakup was indeed caused by an orbital debris, then the formation of a butterfly pattern constitutes a second 'sufficient condition for collision in space'.

III. PHYSICS AND MATHEMATICS

A Poster

Investigative analysis of the Yun-Hai satellite fragmentation in orbit by accidental collision with an orbital debris. Arjun Tan, Alabama A&M University .

Section III (Physics and Mathematics) Posters: Thursday AM

The fragmentation of Yun-Hai meteorological satellite in an accidental collision with a small orbital debris in orbit is investigated in this study. First, the two-line orbital element sets of the two colliding satellites prior to the collision as well as those of the 45 fragments following the collision are gathered from the Space-track website available to the public. All the quantities required for this study are derived and propagated to the time of collision. The ground tracks of Yun-Hai and the debris in the final pass are determined, and the angle and relative collisional speed calculated using spherical trigonometry. Velocity perturbations of the fragments were calculated using exact solutions in the three orthogonal components in the fragmenting satellite's frame of reference. Scatterplot in the horizontal plane shows that the fragments spread was more or less isotropic, but a significantly more fragments with greater spread velocities were located in a quadrant in the direction of the incoming debris.

A Paper

Systematic Investigation of PFOS Adsorption from Water by Metal Organic Frameworks, Activated Carbon, Metal Organic Framework@Activated carbon, and Functionalized Metal Organic Frameworks. Jasneet pala, University of Alabama; Tin Le, University of Alabama; Medha Kasula, University of Alabama; Milad Esfahani, University of Alabama .

Section IV (Engineering and Computer Science) Papers: Thursday AM

Per- and polyfluoroalkyl substances (PFAS) have long-term negative impacts on both human and animal health. The adsorption methodology has demonstrated effective efficacy in eliminating PFAS from water among all strategies. For the removal of short-chain (C<6) and long-chain (C>7) PFAS, a variety of adsorbents have been utilized, including conventional powder, activated carbon (AC), and metal organic frameworks (MOFs). The efficiency and ongoing sorption mechanisms for each of these adsorbents have not yet been extensively examined and compared due to the complexity of the adsorption process, the diversity of adsorbents and PFAS compounds, and the lack of a standardized experimental technique. In this work, we synthesized and characterized the adsorbents and then performed a systematic isotherm adsorption protocol to study the adsorption mechanisms and performance of adsorbents, including nanosized activated carbon AC, MIL-101 (Cr), MIL-101 (Cr)-NH2 and novel hybrid adsorbents of MIL-101 (Cr)@AC for the removal of perfluorooctane sulphonic acid (PFOS) from water. Based on the comparative analysis to investigate the effective parameters governing the PFOS adsorption with respect to each adsorbent, AC with around 93% PFOS removal showed supreme performance over other MOFs; however, MOF-based adsorbents showed faster adsorption compared to AC. The MIL-101(Cr)@AC (with 80% removal performance and 2h adsorption time) possessed the advantages of both AC and MIL-101 (Cr). The hydrophobic-hydrophobic and electrostatic interactions were the main dominant adsorption interactions for AC and MOFs, respectively, while both interactions were influential in the MIL-101 (Cr)@AC adsorption.

IV. ENGINEERING AND COMPUTER SCIENCE

A Paper

Biofilm Formation Influences the Wettability and Settling of Microplastics.

Amber Pete, University of North Alabama; Philip Brahana, Louisiana State University; Mustapha Bello, Louisiana State University; Michael Benton, Louisiana State University; Bhuvnesh Bharti, Louisiana State University University of North Alabama.

Section IV (Engineering and Computer Science) Papers: Thursday AM

The fate of 99% of the plastics present in oceans is unknown. It is presumed that biofilm formation on plastics leads to their sinking to the ocean floor, thus making them undetectable at the surface. While it is established that biofilms lead to sinking of plastics, it is the mechanism by which biofilms enhance the vertical transport of plastics that remains unknown. It is commonly assumed that biofilms increase the effective mass density of the plastics, which drives their sinking. Here, we show that such an assumption is not always true, and formation of biofilms alone is an insufficient criterion to predict the sinking or floating of plastics. We study the biofilm formation and vertical transport of polyethylene microplastics in the presence of Alcanivorax borkumensis, Anabaena sp., and Synechococcus elongatus. We find that while all three microorganisms formed biofilms on microplastics, only Alcanivorax led to their sinking. The sinking of microplastics is attributed to the production of highly active biosurfactants by Alcanivorax and its adsorption onto microplastics, which is not the case for Anabaena and Synechococcus. Our study highlights that it is not only the formation but the properties of the formed biofilms that govern the sinking or floating of plastics.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster

Novel Method for Diabetes Prediction Using Machine Learning. Kyla Gabriel, University of Alabama at Birmingham .

Section IV (Engineering and Computer Science) Posters: Thursday AM

Discovering new methods for the prevention of Type II Diabetes (T2D) is extremely pertinent because of the serious implications it can have on an individual's health. Researchers have begun to use artificial intelligence and related technologies to develop ways to predict diabetes. However, the accuracy of these tools is minimal since it tends to only use information on clinical factors and demographics when creating a prediction model. This research paper aims to create a more accurate tool to predict T2D through the analysis of clinical factors, cardiac history, and social determinants of health. Using the Jackson Heart Study dataset and the R software, machine learning (ML) tools are applied to understand what factors are important in developing T2D. The results of the ML tool accurately recognize the significance of fasting glucose and HbA1c and find positive correlations in commonly overlooked areas of patient data. Specifically, it highlights how hypertension and income correlate with a higher risk of T2D development, aspects that are not well-known in current literature. The ML application can also predict a patient's risk of developing diabetes and the approximate time this would occur in their lifespan. In conclusion, this application shows the importance of expanding the factors that are used in diabetes prediction models and encourages researchers to extrapolate this analytical process to other datasets.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster

Phase and Microstructure Evolution of Composite Metallic/Carbide Laminates under Thermal Loads. Michael Large, University of Alabama; Carter Stotts, Colorado State University; Gregory Thompson, University of Alabama; Christopher Weinberger, Colorado State University .

Section IV (Engineering and Computer Science) Posters: Thursday AM

100th Anniversary Meeting of the Alabama Academy of Science

Phase and Microstructure Evolution of Composite Metallic/Carbide Laminates under Thermal Loads

Michael J. Large1, J. Carter Stotts2, Christopher Weinberger2, and Gregory B. Thompson1

1University of Alabama

Tuscaloosa, AL 35405

2Colorado State University

Ft Collins, CO 80523

Phone: (208) 407 0607

mlarge@crimson.ua.edu

Ultra-High Temperature Ceramics (UHTC's) are characterized by having extremely high melting temperatures as well as superior mechanical properties while at elevated temperatures. They are also known for having low ductility and high brittleness at low temperatures, which can lead to catastrophic failure under loading. To offset this duality of mechanical properties, a multilayer of metal (Zr) and UHTC (ZrC) laminates have been deposited. At low temperatures, the metal phase provides sufficient toughening, and at elevated temperature, the carbide is depleted of carbon that reacts with the metal transforming the composite laminate into a single phase of sub-stoichiometric ZrCx that can survive elevated temperature operations. It is then critical to understand the kinetics and phase transformation pathways that would enable a two phase-to-single phase transformation to occur. For this study we reactively sputter-deposited a multilayer of Zr/ZrC at different Zr metal thicknesses. The composite was annealed at 1325 °C for various times and/or at a fixed time but with various layer thicknesses to quantify the extent of transformation, which is compared to simulations. Through cross-sectional characterization, the carbide grain structure was relatively invariant under the transformation, but the metal layer experienced both carbonization as well as grain growth. The consequences of this evolution are addressed with respect to the carbon diffusion pathways. Finally, the surface oxidation of the topmost layer in the composite stack, whether it be Zr or ZrC, is characterized and discussed with respect to subsequent transformations that occur in the subsurface structure.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster

Effect of Low Temperature Plasma Treatment on Fish Scale Powder-Filled Linear Low Density Polyethylene Films..

MATTHEW BONZU ACKAH, Tuskegee University; Vijaya Rangari, Tuskegee University .

Section IV (Engineering and Computer Science) Posters: Thursday AM

In this study, the effect of incorporation of low-temperature plasma treatment into the synthesis of Fish Scale Powder reinforced Linear Low Density Polyethylene (LLDPE) films was investigated for O2 and SF6 Plasma and non-plasma treated Polyethylene (LLDPE)/Fish Scale Powder (FSP) composite filaments made into thin films using the blow film machine. The mechanical and thermal properties of the of both plasma treated, and non-plasma treated filaments made into films were investigated using Thermogravimetric analysis (TGA) and Differential Scanning Calorimetry (DSC) and universal tensile machine. The highest tensile strength and modulus of 6.72 MPa and 0.026 GPa respectively was obtained at 1% polyethylene (LLDPE)/Fish Scale Powder (FSP) plasma treated composite filaments made into thin films. The TGA and DSC showed the highest maximum rate of decomposition of 500.02 ℃ with a crystallinity of 35.79 % for 1% polyethylene (LLDPE)/Fish Scale Powder (FSP) SF6 plasma treated composite filaments made into thin films.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster

Conversion of a MATLAB Code to Python: Increasing Accessibility to Surface Plasmon Resonance Biosensing Studies.. Reece Phillips, University of North Alabama; Ravi Gollapalli, University of North Alabama; Puneet Paul, University of North Alabama .

Section IV (Engineering and Computer Science) Posters: Thursday AM

Physical experimentation with Surface Plasmon Resonance (SPR) is an expensive and meticulous process. The alternative is to use programming software to study the phenomenon for different possible sensor configurations and samples. In our research efforts, our research team has developed and utilized a program code in MATLAB. MATLAB being a commercial software usually needs an full-fledged computer which may not be readily accessible to many students. Python programming environment offers an open-source approach that would facilitate a less expensive study of SPR by a wide range of researchers and institutions by using inexpensive and accessible hardware such as a Raspberry Pi. In this presentation, I will discuss our current efforts in this conversion process and explain the resulting benefits.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster

Increasing Oil Degradation by Marine Bacteria. Lauren Mays, University of North Alabama; Amber Pete, University of North Alabama; Michael Benton, Louisiana State University; Bhuvnesh Bharti, Louisiana State University .

Section IV (Engineering and Computer Science) Posters: Thursday AM

Prompt and thorough remediation of marine oil spills should be of utmost importance. Bioremediation is an oil spill remediation method where indigenous microbial species consume and use hydrocarbons, removing oil from the environment. But complete biodegradation can take decades. Therefore, we seek methods to enhance the process. Current studies suggest that increasing the emulsification of the oil leads to the greatest degradation. This study uses model marine bacterium, Alcanivorax borkumensis along with altering different parameters to increase emulsification of the oil by this bacterium. We introduce nanoparticles, biopolymers, and alter the salt concentration to increase the amount of apparent biosurfactant production. The study finds an increased growth rate in the presence of biopolymers that we can correlate to reduction at the oil-water interface. We also find that this bacterium produces very powerful surfactants that should be isolated and studied further. The findings in this study suggest that we can enhance oil degradation in natural ways without introducing harmful dispersants or genetically modified organisms.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster

Engineered Biofilm Sandwich for cellulosic-biomass degradation.

Heejoon Park, University of North Alabama; Ross Carlson, Montana State University University of North Alabama.

Section IV (Engineering and Computer Science) Posters: Thursday AM

A synthetic consortium was designed to mimic the naturally occurring ecological template of syntropy. The consortium comprised of Clostridium phytofermentans (Cp), a cellulolytic obligate anaerobe, and Escherichia coli (Ec), a versatile, facultative anaerobe and convenient bioprocess host. Consortium interactions, including the exchange of metabolites, the release of enzymes, and the removal of inhibitors, resulted in the emergent properties of enhanced utilization of cellulose-derived oligomers and enhanced biomass productivity under both planktonic and biofilm culturing conditions. During planktonic growth, consortium biomass productivity increased by 40% compared to the sum of the respective monocultures, cellobiose utilization doubled over Cp monocultures, and ethanol production increased threefold compared to Cp monocultures. Biofilm culturing of the consortium created a spatially partitioned community with Ec residing primarily at the oxic interface and Cp residing in an anoxic zone created by Ec. Oxygen concentrations were measured directly within the biofilm using microelectrodes while laser dissection microscopy combined with qPCR was used to measure spatially resolved species abundances. Cycling the biofilm consortium between anoxic and oxic environments enabled further improvements in resource usage with the consortium producing approximately 2.5 times more biomass than monocultures or static environment consortium controls. The study establishes consortia-based, bioprocessing strategies which employ aerobic and anaerobic chemistries simultaneously for improved conversion of cellulose-derived sugars into bioproducts.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster

Improving a Spatial Atomic Layer Deposition (ALD) Prototype Using A Gear Drive System and Programmable Logic Control (PLC) System.

Ronnie Myers, University of North Alabama; Jacob Lynch, UNA; Anna Warner, UNA; Emerson Miller, UNA; Caedmon Jones, UNA ; Dongqing Pan, UNA .

Section IV (Engineering and Computer Science) Posters: Thursday AM

Atomic Layer Deposition (ALD) is a precise nanomanufacturing technique to fabricate thin films for semiconductor micro electronic devices such as transistors, processors, memory drives, as well as solar panels. Traditional ALD process is time-consuming, and hence, it has very low throughput. Spatial ALD has been proven as a working concept to improve the deposition efficiency dramatically. Our research project is working to design and develop a faster spatial ALD system. Several prototypes were developed and flow tests were carried out in the past. From the last prototype, we are improving the drive system of the spatial ALD prototype from belt to a gear and lead screw system to improve the linear transmission of the system. The new drive system will help to reduce the lagging issue of the current belt system and increase the speed. At the same time, due to more control parts such as valves, pressure gauge, mass flow controller and stepper motors, etc. added to the system, we plan to use a PLC controller instead of a microcontroller for better control of the components by adding more points of digital and analog inputs and outputs. The improved system is expected to improve the current prototype in terms of power transmission and control.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster

Nanoplastics Removal from Water Based on the Liquid-Liquid Extraction Method.

Ashish Srivastava, University of Alabama; Dr. Milad Esfahani, The University of Alabama .

Section IV (Engineering and Computer Science) Posters: Thursday AM

Nanoplastics (NPs) are an emerging concern as the new class of hazardous materials spreading across all the environmental media, including fresh water. The occurrence of nanoplastics can be of inclusion in cosmetics, paints, thin film coatings, and their biological and ecological impacts are more complicated. Nanoplastics toxicity is extremely harmful to humans because of cell damage, liver failure and cell death. The current conventional water treatment methods such as coagulation, flocculation, filtration, photocatalytic degradation, microbial bioremediation showed lack of efficiency for the removal of different nanoplastics. .The liquid-liquid extraction method using ionic liquid as extractants is a promising separation technique for efficient removal of nanoplastics in water treatment . In the present work, the removal of polystyrene nanoplastics (PSNPs) using 1-methyl-3-octylimidazolium bis(trifluoromethyl)imide) ({C8C1Im} {NTf2}) was studied. ({C8C1Im} {NTf2}) showed more than 99% removal of PSNPs from water.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster

Systematic Investigation of PFOS Adsorption from Water by Metal Organic Frameworks, Activated Carbon, Metal Organic Framework@Activated carbon, and Functionalized Metal Organic Frameworks.

Jasneet pala, University of Alabama; Tin Le, University of Alabama; Medha Kasula, University of Alabama; Milad Esfahani, University of Alabama .

Section IV (Engineering and Computer Science) Posters: Thursday AM

Per- and polyfluoroalkyl substances (PFAS) have long-term negative impacts on both human and animal health. The adsorption methodology has demonstrated effective efficacy in eliminating PFAS from water among all strategies. For the removal of short-chain (C<6) and long-chain (C>7) PFAS, a variety of adsorbents have been utilized, including conventional powder, activated carbon (AC), and metal organic frameworks (MOFs). The efficiency and ongoing sorption mechanisms for each of these adsorbents have not yet been extensively examined and compared due to the complexity of the adsorption process, the diversity of adsorbents and PFAS compounds, and the lack of a standardized experimental technique. In this work, we synthesized and characterized the adsorbents and then performed a systematic isotherm adsorption protocol to study the adsorption mechanisms and performance of adsorbents, including nanosized activated carbon AC, MIL-101 (Cr), MIL-101 (Cr)-NH2 and novel hybrid adsorbents of MIL-101 (Cr)@AC for the removal of perfluorooctane sulphonic acid (PFOS) from water. Based on the comparative analysis to investigate the effective parameters governing the PFOS adsorption with respect to each adsorbent, AC with around 93% PFOS removal showed supreme performance over other MOFs; however, MOF-based adsorbents showed faster adsorption compared to AC. The MIL-101(Cr)@AC (with 80% removal performance and 2h adsorption time) possessed the advantages of both AC and MIL-101 (Cr). The hydrophobic-hydrophobic and electrostatic interactions were the main dominant adsorption interactions for AC and MOFs, respectively, while both interactions were influential in the MIL-101 (Cr)@AC adsorption.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster

A COMPREHENSIVE SOLUTION FOR OUTAGE PREDICTION, SYSTEM DEMAND ANALYSIS, ASSET MANAGEMENT & DEVELOPMENT OF A POWER FAILURE RISK INDEX.

Selami Buzluk, University of Alabama at Birmingham; Rouzbeh Nazari, University of Alabama at Birmingham; Abi Giglou, University of Alabama at Birmingham University of Alabama at Birmingham.

Section IV (Engineering and Computer Science) Posters: Thursday AM

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 how the central parts of Alabama States are vulnerable to outages. Due to this tornado, thirty-three thousand houses and businesses in Jefferson County suffered a power outage. 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 and rainfall. Previous studies have highlighted the Weather Research and Forecasting Model (WRF), a physics-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 wind speed variations. The WRF is now moved to QGIS, which is an open-source geographic information system (GIS) cross-platform environment and called that new plug-in GIS4WRF. The core capabilities of GIS4WRF include direct integration with the QGIS framework for presenting geospatially placed WRF input and output data as raster layers, creation and visualization of domains, production of namelists, and simple conversion and manipulation of spatial information. The model is set up with three nested domains covering the study area with spatial resolutions of 27, 9, and 3 km. Validation results with the observed data of the past extreme weather events confirmed that WRF Single Moment 5 Class and Grell–Devenyi (GD) Ensemble

micro-physics and cumulus schemes are the best options for model configuration. With the selected parameters, the model is run for a 15-day weather forecast. Then spatial analysis was performed on the geographic information system (GIS), and a failure index was developed. The index has illustrated that for the selected time period, weather events will not have an effect on the power grid.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster

Implementing Gamification in Online Asynchronous Engineering Graduate Courses. Md Abu Shohag, University of North Alabama .

Section IV (Engineering and Computer Science) Papers: Thursday AM

Engaging students in an online class is important for better learning outcomes including academic success. Student motivation and engagement in the classroom can be increased by effectively using gamification. Games entice the player with constant rewards to continue playing. Many studies show the benefits of implementing games in in-person classes, however, there are limited studies on the effectiveness of gamification in online asynchronous graduate classes. A freely available online interactive educational tool called 'Fling the Teacher' is used in this study. This interactive gamified tool is modeled after the popular Angry Birds video game. The instructor can create a game that includes a minimum of 15 multiple-choice questions for students to answer in an interactive setting. Students achieve the chance to fling an avatar of a teacher with a slingshot in one minute after answering all 15 questions correctly. The game allows students for multiple attempts without any penalty, thus motivating students to keep playing, and learning, until they reach the desired level of understanding. Three online graduate courses of the applied manufacturing engineering curriculum were tested with the 'Fling the Teacher' game. The interactive game was implemented in the middle and end of the course with each having 15 multiple choice questions. An online survey was conducted to obtain the students' perceptions regarding the effectiveness of the method in terms of keeping them engaged during online classes. The findings indicated that the students found the game-based tool to enhance engagement in the online learning environment.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster

“Out of Sight, Out of Mind” Comparing DHH Child’s Response to Parental ASL Delivery and ASL Recommendation Systems.

Merritt Cahoon, Samford University; Ekram Hossain, University of Rochester; Zhen Bai, University of Rochester .

Section IV (Engineering and Computer Science) Papers: Thursday AM

The Tabletop Interactive Play System (TIPS) was created to provide linguistic input to deaf and hard of hearing (DHH) children while exposing hearing parents to American Sign Language (ASL) through an ASL vocabulary recommendation system during non-obtrusive toy play. Along with our novel ASL recommendation system, a definition of successful ASL delivery is introduced to assist in determining the quality and quantity of the ASL input for the child. We compare our proposed system with pre-established technology that can aid ASL learning. Through our proposed measurements and future user study, we will be able to learn more about DHH children and how they respond to ASL, as well as objectively determine the best system to aid parents in learning ASL.

IX. HEALTH SCIENCES

A Paper

Treatment Options for Physical Symptoms of Parkinson's Disease: A Systematic Review. Rileigh Mitcham, Birmingham-Southern College .

Section IX (Health Sciences) Papers Thursday PM

Parkinson's disease (PD) is a chronic, progressive neurodegenerative disorder of the central nervous system characterized by the loss of dopamine neurons within a person's basal ganglia. The symptoms of PD include tremor, changes in speech, degradation in balance and posture, and slowness or loss of mobility (walking). The objective of this systematic review was to compare interventions used to treat the physical symptoms of PD using keywords ("Parkinson's disease") and (exercise) and (balance or gait or falls) in PubMed. Included studies were clinical trials or randomized control trials, published within the last five years, human trials, in English, and the participants in the 65+ age category. Eighty-two studies were screened for relevance by title and abstract, sixty-six articles were eliminated, and fourteen articles passed the full-text review for key outcomes: the patient's mobility, balance and gait, and the number of falls. The interventions studied included aerobic exercise, treadmill training, progressive resistance training, physiotherapy, customized videogame, virtual reality, and rhythmic auditory stimulation. Each of these interventions aimed to treat either mobility, balance and gait, falls, or a combination of these outcomes measured pre and post-treatment by: Timed Up & Go, Berg-Balance Scale, Fall Efficacy Scale, Number of Falls, Step Length, Mini-BEST, and Stability of Gait. All of the interventions, with the exception of physiotherapy, proved to be effective in treating at least one of the physical symptoms of PD based on the tests listed above for the measured outcomes. Further research should be completed to understand individualized symptoms to customize therapy.

IX. HEALTH SCIENCES

A Paper

Cadaver Anomalies in Peripheral Upper Extremity Nerves.

Mark Caulkins, Samford University; Nicholas Washmuth, Samford University; Will Scogin, Samford University .

Section IX (Health Sciences) Papers Thursday AM

Cadaveric dissection has long been a part of the education and training for students in medicine. It allows appreciation of the three-dimensional structure and different textures of the human body. It has particular utility in the education of future clinicians such as surgeons, physician assistants, physical therapists, and occupational therapists.

One of the advantages of cadaveric dissection is studying the anomalies found in every cadaver.

We present some of the interesting anomalies found in the upper extremity peripheral nerve anatomy of cadavers dissected at the Samford University Cadaver Lab.

IX. HEALTH SCIENCES

A Paper

Cadaver Anomalies in Forearm Musculature. Mark Caulkins, Samford University; Nicholas Washmuth, Samford University; Will Scogin, Samford University .

Section IX (Health Sciences) Papers Thursday AM

Cadaveric dissection has long been a part of the education and training for students in medicine. It allows appreciation of the three-dimensional structure and different textures of the human body. It has particular utility in the education of future clinicians such as surgeons, physician assistants, physical therapists, and occupational therapists.

One of the advantages of cadaveric dissection is studying the anomalies found in every cadaver.

We present some of the interesting anomalies found in the forearms and hands of cadavers dissected at the Samford University Cadaver Lab

IX. HEALTH SCIENCES

A Paper

Cadaver Anomalies in Peripheral Upper Extremity Nerves.

Mark Caulkins, Samford University; Nicholas Washmuth, Samford University; Will Scogin, Samford University .

Section IX (Health Sciences) Papers Thursday AM

Abstract: "Cadaveric dissection has long been a part of the education and training for students in medicine. It allows appreciation of the three-dimensional structure and different textures of the human body. It has particular utility in the education of future clinicians such as surgeons, physician assistants, physical therapists, and occupational therapists.

One of the advantages of cadaveric dissection is studying the anomalies found in every cadaver.

We present some of the interesting anomalies found in the upper extremity peripheral nerve anatomy of cadavers dissected at the Samford University Cadaver Lab."

IX. HEALTH SCIENCES

A Paper

A Structural Equation to Predict Healthcare Worker Burnout: The risk for young workers. John Shelley-Tremblay, University of South Alabama; Binata Mukherjee, University of South Alabama; Elly Trepman, University of South Alabama; William Barber, University of South Alabama .

Section IX (Health Sciences) Papers Thursday PM

Burnout is prevalent in health care workers, but limited information is available about burnout in US medically underserved areas during the COVID-19 pandemic. We assessed employee burnout, work conditions, resilience, and mindfulness at an academic medical center in a US medically underserved region during the pandemic. The causes of burnout in health care workers may include work-related stressors such as high workload with unrealistic expectations and perceived lack of job control and autonomy. Burnout also may be associated with poor balance between effort and reward, limited organizational and social support at work, perceived lack of fairness from supervisors and colleagues, and incongruity between professional values versus the perceived failure to contribute favorably to patient care. Respondents provided information about demographics and work setting. They completed the Maslach Burnout Inventory (MBI), Areas of Worklife Survey (AWS), Connor-Davidson Resilience Scale 10 (CD-RISC 10), and Philadelphia Mindfulness Scale (PHLMS awareness and acceptance subscales) and answered a question about intention to stay in the present job until retirement. We performed exploratory stepwise logistic regression to evaluate associations between variables and intention to stay. We evaluated associations between variables with a structural equation model. The 655 respondents mostly were White women providers, aged ≤ 50 years, who worked in inpatient wards, emergency departments, or intensive care units. The mean MBI subscale scores showed high emotional exhaustion (35 ± 12) and moderate depersonalization (12 ± 6) despite high personal accomplishment (43 ± 8), middle-range AWS subscale scores, and middle to high CD-RISC 10 (29 ± 5), awareness (37 ± 6), and acceptance scores (30 ± 8). There were 447 respondents (68%) willing to stay in their present job. Higher age was associated with intention to stay (coefficient, 1.1 ± 0.1; $P < .001$), and age alone predicted intention to stay with 77% accuracy.

We constructed a structural equation model (SEM) as a causal network of risk and protective factors for burnout. We included and estimated measurement error for the measured variables age, MBI, AWS, CD-RISC 10 score, and PHLMS subscale scores, and intention to stay. We used confirmatory factor analysis to construct 2 latent variables: workplace fit using the AWS subscales, and burnout-SEM (distinct from the latent burnout-profile) using the MBI subscales. We tested the conceptual model quantitatively using SEM software (IBM SPSS Amos, version 26, IBM) for exploratory and confirmatory factor analysis, calculated standardized beta coefficients, and assessed model fit using metrics of fit. The latent variable burnout-SEM that was constructed from the MBI subscales inversely predicted intention to stay (coefficient, −0.33; $P < .001$), and this relationship was mediated by age. Burnout in health care workers is prevalent despite substantial personal accomplishment, resilience, and mindfulness. Younger

employees are less likely to stay in their job. Our model suggests that, despite the prevalence of research suggesting the benefits of mindfulness and resilience for protecting workers from burnout and leaving their job, these factors did not account for significant variance in burnout or intention to leave.

IX. HEALTH SCIENCES

A Paper

65-Year-Old Woman with No Menopause and Family History of No Menopause: A Case Report. Keana-Kelley Swanner, Alabama College of Osteopathic Medicine; Braden Richmond, .

Section IX (Health Sciences) Papers Thursday PM

Introduction

Menopause is currently accepted as being a universal process in a woman's life where they naturally stop having menstrual periods. Menopause happens when the ovaries stop producing estrogen and averages around age 51 in the United States. Late-onset menopause is when a woman begins menopause after age 55. A thorough PubMed search revealed that there are currently no records of extended menopause through the entirety of a woman's geriatric years.

Case Report

A 65-year-old G2P2 Caucasian woman was admitted to the ER with a possible cerebrovascular accident. During admission it became evident that the patient had vaginal bleeding. CT scan revealed large fibroid and ultrasound revealed extremely thin endometrium, excluding endometrial pathology. Gynecology was consulted and in interviewing the patient she was not surprised at her bleeding - thorough previous medical and family history reveals that the patient has never had any significant time of oligomenorrhea, and that, in fact, her maternal grandmother and aunt, as well as her mother, had the same prolonged menstrual history. LH and FSH levels were tested to confirm menstruation and were low, in the premenopausal range. So, in fact, there was no concern for postmenopausal bleeding. Patient informed consent was obtained and patient encouraged sharing of her current state.

Conclusion/Implications

Certain individuals may have continued menstruation into much later years of their lives. This should affect how vaginal bleeding is treated in the geriatric population with careful menstrual and family history followed by confirmatory tests.

IX. HEALTH SCIENCES

A Paper

Pharmacological Amelioration of Hypersplenism in Non-Hodgkin's Lymphoma: A Cadaveric Case Study. Ronald N. Hunsinger, Samford University; R. Mark Caulkins, Samford University; Jayson Halliday, Auburn VCOM School of Osteopathic Medicine .

Section IX (Health Sciences) Papers Thursday PM

Non-Hodgkin's Lymphoma (NHL) of the Splenic Marginal Zone Type (SMZL) is a B-cell lymphoma due to a translocation of chromosomes 14 and 18, which constitutionally activates the BCL-2 Gene. This results in the massive proliferation of neoplastic B-cells in the marginal zone and follicles of the splenic white pulp. Thus, splenomegaly (hypersplenism) is an expected feature of the disease and can be a source of abdominal pain, sequestration of platelets, and even rupture of the enlarged spleen. Furthermore, these white pulp splenic areas serve as "nests" for malignant B-cell proliferation. In our gross anatomy laboratory, a 96-year-old female cadaver had succumbed to NHL (SMZL). Even though splenectomy is a common preliminary step in the treatment of the disease, upon examination, there were no signs of a previous splenectomy. No doubt because of her age, surgical splenectomy had been considered too risky. Even though her spleen should have been massively enlarged, upon dissection and exploration of the abdominal cavity, her spleen was found to be greatly reduced in size. Our research led us to the use of the drug, RITUXAN® (rituximab) which is the drug of choice for pharmacological amelioration of hypersplenism in NHL (SMZL) and attacking circulating and tissue-bound malignant B-Cells. RITUXAN® is a chimeric murine/human monoclonal IgG that attacks CD20/CD19 markers which are abundantly present on malignant B-Cells. When bound to CD20, the drug causes cell lysis via complement-dependent cytotoxicity, antibody-dependent cell-mediated cytotoxicity, and apoptosis. As these neoplastic cells are depleted, normal B-Cell recovery takes place within 6 – 12 months. The case study demonstrates how observations in the gross anatomy lab can enrich the teaching of pathological concepts while fulfilling its main mission of demonstrating anatomical features.

IX. HEALTH SCIENCES

A Paper

Focused Assessment with Sonography in Trauma. Donna Cleveland, University of South Alabama .

Section IX (Health Sciences) Papers Thursday AM

Focused assessment with sonography in trauma (commonly abbreviated as FAST) is a rapid bedside ultrasound examination performed by surgeons, emergency physicians, and paramedics as a screening test for blood around the heart (pericardial effusion) or abdominal organs (hemoperitoneum) after trauma. There is also the extended FAST (eFAST) which includes some additional ultrasound views to assess for pneumothorax.

The four classic areas that are examined for free fluid are the perihepatic space (including Morison's pouch or the hepatorenal recess), perisplenic space, pericardium, and the pelvis. With this technique it is possible to identify the presence of intraperitoneal or pericardial free fluid. In the context of traumatic injury, this fluid will usually be due to bleeding.

Reasons a FAST or eFAST would be performed would be:

1. Blunt abdominal trauma
2. Penetrating abdominal trauma
3. Blunt thoracic trauma
4. Penetrating thoracic trauma
5. Undifferentiated shock (low blood pressure)

Since the FAST/eFAST is performed with ultrasound, there is very little risk to the patient as ultrasounds only emit sound waves and record the echo to create a picture. The most common contraindication would be delay of definitive care such as surgical intervention in the setting of obvious trauma or resuscitative efforts in an extreme scenario.

There are five components to the eFAST exam:

1. Right Upper Quadrant of the abdomen (Perihepatic view). Right upper quadrant is examined by working your probe down the midaxillary line starting at the right 8th rib to the 11th rib. This examines for free fluid around the kidney and liver.

2. Left Upper Quadrant of the abdomen (Perisplenic view). Left upper quadrant is examined by working your probe down the midaxillary line starting at the left 8th rib to the 11th rib. This examines for free fluid around the kidney and spleen.

3. Pelvic views (Long and transverse axis). The suprapubic view helps assess for free fluid in the pelvic cavity.

4. Cardiac view. The pericardial component is assessed using the subxiphoid view.

5. Lung views (Right and Left, Long axis). These final views help determine if a pneumothorax is present.

FAST is most useful in trauma patients who are hemodynamically unstable. A positive FAST result is defined as the appearance of a dark ("anechoic") strip in the dependent areas of the peritoneum. In the right upper quadrant this typically appears in Morison's Pouch (between the liver and kidney). This location is most useful as it is the place where fluid will collect with a supine patient. In the left upper quadrant, blood may collect anywhere around the spleen (perisplenic space). In the pelvis, blood generally pools behind the bladder (in the rectovesicular space). A positive result suggests hemoperitoneum; often CT scan will be performed if the patient is stable or a laparotomy if unstable. In those with a negative FAST result, a search for extra-abdominal sources of bleeding may still need to be performed.

IX. HEALTH SCIENCES

A Paper

Necrotizing Fasciitis Presenting as Generalized Weakness, Malaise, and Acute Kidney Injury.

laurence stolzenberg, Alabama College of Osteopathic Medicine; Alexis Koch, ACOM; Austin Huang, ACOM; Mohammad Usman, ACOM; Jason Seale, Decatur Morgan Hospital .

Section IX (Health Sciences) Papers Thursday PM

Necrotizing fasciitis (NF) is a surgical emergency that must be diagnosed promptly in order to avoid serious consequences or death. Additionally, symptoms of this condition are similar to less severe skin and soft tissue infections such as cellulitis or erysipelas and can be easily confused. In this case, the patient presented to the emergency department with systemic symptoms, notably malaise and generalized weakness. A cutaneous complaint, a “labial cyst”, was only elicited after more specific questioning. Laboratory investigations revealed abnormal renal function tests (RFTs), suggestive of an acute kidney injury. An abdominal/pelvic computed tomography (CT) showed gas in the subcutaneous tissue. These findings led to clinical suspicion of NF, prompting a general surgery consultation. The surgeon proceeded to perform extensive debridement following the discovery of necrotic tissue. The prompt diagnosis and treatment of this condition resulted in patient survival and expected recovery. It is therefore critical to keep this condition in mind when diagnosing apparent skin and soft tissue infections presenting with abnormal renal function tests due to the possibility of rapid decline and death if the NF is left untreated. Additionally, this is a case of less frequent Fournier's gangrene in a non-diabetic female. Finally, it underlines the importance of eliciting additional symptoms, even those that may seem unrelated, or less concerning, to the patient’s initial complaint.

IX. HEALTH SCIENCES

A Paper

Burnout, Resilience, and Mindfulness in Health Care Workers in a Medically Underserved Region During. John Shelley-Tremblay, University of South Alabama; Binata Mukerjee, University of South Alabama; William Barber, University of South Alabama .

Section IX (Health Sciences) Papers Thursday AM

Burnout is prevalent in health care workers, but limited information is available about burnout in US medically underserved areas during the COVID-19 pandemic. We assessed employee burnout, work conditions, resilience, and mindfulness at an academic medical center in a US medically underserved region during the pandemic. The causes of burnout in health care workers may include work-related stressors such as high workload with unrealistic expectations and perceived lack of job control and autonomy. Burnout also may be associated with poor balance between effort and reward, limited organizational and social support at work, perceived lack of fairness from supervisors and colleagues, and incongruity between professional values versus the perceived failure to contribute favorably to patient care. Respondents provided information about demographics and work setting. They completed the Maslach Burnout Inventory (MBI), Areas of Worklife Survey (AWS), Connor-Davidson Resilience Scale 10 (CD-RISC 10), and Philadelphia Mindfulness Scale (PHLMS awareness and acceptance subscales) and answered a question about intention to stay in the present job until retirement. We performed exploratory stepwise logistic regression to evaluate associations between variables and intention to stay. We evaluated associations between variables with a structural equation model. The 655 respondents mostly were White women providers, aged ≤ 50 years, who worked in inpatient wards, emergency departments, or intensive care units. The mean MBI subscale scores showed high emotional exhaustion (35 ± 12) and moderate depersonalization (12 ± 6) despite high personal accomplishment (43 ± 8), middle-range AWS subscale scores, and middle to high CD-RISC 10 (29 ± 5), awareness (37 ± 6), and acceptance scores (30 ± 8). There were 447 respondents (68%) willing to stay in their present job. Higher age was associated with intention to stay (coefficient, 1.1 ± 0.1; P < .001), and age alone predicted intention to stay with 77% accuracy.

We constructed a structural equation model (SEM) as a causal network of risk and protective factors for burnout. We included and estimated measurement error for the measured variables age, MBI, AWS, CD-RISC 10 score, and PHLMS subscale scores, and intention to stay. We used confirmatory factor analysis to construct 2 latent variables: workplace fit using the AWS subscales, and burnout-SEM (distinct from the latent burnout-profile) using the MBI subscales. We tested the conceptual model quantitatively using SEM software (IBM SPSS Amos, version 26, IBM) for exploratory and confirmatory factor analysis, calculated standardized beta coefficients, and assessed model fit using metrics of fit. The latent variable burnout-SEM that was constructed from the MBI subscales inversely predicted intention to stay (coefficient, −0.33; P < .001), and this relationship was mediated by age. Burnout in health care workers is prevalent despite substantial personal accomplishment, resilience, and mindfulness. Younger employees are less likely to stay in their job. Our model suggests that, despite the prevalence of

research suggesting the benefits of mindfulness and resilience for protecting workers from burnout and leaving their job, these factors did not account for significant variance in burnout or intention to leave.

IX. HEALTH SCIENCES

A Poster

Minimizing the Environmental Impact of Anesthesia.

Ann Marie Gieger, Samford University; Terri M, Cahoon .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Healthcare is responsible for an estimated 10% of greenhouse gas emissions (GHGs) with a considerable portion of these originating in perioperative services. Anesthetic gases contribute to GHG emissions with varying degrees of severity. There are currently no universal guidelines to monitor the amount of anesthetic gas released from hospitals into the atmosphere. Clinical question: In surgical patients, what techniques can be used to minimize the environmental impact of anesthesia? Spinal anesthesia can be equally effective for certain procedures and patient populations, with the added benefits of faster recoveries and decreased post-operative complications. Researchers found that CO2 equivalent (CO2e) emissions decreased from an average of 4,725g with a general anesthetic to just 63g in the spinal anesthetic group. A total intravenous anesthetic (TIVA) has the lowest carbon footprint, an impact 4 orders of magnitude lower than inhaled anesthetics. If inhaled anesthesia is necessary, regional techniques used for analgesia can lessen the amount of gas required to maintain sufficient anesthetic depth. Gas use may be limited by using low flow anesthesia (LFA), defined as flows < 2 L/min. Implementing greener anesthetic techniques has positive environmental, fiscal, and patient outcomes. Translation to Practice: An interprofessional team should review the literature and design a pilot study to implement. Baseline information on purchasing data of volatile anesthetics should be obtained, with the goal of decreasing purchased gas – and emissions – by 25% over 1 year. A guideline should be developed to determine when regional anesthesia or a TIVA is preferable over inhaled anesthetics.

IX. HEALTH SCIENCES

A Poster

A look at excess deaths due to to stroke in the state of Alabama.

Michael Ernst, Alabama College of Osteopathic Medicine; Andrew Harbin, Alabama College of Osteopathic Medicine Alabama College of Osteopathic Medicine.

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Stroke is a devastating diagnosis which leaves many debilitated and devastated. Our research team would like to find possible solutions to improve outcomes for stroke patients. Our team began by analyzing data from the Centers for Disease Control and Prevention regarding the percent of potentially excess stroke deaths each year in the state of Alabama. Between 2005 to 2015, the percent of potentially excess stroke deaths has ranged from 48.9 to 62.7 percent. In 2015, the percent of potentially excess stroke deaths was estimated to be 56.6 percent. This seems to be an excessively high percentage of potentially excess deaths. This high percentage could be due to multiple factors some of which could include the method in which the percentage of potentially excess deaths is calculated, personal medical factors related to these patients, and the actual healthcare delivery itself. The methods in which the percentage of potentially excess deaths due to stroke is calculated has been included in our research as well as some hypotheses as to other factors which could be contributing to this high percentage of potentially excess deaths. Our research team plans to investigate further to look at potentially modifiable contributing factors to identify some specific changes which can be made in the way healthcare is delivered to these patients to improve patient outcomes and reduce excess deaths due to stroke in the state of Alabama.

IX. HEALTH SCIENCES

A Poster

Medicare Spending on Lipid Lowering Medications from 2016-2020.

Bradley Perkins, Alabama College of Osteopathic Medicine; Zoe Leuthner, Alabama College of Osteopathic Medicine; Ashley Calise, Alabama College of Osteopathic Medicine .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Statins have been a mainstay of treatment for lipid-lowering therapy with the goal of reducing incidence of vascular events. Medications with differing mechanisms of action have emerged which may present a significantly higher cost burden for our healthcare system. Here, we analyze the trends in Medicare spending among lipid-lowering medication classes and the cost difference between generic and non-generic options. Data on total spending and number of beneficiaries for medications in the classes of statins, bile acid resins, proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitors, fibrates, and ezetimibe was obtained from the Center for Medicare and Medicaid Services database from the years 2016-2020. Of these medications, in 2020, generic statins made up 89.4% of prescriptions and accounted for 60.5% of spending. From 2016-2020, cost per beneficiary increased for non-generic statins, generic and non-generic bile acid resins, non-generic fibrates and non-generic ezetimibe, while it decreased for generic statins, PCSK9 inhibitors, generic fibrates, and generic ezetimibe. Average spending per beneficiary for non-generic compared to generic medications in the same class followed an upward trend, rising from 7-fold in 2016 to 13-fold in 2020. In 2020, PCSK9 inhibitors were the most expensive medication per beneficiary, costing $3,351, while the least expensive were generic statins, at $101. These findings demonstrate that when selecting lipid-lowering medications, the decision to prescribe non-generic options or medications without generic options such as PCSK9 inhibitors may lead to significantly increased costs for the Medicare system.

IX. HEALTH SCIENCES

A Poster

Trends and Associated Costs of Medicare Prescriptions for Major Anticoagulant Medications from 2016-2020.

Zoe Leuthner, Alabama College of Osteopathic Medicine; Bradley Perkins, Alabama College of Osteopathic Medicine .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

While warfarin was once first line for anticoagulation therapy, direct oral anticoagulants (DOACs), especially factor Xa inhibitors, have been increasingly preferred for prophylaxis in conditions such as atrial fibrillation and venous thromboembolism. Although DOACs are significantly more expensive, they have been shown to reduce the risk of bleeding events and death. Here, we analyze the trends in Medicare spending among major anticoagulation medications between 2016 and 2020. To conduct this study, data on total spending and number of beneficiaries was obtained from the databases at the Center for Medicare and Medicaid Services for medications in the classes of Xa inhibitors, LMWH, and warfarin from the years 2016-2020. We found that between 2016 and 2020, total spending increased from $4.0 billion to $14.7 billion for Xa inhibitors, while it decreased from $401.4 million to $278.1 million for LMWH, and decreased from $374.5 million to $237.8 million for warfarin. Total number of beneficiaries increased from 1.66 million to 3.84 million for Xa inhibitors and decreased from 5.01 million to 3.17 million for warfarin, while remaining relatively stable around a mean of 750,000 for LMWH. Cost per beneficiary for Xa inhibitors increased marginally from $5,292 to $5,350 and was on average 51-fold the cost of warfarin per beneficiary between 2016-2020. These data demonstrate that medical management of anticoagulation therapy is shifting heavily towards newer and more expensive medications. It will be imperative to analyze the rising Medicare costs of such medications against their demonstrated benefits and the adverse events they prevent.

IX. HEALTH SCIENCES

A Poster

Thoracoabdominal Anomalies found in Student Cadaveric Dissections.

Maggie Cushing, Samford University; Mark Caulkins, Samford University; Nicholas Washmuth, Samford University; Will Scogin, Samford University; John Hurt, Samford University ; Brad Cantley, Samford University .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Cadaveric dissection has long been a part of the education and training for students in medicine. It allows appreciation of the three-dimensional structure and different textures of the human body. One of the advantages of cadaveric dissection is the anomalies found in every cadaver.

We present anomalies found in the thoracic cavity and abdominal cavities of cadavers dissected in the Samford University Cadaver Lab

IX. HEALTH SCIENCES

A Poster

Large Diaphragmatic Hernia in Student Dissected Cadaver.

Hartley Anderson, Samford University; Mark Caulkins, Samford University; Nicholas Washmuth, Samford University; Will Scogin, Samford University; Wes Johnson, Samford University ; Paul Harrelson, Samford .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Cadaveric dissection has long been a part of the education and training for students in medicine. It allows appreciation of the three-dimensional structure and different textures of the human body. One of the advantages of cadaveric dissection is the anomalies found in every cadaver.

We present a large diaphragmatic hernia with herniation of the entire stomach and part of duodenum into the thoracic cavity in a cadaver dissected in the Samford University Cadaver Lab.

IX. HEALTH SCIENCES

A Poster

Cadaver Anomalies in Peripheral Upper Extremity Nerves.

Mark Caulkins, Samford University; Nicholas Washmuth, Samford University; Will Scogin, Samford University .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Cadaveric dissection has long been a part of the education and training for students in medicine. It allows appreciation of the three-dimensional structure and different textures of the human body. One of the advantages of cadaveric dissection is the anomalies found in every cadaver.

We present upper extremity peripheral nerve anomalies found in cadavers dissected in the Samford University Cadaver Lab.

IX. HEALTH SCIENCES

A Poster

Forearm Muscle Anomalies in Student Cadaveric Dissections.

Seth Ford, Samford University; Seth Ford, Samford University; Mark Caulkins, Samford University; Nicholas Washmuth, Samford University; Will Scogin, Samford University ; Wesley Calhoun, Samford University .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Cadaveric dissection has long been a part of the education and training for students in medicine. It allows appreciation of the three-dimensional structure and different textures of the human body. One of the advantages of cadaveric dissection is the anomalies found in every cadaver.

We present forearm muscle anomalies found in cadavers dissected in the Samford University Cadaver Lab.

IX. HEALTH SCIENCES

A Poster

Alabama farmers' markets and purchase of fruits and vegetables.

Suresh Mathews, Samford University; Morgan Gaddy, Samford University; Payton Vines, Samford University; Ahinee Amamoo, Samford University .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Fruit and vegetable intake is a key modifiable factor for the prevention of chronic diseases, including cardiovascular disease, and cancer, and all-cause mortality. However, lack of adequate knowledge, availability of fruits and vegetables, and inequities in accessibility influence choice of foods and overall health. Farmers markets exert a positive impact on the availability and purchase of healthy foods. The purpose of this study was to examine socio-demographic characteristics, motivation, reasons, and barriers to farmers' market shopping, and the association between farmers' market use and purchase of fruits and dark green, red, yellow, and orange vegetables. A total of 103 participants (n=50, Pepper Place Farmers' Market, Birmingham, AL, and n=53, Northport Farmers' Market, Tuscaloosa, AL) completed a cross-sectional survey which included questions addressing sociodemographic characteristics, participation in SNAP/ WIC/FMNP, purchase of fruits and vegetables, and shopping experiences. Over 50% of farmers' market shoppers purchased dark green vegetables and red fruits compared to other produce. The purchase of yellow vegetables, the duration and frequency of visits were significantly higher at Pepper Place compared to Northport Farmers Market. The motivations to shop were significantly different, with the availability of organic and green farm produce, baked goods, prepared meals, and festive atmosphere at Pepper Place contributing to the enhanced shopping experience compared to the availability of fresh produce at Northport Farmers' Market. Overall, this study has shown that farmers' markets in both urban and rural settings in Alabama may have a positive influence in the purchase of fresh, organic, and green farm produce.

IX. HEALTH SCIENCES

A Poster

Preoperative Opioid Education. Hunter Tinnell, Samford University; Lisa Herbinger, Samford .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Background

Although a valuable asset for pain management, opioid use carries significant risks for addiction and abuse. Most surgical patients report never having a preoperative discussion regarding opioids with any healthcare practitioner. In addition, patients often experience their first exposure to opioids during a perioperative course.

Clinical Question

In surgical patients, could preoperative education related to the use of opioids decrease the risk of addiction and abuse postoperatively?

Evidence Based Discussion

Since the advent of pain as the fifth vital sign, clinicians have felt pressured to aggressively treat pain. Reimbursement is tied to surveys with patients asked to subjectively rate their pain management. This has supported unreasonable expectations related to postoperative pain management and fueled the opioid crisis. In addition, improper storage and disposal increases non-prescribed opioid use. Among patients receiving preoperative opioid education, increased rates of proper storage and disposal have been observed.

Translation to Practice

An interdisciplinary perioperative team should be formed for development and implementation of an evidence based educational program. Current evidence suggests that content is more important than the delivery method. Simple, concise videos or handouts to be used throughout the perioperative period would be feasible. Recommendations for opioid alternatives, storage, disposal and minimizing risks of addiction and abuse should be included. Because most patients have some degree of health illiteracy, education should be presented at an easy-to-understand level. Future research should focus on educating specific population groups and the effectiveness of various delivery methods.

IX. HEALTH SCIENCES

A Poster

Non-Pharmacologic Preoperative Anxiolysis. Abigail Brady, Samford University; Lisa Herbinger, Samford .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Non-Pharmacologic Preoperative Anxiolysis

Abigail Brady, BSN

Background

Preoperative anxiety affects 60-80% of surgical patients and is correlated with an increased risk of adverse events. An awareness by the anesthesia practitioner of the pharmacologic and non-pharmacologic interventions available for anxiolysis can improve patient satisfaction and postoperative outcomes.

Clinical Question

In the adult patient undergoing general anesthesia, could non-pharmacologic interventions effectively treat preoperative anxiolysis with less perioperative adverse effects when compared to midazolam?

Evidence Based Discussion

Researchers report a significant correlation between preoperative anxiety, anesthetic consumption and postoperative pain. Pain in the postoperative period leads to increased narcotic consumption with subsequent side effects. Anxiety increases the risk of nausea and vomiting, hemodynamic fluctuations and infection. Recovery periods and length of hospital stays are extended in patients with preoperative anxiety. Midazolam is the most widely used agent for preoperative anxiolysis but can lead to adverse effects including over-sedation, hypotension and respiratory depression. Alternative measures studied for anxiolysis include cognitive behavioral therapy, music therapy, audiovisual programs, meditation, virtual reality, acupuncture, aromatherapy and melatonin.

Translation to Practice

Midazolam often successfully prevents significant preoperative anxiety. However, the increased risk of adverse effects makes it a poor choice for some patients. Because there is evidence that safe, non-pharmacologic alternatives are also effective, those options should be explored. Cohort studies related

to non-pharmacologic interventions and utilizing the State-Trait Anxiety Inventory (STAI) scale could help determine efficacy. Ultimately, guidelines for the use of non-pharmacologic interventions for preoperative anxiolysis can be developed.

IX. HEALTH SCIENCES

A Poster

Increasing the Number of Dormant Bacillus cereus Spores Promotes Greater Attachment to Radiation Therapy Thermoplastic Immobilization Mask Material. Dev Mehta, University of South Alabama; Terry Ravine, University of South Alabama .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Bacillus cereus is an environmentally widespread bacterium forming dormant spores not easily eliminated by routine chemical disinfectants. Several B. cereus bacteria were recovered by sampling 12 thermoplastic immobilization masks, which keep patients motionless during high dose radiation therapy treatment of brain tumors. The current study examined whether increasing the number of spores from a recovered Bacillus cereus designated as MAB03F would also increase its ability to adhere to mask material. The outer spore layer of B. cereus is distinctly different from cell walls of actively growing bacteria. Spore formation was promoted by exhausting available nutrients by extending the normal 24-hour incubation to 96-hours. Suspensions made from each incubation condition were then compared to each other by applying to mask material and sampling after 1-hour contact time. Spore stains determined the number of spores in each suspension. Triplicate pieces of mask material were used for either condition. Plate counts demonstrated the number of bacteria transferred to the mask material. Mask pieces receiving the 24-hour inoculum averaged 0.2 spores with 0.7 x 100 recovered bacteria while those receiving the 96-hour inoculum averaged 179.4 spores with1.3 x 103 recovered bacteria. The significance of this finding is underlined by the fact the B. cereus (MAB03F) having been previously recovered from this same mask material at 4 weeks, a timeframe often required to complete a series of radiation therapy treatments. The presence of spores combined with their ability to survive for extended periods suggests a potential threat to a patient wearing a contaminated mask.

IX. HEALTH SCIENCES

A Poster

A Multi-Criteria Decision Framework for the Selection of Cancer Treatment: Practical Implications. Lauren Shouse, Samford University; Jordan Skiera, Samford University; Georges Adunlin, Samford University

.

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Background: Situations involving multiple alternatives can increase the difficulty of identifying the optimal treatment for health care providers. This is prevalent in cancer care, especially when there is a lack of head-to-head trials. In such cases, providers can rely on decision support tools to compare the efficacy and safety data of the competing treatment.

Objective: To identify the most relevant decision criteria for cancer treatment and assess whether the multicriteria decision analysis (MCDA) can support rational decision-making process for cancer treatments.

Methods: Decision criteria were identified from a review of the medical literature and clustered based on experts' opinions. An appraisal of guidelines for MCDA was used to provide a summary of recommendations for method selection.

Results: Ten decision criteria ("overall survival," "disease-free survival," "progression-free survival," "relapse-free survival," "complete response," "objective response rate," "time to progression," "time to treatment failure," "toxicity," and "cost-effectiveness") clustered into three indicators (efficacy, safety, economic) were identified for the evaluation of cancer treatments. Five guidelines on good practices for MCDA were appraised. Among all the MCDA methods considered, an outranking-based method, ELECTRE 1S, was best suited to solve a cancer treatment decision problem. ELECTRE 1S is adequate for processing quantitative and qualitative data without information loss.

Conclusion: The MCDA method can improve decision-making by contributing to the risk-benefit assessment and optimization of treatment outcomes. Application to a real-world clinical decision problem is needed to evaluate the feasibility of implementation in clinical practice to enable conclusions about the value of the ELECTRE 1S framework.

IX. HEALTH SCIENCES

A Poster

Opioid-Related Overdose Deaths in the South Region of the U.S. From 2013 to 2020. Jordan Skiera, Samford University; Jonathan Thigpen, McWhorter School of Pharmacy .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

OBJECTIVES: The United States is currently suffering an epidemic of rising opioid-related deaths. This alarming trend is worrisome for states in the census-defined South Region of the United States. This research aims to explore the South Region, consisting of the South Atlantic, East South-Central, and West South-Central divisions, in assessing the average annual change and total change in opioid-related overdose deaths from 2013 to 2020.

METHODS: Age-adjusted opioid-related death rates per 100,000 population were captured for each of the 17 states in the South Region. Rates were collected for each year; from 2013 through 2020. Analysis was used to determine differences in opioid-related deaths over time and among divisions. Statistical comparisons were performed using paired T-tests, ANOVA, and post hoc tests.

RESULTS: From 2013 to 2020, there was a significant increase in average age-adjusted opioid-related overdose deaths per 100,000 population within the South Region of the United States (mean 18.2; 95% CI, 24.7 to 11.8; $p<0.001$). Although there was no statistical difference in average total death rates among the three compared divisions, the average yearly percent change was statistically significantly different ($p=0.029$). Specifically, the South Atlantic division showed increased yearly rates of opioid-related deaths compared to the West South Central division (mean 12.7; 95% CI, 1.36 to 24; $p=0.028$).

CONCLUSION: Opioid death rates have increased in the South Region of the United States from 2013 to 2020. Further studies need to be conducted to compare differences among regions and determine what factors are causing an increase in opioid-related deaths.

IX. HEALTH SCIENCES

A Poster

The Use of Acupuncture for Cervical Ripening and Induction of Labor.

Makayla Chalacoff, Samford University; Steven Johnson, Samford University .

Section I (Biological Sciences) Papers: Thursday AM

Childbirth is the leading reason for hospitalization in women in the United States. An increasing number of childbirths result in the need for cervical ripening and induction of labor (IOL) intervention. Despite the current use of traditional modalities of pharmacologic and mechanical intervention, research into the use of Complementary and Alternative Medicine (CAM) methods, specifically acupuncture, has proven to offer positive outcomes in cervical ripening and IOL. This research examines studies comparing the use of electro-acupuncture and mechanical acupuncture to traditional modalities to analyze the effectiveness of acupuncture as a method of cervical ripening and IOL. The efficiency of acupuncture in doing so could potentially offer a viable alternative for expectant women who do not want pharmacologic management or those that are unable to engage in traditional inductive agent therapy.

IX. HEALTH SCIENCES

A Poster

An Analysis of Health Outcomes in Rural Appalachian Regions with Geographical Access to Healthcare Facilities.

Baylee Salyers, Samford University; Steven Johnson, Samford University .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

With the rising incidence of health disparities in rural Appalachian populations, it is important to understand how to better help these populations. Past research has been focused on providing care since most of Appalachia is designated as an underserved population. This research examined spatial access to healthcare facilities and how longer travel times can have detrimental impacts on the health of Appalachian people. This research used multiple studies to determine that there is a link between longer travel times/spatial access and poorer health outcomes.

IX. HEALTH SCIENCES

A Poster

Development of Novel Doxycycline Topical Formulations to Combat Methicillin Resistant Staphylococcus Aureus.

Jay Olivet, Samford University; John Arnold, Samford University .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Methicillin-resistant Staphylococcus aureus (MRSA) is an area of clinical concern as more antibiotics are rendered useless by bacterial resistance. One area of particular concern is the lack of topical options for the treatment and nasal decolonization of MRSA. In some parts of the world, MRSA resistance to the standard therapy, mupirocin, has been reported to be higher than 80%. Novel therapies are necessary to allow continued treatment of MRSA skin infections and nasal decolonization. A topical form of doxycycline could provide effective treatment while avoiding systemic effects and ensuring a decreased opportunity for resistance compared to oral therapy.

Doxycycline was compounded in lipolayer transdermal base (1% w/w) alone or with zinc oxide (ZnO) (15% w/w).

Release from the compounded formulations was determined using a Franz diffusion cell array utilizing a semipermeable dialysis membrane. One gram of each formulation was placed into the donor chamber and samples were drawn from the receiver chamber at defined intervals for 24 hours. Both topical formulations were studied in triplicate. Doxycycline release was determined via high performance liquid chromatography (HPLC).

Chemical stability of doxycycline (stored at room temperature, protected from light) in each compounded formulation was determined at predetermined intervals for 4 weeks. Methanol was used to extract doxycycline from samples of each formulation and percentage of breakdown was determined via HPLC.

The amount released from the 1% w/w doxycycline without ZnO formulation was 3.1 mcg (0.03% of total drug in donor chamber initially) at the end of the 24-hour period. The amount released from the doxycycline with ZnO formulation was 2.5 mcg (0.02% of total drug in donor chamber initially) after a 24-hour period. Doxycycline formulated alone retained a chemical stability of 94.5% of initial potency after four weeks with an average weekly breakdown of 1.4%. Doxycycline formulated with ZnO retained a chemical stability of 92.8% of initial potency after four weeks with an average weekly degradation of 1.8%. Notably, the formulation without ZnO maintained pharmaceutical elegance for a longer period, as the ZnO cream developed a gritty texture as time progressed with visual particles forming on the surface of the preparation.

Doxycycline can be formulated into a topical base to provide a compounded treatment option for MRSA. This formulation uses cheap and readily available ingredients for ease of access. Doxycycline is stable for a suitable timeframe in lipolayer and does not cross the skin barrier in high concentrations. The relative inability to cross the skin layer could allow doxycycline to be used in populations who previously

would not qualify for a tetracycline antibiotic. In addition, ZnO used as a sun protection factor does not substantially harm the release mechanics or stability of the doxycycline formulation.

IX. HEALTH SCIENCES

A Poster

Patient Opinions and Side Effects Before and After General Anesthesia for Surgery.

Mohammad Usman, Alabama College of Osteopathic Medicine; Laurence Stolzenberg, ; Austin Huang, ; Martin Clemmons, ; Justin Hovey, ; Gordon MacGregor, .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

he purpose of this study was to explore the general public's opinions and experiences of general anesthesia, as well as any change in their perception after having undergone a procedure requiring it. Our online anonymous survey, although based on a limited population, shows that there is a significant amount of anxiety related to anesthesia, but that most people describe a significant decrease after having undergone it. The survey specifically targeted people age 21 and older who have already or who will undergo general anesthesia within 6 months. We also explored the different interventions that participants felt would make them more comfortable and reduce anxiety prior to anesthesia. Noticeably, people were made more comfortable by discussing anesthesia with people that had lived through the experience, and people believe they would be significantly comforted by the presence of therapy animals prior to beginning their procedures. We hope that our exploratory research will promote future research into this topic in order to improve the healthcare outcomes of a significant number of patients.

IX. HEALTH SCIENCES

A Poster

Survey investigating the impact of the Covid-19 pandemic on the public's perception of healthcare professionals.

laurence stolzenberg, Alabama College of Osteopathic Medicine; Mohammad usman, ACOM; Austin Huang, ACOM; Gordon MacGregor, ACOM .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

The Covid-19 pandemic brought immense attention and exposure to health care in general. While much research has been done about the effects of Covid-19 on the health care system, there has been little about the change in opinions of our patients. We decided to further investigate these variations in order to better understand how best we can serve them and society. The key takeaway from the data we gathered was that both the levels of trust and respect actually decreased since the beginning of the pandemic. Our data showed the level of respect went from an average of 7.31 before to 6.55 and the level of trust went from 7.84 to 7.34. While these changes were not massive, they do show a striking trend. Interestingly, the shift in the results was not uniform; rather there was a split distribution where some respondents had a higher level of trust and respect, and others lower compared to their past opinions. Finally, we also asked if members of the public would consider becoming HCWs and overwhelmingly there was very little interest. We believe that our results show an important trend that all health care workers should be aware of. While we should all strive to treat our patients in the best manner, we must consider the current environment in which small mistakes or mistrust can have grave consequences on health outcomes. In addition, the lack of interest in joining the medical community is concerning considering all those leaving the profession.

IX. HEALTH SCIENCES

A Poster

Social Vulnerability Related to Rural Disparities in Colorectal Cancer Mortality in Florida.

Alejandro Arroyo Rodriguez, Alabama College of Osteopathic Medicine; Cassie Odahowski, University of Central Florida; Chris Emrich, University of Central Florida .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Introduction:

Rural and urban counties in Florida exhibit different socioeconomic characteristics and access to healthcare, potentially impacting rates of colorectal cancer (CRC). We examined rural and urban differences in county-level CRC incidence, CRC mortality, and characteristics related to rural disparity in CRC mortality in Florida.

Methods:

We examined CRC data from National Cancer Institute (NCI) State Cancer Profiles and United States Census Bureau definition for rurality. We used a t-test for unequal variances to examine differences in mean CRC incidence and mortality for rural vs. urban counties. ArcGIS visually displayed a bivariate (rural mortality) map and linear regression used to examine county social vulnerability (SoVI) metrics and Medically Underserved Areas (MUA) related to CRC mortality.

Results:

Incidence of CRC was not significantly different for rural (40.93 per 100,000) and urban counties (36.82 per 100,000, p=0.16). The rural mortality per 100,000 for CRC was significantly higher than urban mortality per 100,000 (18.22 vs 13.12, p=<0.01). Mapping displayed clustering of high rural CRC mortality in north-central Florida. Regression results showed four SoVI variables significantly related to the observed rural disparity in CRC mortality: percent in nursing facilities, percent Native American, per capita income, and households earning >$200,000.

Conclusion:

Rural CRC risk was not significantly higher than urban risk. However, the rural CRC death rate was significantly higher in rural than urban counties. These results identify and add to the understanding rural disparities in CRC mortality. Further work is needed to address strategies for eliminating rural disparities in CRC mortality in Florida.

Special 1. Alabama Honors Scholars

A Paper

DNA Methylation of the AGTR1 Gene in a Hypertensive Population of Kenyans.

Michael Roque, University of South Alabama; Nancy Rice, .

Section IX (Health Sciences) Papers Thursday AM

Cardiovascular disease (CVD), the leading cause of death worldwide, is rapidly increasing in low-and middle-income countries (LMICs), particularly those of Sub-Saharan Africa (SSA). Hypertension is the leading risk factor for CVD with no single genetic cause. Evidence indicates that hypertension is predisposed by environmental regulation of genes through heritable, modifiable, epigenetic changes to DNA leading to changes in gene expression, e.g. methylation. Understanding the etiology of hypertension in LMICs is a global priority but few epigenetic studies exist on populations living in SSA. The renin-angiotensin system (RAS) is the primary hormonal pathway that regulates blood pressure through changes in salt and water retention. Previously, we found a high prevalence of hypertension (55 % had systolic blood pressure (SBP) >130mm Hg) in a rural population of Kenyans that was not correlated with lifestyle or behavioral factors. Our current study investigates the hypothesis that DNA methylation of AGTR1 increases the risk of high blood pressure in this population. Preliminary studies from our lab indicate hypermethylation in hypertensive versus normotensive Kenyans (4.78 ±0.45 and 3.84 ± 0.48, respectively) when four cytosine-phosphate guanine (CpG) sites of the AGTR1 promoter were analyzed (n=75). Additionally, when analyzed by multiple linear regression, methylation at CpG 2 (-2.941 ± 1.310; p=0.032) and CpG4 (3.641 ± 1.782; p=0.049) are inversely correlated and may be predictive of diastolic blood pressure, whereas CpG3 methylation may have predictive value for SBP (2.405 ± 1.138; p=0.042).

Special 1. Alabama Honors Scholars

A Paper

DNA Methylation of the AGTR1 Gene in a Hypertensive Population of Kenyans. Michael Roque, University of South Alabama; Nancy Rice, University of South Alabama .

Section IX (Health Sciences) Papers Thursday AM

Cardiovascular disease (CVD), the leading cause of death worldwide, is rapidly increasing in low-and middle-income countries (LMICs), particularly those of Sub-Saharan Africa (SSA). Hypertension is the leading risk factor for CVD with no single genetic cause. Evidence indicates that hypertension is predisposed by environmental regulation of genes through heritable, modifiable, epigenetic changes to DNA leading to changes in gene expression, e.g. methylation. Understanding the etiology of hypertension in LMICs is a global priority but few epigenetic studies exist on populations living in SSA. The renin-angiotensin system (RAS) is the primary hormonal pathway that regulates blood pressure through changes in salt and water retention. Previously, we found a high prevalence of hypertension (55 % had systolic blood pressure (SBP) >130mm Hg) in a rural population of Kenyans that was not correlated with lifestyle or behavioral factors. Our current study investigates the hypothesis that DNA methylation of AGTR1 increases the risk of high blood pressure in this population. Preliminary studies from our lab indicate hypermethylation in hypertensive versus normotensive Kenyans (4.78 ±0.45 and 3.84 ± 0.48, respectively) when four cytosine-phosphate guanine (CpG) sites of the AGTR1 promoter were analyzed (n=75). Additionally, when analyzed by multiple linear regression, methylation at CpG 2 (-2.941 ± 1.310; p=0.032) and CpG4 (3.641 ± 1.782; p=0.049) are inversely correlated and may be predictive of diastolic blood pressure, whereas CpG3 methylation may have predictive value for SBP (2.405 ± 1.138; p=0.042).

Special 1. Alabama Honors Scholars

A Paper

DNA Methylation of the AGTR1 Gene in a Hypertensive Population of Kenyans.

Michael Roque, University of South Alabama; Nancy Rice, University of South Alabama .

Section IX (Health Sciences) Papers Thursday AM

Cardiovascular disease (CVD), the leading cause of death worldwide, is rapidly increasing in low-and middle-income countries (LMICs), particularly those of Sub-Saharan Africa (SSA). Hypertension is the leading risk factor for CVD with no single genetic cause. Evidence indicates that hypertension is predisposed by environmental regulation of genes through heritable, modifiable, epigenetic changes to DNA leading to changes in gene expression, e.g. methylation. Understanding the etiology of hypertension in LMICs is a global priority but few epigenetic studies exist on populations living in SSA. The renin-angiotensin system (RAS) is the primary hormonal pathway that regulates blood pressure through changes in salt and water retention. Previously, we found a high prevalence of hypertension (55 % had systolic blood pressure (SBP) >130mm Hg) in a rural population of Kenyans that was not correlated with lifestyle or behavioral factors. Our current study investigates the hypothesis that DNA methylation of AGTR1 increases the risk of high blood pressure in this population. Preliminary studies from our lab indicate hypermethylation in hypertensive versus normotensive Kenyans (4.78 ±0.45 and 3.84 ± 0.48, respectively) when four cytosine-phosphate guanine (CpG) sites of the AGTR1 promoter were analyzed (n=75). Additionally, when analyzed by multiple linear regression, methylation at CpG 2 (-2.941 ± 1.310; p=0.032) and CpG4 (3.641 ± 1.782; p=0.049) are inversely correlated and may be predictive of diastolic blood pressure, whereas CpG3 methylation may have predictive value for SBP (2.405 ± 1.138; p=0.042).

Special 1. Alabama Honors Scholars

A Paper

Social Determinants Associated with Illicit Substance Use and Treatment Seeking Behaviors in Females of Reproductive Age.

Alyssa Thompson, University of Alabama; Kendall Willard, University of Alabama; Holly Horan, University of Alabama .

Section IX (Health Sciences) Papers Thursday PM

Social determinants of health (SDoH) have been linked to maternal health disparities, including substance use disorders (SUD). Females of reproductive age (FoRA) have the highest reported rate of substance use and are the demographic most likely to be diagnosed with an SUD. Pregnant people are a subset of FoRA and those who are substance involved have 92% greater odds of needing treatment, yet pregnancy is not positively associated with treatment seeking. Data for this study were acquired from the U.S. National Survey on Drug Use and Health. We delimited the dataset to pregnancy status and females ages 18 to 49.

Of 41,505 FoRA, 2,287 reported substance use. Of those who reported use in the past year, 11.83% of non-pregnant FoRA and 15.63% of pregnant people sought treatment. Substance use was associated with young age, White race, having a college degree, having an income of < $20,000, history of criminal behavior, depression severity, urbanicity, lack of insurance, and low religiosity. Treatment seeking was associated with older age, White race, having an income of < $20,000, history of criminal behavior, high religiosity, depression severity, having insurance, and having a chronic disease.

Our analysis describes how SDoH are associated with SUDs and treatment seeking in FoRA. Healthcare professionals would benefit from understanding SDoH and how they interact with preventative treatment, screening, care plans, and referrals. Our analysis should be used to disrupt dated ideologies related to SUD and treatment-seeking behaviors.

Special 1. Alabama Honors Scholars

A Paper

Consistency and Academic Freedom. Liberty Wigen, University of Alabama at Birmingham .

Section V (Social Sciences) Papers: Thursday PM

Academic freedom at American colleges and universities is becoming an increasingly contentious issue. While there are many perspectives on the issue such as those of faculty, university administrators, and ideologically-driven state and federal legislators, this presentation will examine the issue from the perspective of the student. Several pertinent legal cases that deal with academic freedom, focusing specifically on free speech on college campuses will be discussed. In the United States freedom of speech is a fundamental right, as enshrined in the Constitution, yet speech is often restricted in college codes of conduct. Academic freedom can be modeled in classrooms in a number of ways, from students challenging their professor's theories and assertions to professors teaching controversial topics. There exists no enumeration of academic freedom and there is a consistent lack of framework under which courts deal with these cases. By introducing a clear definition of what academic freedom is and a robust framework through which to decide cases, students will have more consistency on what constitutes academic freedom on campus.

Special 1. Alabama Honors Scholars

A Paper

The Social Distribution of Direct and Indirect Exposure to Major Discrimination among Black Adults. Curdajah Bonner, University of Alabama at Birmingham .

Section V (Social Sciences) Papers: Thursday PM

While there have been efforts to understand the relationship between health and discrimination, the ideology of this study has been limited to perceived discrimination. Additionally, studies have proven to lack information regarding the racial discrimination's significant impact on both people and their loved ones through secondhand exposure. This study conceptualizes race-related stress framework by Harrell that concluded the inclusion of vicarious experiences is critical in understanding the effect of racism. Within group differences were analyzed to improve our understanding of certain racial health inequities, such as the "race paradox". Data were taken from the Nashville Stress and Health Study which is a random sample (N=1252) consisting of 627 Black adults. Those who participated in the study resided within Davidson County, Tennessee. This area includes two large historically Black universities (Fisk and Tennessee State) along with the country's oldest historically Black medical school (Meharry Medical College). To capture the entire racial discrimination experience, personal experiences of major discrimination, and vicarious experiences of major discrimination (i.e., spousal, child, and close friend) were assessed. We found that the women had lower odds of reporting personally experienced major discrimination than the men in the sample. Additionally, respondents in the sample who had greater social support from friends had higher odds of reporting vicarious discrimination experiences, which offers partial evidence for the study's hypotheses. From the conclusions of this study, further research should examine how Black women may be disproportionately exposed to secondhand discrimination as a result of their social roles as caregivers.

Special 1. Alabama Honors Scholars

A Paper

Genetically Modified Organisms (GMO's): Humanity's Solution to Rising Hunger Concerns. Hannah Enskat, University of Alabama at Birmingham

.

Section I (Biological Sciences) Papers: Thursday PM;

In November of 2022, the Earth officially surpassed a global population of 8 billion. Unfortunately, this drastic increase in population size accompanies a myriad of universal concerns, with malnutrition and food insecurity remaining as one of the most pressing issues plaguing the 21st century. However, this is not the first time in history that the hungry mouths of the human population have far exceeded the Earth's limited resources. When faced with famine, populations throughout history have utilized selective breeding techniques in order to produce high-yielding crop strains that were resistant to harsh environmental conditions, such as flooding and drought. In the agricultural sense, selective breeding refers to a process in which two plants showcasing an advantageous phenotype are effectively isolated and crossbred with one another, in hopes of creating a hybrid offspring that displays one or more of these desirable characteristics. Although selective breeding has proven to be an effective technique, it is a costly and time-consuming endeavor, leading scientists to turn toward faster, more-efficient agricultural practices, such as Genetically Modified Organisms (GMOs). The development of genetic engineering technology has made it possible for scientists to directly insert a strand of DNA that codes for a desired trait into a plant's pre-existing genome, a process that saves both time and manpower by effectively "cutting out the middleman." With a global population that is projected to reach 10 billion by 2058, the agricultural industry is like to undergo a complete paradigm shift that favors the mainstream use of GMOs.

Special 1. Alabama Honors Scholars

A Paper

Why Originalism?. Anthony Venezia, University of Alabama at Birmingham .

Section V (Social Sciences) Papers: Thursday PM

The current Supreme Court is the first to have a plurality of Justices who openly identify as originalists. That is, they purport to interpret the text of the Constitution in accordance with its original public meaning. The newfound dominance of this approach has already resulted in a dramatic shift of the Court's practices. Numerous precedents have been overturned, it has been suggested by some members of the Court to revisit even more. To understand why the current Court is departing so significantly from certain predecessors, it is important to grasp the concepts underlying this application of originalism. It will be argued here that the procedure versus substance framework of contrasting originalism with its counterparts may lack critical nuance. While originalism in practice arguably does not concern itself with the substantive outcomes of individual cases, the choice to pursue originalism over other methodologies is one of substance. How originalism interacts with principles of democracy, equality, and liberty is critical to making that choice. A more holistic perspective entails that the appeal of originalism lies in an appeal to those principles rather than the procedural approach which ignores them. This comprehensive approach posits that originalism's procedure is a substantive consideration and that, regardless of its persuasive power, understanding this can offer important insights into the Court's current situation and its future.

Special 1. Alabama Honors Scholars

A Poster

Pseudomonas aeruginosa ExoY Does Not Affect ExoS/T-Induced Cytotoxicity in Pulmonary Microvascular Endothelial Cells.

Andrea Vavrinek, University of South Alabama; Phoibe Renema, University of South Alabama; Terrence Ravine, University of South Alabama; Troy Stevens, University of South Alabama .

Section I (Biological Sciences) Posters: Thursday PM;

Pseudomonas aeruginosa (P. aer) bacteria is the most common cause of ventilator-associated pneumonia (VAP) in ICU patients. P. aer uses a type III secretion system (T3SS) to inject combinations of exoenzymes S, T, U, and Y into host cells, causing cell rounding and/or cell death. ExoY is most frequently linked to VAP. Cultured rat pulmonary microvascular endothelial cells (PMVECs) are used to evaluate cellular changes caused by the exoenzymes. ExoY causes PMVEC rounding and subsequent increased vascular permeability. Importantly, ExoY is not cytotoxic to PMVECs, while ExoS is. It has previously been shown in epithelial cells that ExoY inhibits ExoS-induced cytotoxicity. The current study evaluated whether this occurs in endothelial cells. P. aer. strain PAK which produces ExoS, ExoT, and ExoY was compared to isogenic strains expressing either S, SY, T, TY, Y, or lacking STY (Null). PMVECs were infected for 6 hours with each isogenic strain. Post-infection supernatants were assessed for the presence of LDH as an indication of cytotoxicity. Results demonstrated significant cytotoxicity after infection with WT, S, and SY but not with Null, T, TY, or Y. However, there was no significant difference in LDH release between S and SY. These data indicate that ExoY does not inhibit ExoS-mediated cytotoxicity in PMVECs. The mechanism by which ExoY affects cell death is still unknown. Future directions will focus on determining whether ExoY actively inhibits cell death pathways in PMVECs.

Special 1. Alabama Honors Scholars

A Poster

Vascular Endothelial Growth Factor Impacts Blood-Brain Barrier Integrity During Group B Streptococcus Infection.

Alexandra Meyer, University of Alabama; Natalie Alexander, University of Alabama; Brandon Kim, University of Alabama .

Section I (Biological Sciences) Papers: Thursday AM

The blood-brain barrier (BBB) is a network of highly specialized blood vessels that vascularize the central nervous system (CNS) while maintaining separation between the circulation and the brain. This network is upheld by specialized brain endothelial cells (BECs) that comprise the blood vessels throughout the brain. Through these BECs, the BBB can stringently regulate what enters and exits the brain, sustaining homeostasis of the CNS whilst keeping bacteria and other pathogens at bay. Group B Streptococcus (GBS) is a pathogen that invades the brain and is the most prevalent causes of neonatal bacterial meningitis. The mechanisms in which GBS invades the CNS are still not completely known. Vascular endothelial growth factor (VEGF) is a secreted angiogenic mitogen that is known to increase vascular permeability and induce BBB dysfunction. Using in vitro models including the CMEC/D3 cell line and the induced pluripotent stem-cell derived BEC model (iBEC), we have discovered that in response to GBS, BECs upregulate and secrete VEGF. We will discover if GBS induced VEGF expression and secretion is sufficient to contribute to BBB dysfunction during infection. Future work will utilize recombinant VEGF and inhibitors of VEGF or VEGF signaling cascades to determine a role of VEGF signaling in GBS mediated BBB disruption.

Special 1. Alabama Honors Scholars

A Poster

Mapping Health Disparity and Socioeconomic Status in Geographic Information Systems: A Critical Perspective of Civil Rights Challenges in Alabama.. Eric Thompson, Alabama State University; Eric Thompson, Alabama State University; Oluwatosin Oyekeye, Alabama State University; Ram Alagan, Alabama State University; Seela Aladuwaka, Alabama State University ; Manoj Mishra, Alabama State University .

Section VIII (Environmental and Earth Science) Papers: Thursday PM

Mapping Health Disparity and Socioeconomic Status in Geographic Information Systems:

A Critical Perspective of Civil Rights Challenges in Alabama.

Oluwatosin Oyekeye1 Eric Thompson2 and Ram Alagan3, Seela Aladuwaka4, Manoj Mishra5

1Computer Science and W.E.B Du Bois Honors Program, Alabama State University; 2Department of Biological Sciences and W.E.B Du Bois Honors Program, Alabama State University; 3W.E.B Du Bois Honors Program, Alabama State University; 4Department of Advancement Studies, Alabama State University; 5Cancer Biology Research and Training and Department of Biological Sciences, Alabama State University, Montgomery, AL

Background: The proposed research underlines the enduring and pressing civil rights (CR) issues of health disparity and poor socioeconomic status (SES) in Alabama counties that African American predominantly occupy. The statistics reveal that these counties are disproportionately affected by a lack of access to health care, education, employment, income, and increased poor health burdens. The research also emphasizes civil rights advocacy efforts to improve awareness of 1) health disparity, 2) socioeconomic status, and 3) the distribution of healthy food, healthcare, and income distribution for the Black Belt (BB) region. Highlighting critical civil rights fundamentals of discrimination, injustice, and inequality in GIS profoundly vital and timing.

Hypothesis/Objectives: The study hypothesizes that health disparity and SES are closely associated. In particular, poor SES status severely influences healthcare, healthy food, education, employment, and housing. The research explores the impact of selected SES factors to understand health disparity and purposes equitable public health policy in Alabama.

Method: Geospatial Technology (GIS) used to analyze the health and SES disparity. We aim to develop awareness among student activists, community leaders, and other stakeholders about CR issues and push for change. We will engage the public and policymakers to address enduring and pressing CR problems and support proactive policy planning.

Conclusion: The GIS-based CR research recognizes that addressing health disparity and SES is complex and challenging. However, the innovative approach of GIS for health disparity and SES will provide another perspective on the catalyst for greater awareness, fair policy formulation.

Special 1. Alabama Honors Scholars

A Poster

Developing and Testing a Novel Device for Detecting Peripheral Artery Disease Using Radio Frequency Energy.

Julia Nelson, University of South Alabama; Connor Cobb, University of South Alabama; Joshua Keller, University of South Alabama; David Nelson, University of South Alabama; Michael Francis, University of South Alabama .

Section IV (Engineering and Computer Science) Posters: Thursday AM

Peripheral Artery Disease (PAD) is a condition characterized by reduced blood flow in the arms and legs. People at high risk for PAD include those with diabetes, high cholesterol, and those who smoke. Generally, only people who present symptoms such as claudication and ulcers are tested for PAD. An estimated 20-50% of persons with PAD are asymptomatic. This presents the need for a screening tool that can be used by anyone in a high-risk group. Our lab is developing a tool for noninvasive and portable detection of PAD. This technology (REFLO) uses low-power radio frequency energy in the Ka band (26.5-40 GHz) to heat the skin while simultaneously measuring the surface temperature. The amount of blood flowing through the vasculature affects the temperature of the skin, which will allow us to define 'normal' blood flow versus that of PAD. We have tested this model in vivo using rabbit pinnae, an accepted model for human skin, and in silico with a computer-generated flow model. Our prototype employs a small micropatch antenna and an infrared temperature sensor, integrated in a compact transducer. Human subject experiments are being conducted under a protocol approved by the University of South Alabama Institutional Review Board. During the study, the REFLO vascular assessment device is tested and compared to a near-infrared spectroscopy (NIRS) device, an accepted indicator of vascular function. We predict that results from the REFLO device will correlate with readings from the NIRS device, indicating whether our device can differentiate between normal and impaired flow.

Special 1. Alabama Honors Scholars

A Poster

Characterization of SAP in Group B Streptococcus as a Novel Virulence Factor Contributing to Bacterial Meningitis. Aidan Flanagan, University of Alabama; Jacob Wood, University of Alabama .

Section I (Biological Sciences) Posters: Friday AM

The blood-brain barrier (BBB) is a highly specialized collection of brain endothelial cells (BECs) that are distinguished by protective mechanisms. These cells surround the neural vasculature and allow for the selective passage of substances, while simultaneously keeping the bloodstream separated from the brain. This separation is vital to protect the brain from pathogens like Group B Streptococcus (GBS), which can cause diseases like bacterial meningitis. There have been few models which provide an accurate representation of BBB function. We use an induced pluripotent stem cell (iBEC) model which provides a better characterization of BBB function. RNA sequencing of GBS revealed a set of encoded genes carrying an LPXTG motif, indicating a surface anchoring region on the protein. Because of their extracellular nature, LPXTG-type surface proteins have a likelihood to contribute to virulence. One identified protein, Streptococcus agalactiae pullulanase (SAP), is of interest because of its known ability to bind extracellular polysaccharides. Polysaccharides are a known component of the extracellular matrix in eukaryotic cells, involved in protection against desiccation, cell signaling, and adhesion. Previous literature has demonstrated SAP's ability to bind cells, but interaction with BECs is a novel approach. Our interest is characterizing the interaction between SAP and BECs. Using E. coli expression vectors, we will selectively target and express 2 separate fragments along with the full-length protein for purification using a Ni-NTA chromatography system. The modules and full-length targets will be used to characterize the chemical and enzymatic interactions of SAP with BECs by conducting iBEC cell-based assays.

Special 1. Alabama Honors Scholars

A Poster

Virtual Young Teen Asthma & Wellness Camp (VYTAWC): A School-Based Expansion to Rural Underserved Counties to Address Health Disparities.

Hannah Wright, Samford University; LaBrenda Marshall, Samford University; Mikiah Dumas, Samford University; Allison Jackson, Samford University; Ellen Buckner, Samford University .

Section IX (Health Sciences) Papers Thursday PM

The Virtual Young Teen Asthma & Wellness Camp (VYTAWC) was founded in 2020 with interprofessional team members representing nursing, pharmacy, social work, respiratory therapy, medicine, and asthma educators. The program provides asthma self-management education and wellness activities to youth ages 11-15 by a virtual platform. A primary purpose is increasing adolescent responsibility for self-management and collaboration with family to strengthen coping strategies. In 2021-2022 a school-based model was developed, and asthma educators took on an expanded role. Asthma varies by race, geographical area, and socioeconomic status. Kane (2022) uses geo-mapping to show that risk factors such as low-income, environmental hazards, and linguistic isolation increase the risk of childhood asthma. Areas with a higher minority population, including those with roots in systemic segregation, face a higher risk for acute care visits related to pediatric asthma (Kane, 2022). In addition, children in rural families experience disparities compared with children in urban areas due to factors like their environment, accessibility, and education on part of the healthcare professionals and patients (Estrada & Ownby, 2017). Because of this, it is important to incorporate “cultural weaving” into the healthcare process to provide adequate care to all communities. By implementing a school-based program that includes members from the community, individual strands create a tapestry. Desired outcomes include reduced absences, improved asthma control, and growth in responsibility. The Virtual Young Teen Asthma & Wellness Camp demonstrates a new virtual model for asthma self-management education in the time of Covid-19 pandemic, potentially accessible to high risk and underserved areas.

Special 2. Society of Physics Students

A Paper

A Modified Czolchralski Method for Growth of Cesium Hexachlorohafnate Scintillator Crystals.

Jordan Drake, Alabama A&M University; Stephen Babalola, Alabama A&M University; Elijah Adedeji, Alabama A&M University; Angel Sumlin, Alabama A&M University .

Section III (Physics and Mathematics) Papers: Thursday PM

Cesium hexachlorohafnate (CHC) is a non-hygroscopic, high light yield (54,000 photons/MeV), scintillator crystal with high effective atomic number. Unlike many other scintillator crystals, it requires no doping to achieve the high light yield and high energy resolution. This paper reports on an attempt at growing CHC using a modified Czochralski technique and novel ampoule design to contain the starting materials. The ampoule uses a rotatable borosilicate stir rod to lower and introduce the seed crystal to the crystal melt. An O-ring is used to maintain a controlled atmosphere for the hygroscopic starter materials and the melt which produces hafnium vapor within the ampoule. A distinct ampoule design with gas lines to feed inert gas into the top of the ampoule was also tested. The grown crystals will be characterized for defects using transmission infrared spectroscopy and for scintillation performance by its response to gamma radiation.

Special 2. Society of Physics Students

A Poster

Thermodynamic Study of the Formation of Cesium Hexachlorohafnate from Melt.

Jordan Drake, Alabama A&M University; Stephen Babalola, Alabama A&M University; Elijah Adedeji, Alabama A&M University; Angel Sumlin, Alabama A&M University .

Section III (Physics and Mathematics) Posters: Thursday AM

Cesium hexachlorohafnate (CHC) is a non-hygroscopic, high light yield (54,000 photons/MeV), scintillator crystal with high effective atomic number. Unlike many other scintillator crystals, it requires no doping to achieve the high light yield and high energy resolution. This poster reports on the thermodynamic properties of the growth of CHC. CHC is a cubic (BCC) crystal with a perovskite structure consisting of cesium cations and hexachlorohafnate anions. Formation of the hexachlorohafnate anion is of particular interest for this poster, as its formation may facilitate a reduction in the vapor pressure of hafnium over the crystal melt during CHC growth, which may result in more precise stoichiometry. Theoretical predictions about the thermodynamic properties will be made using the existing literature and will be used to predict a temperature profile during the growth process. These predictions will be compared to using the temperature profile of the melt during the crystallization process.

Inconel 625 for Laser Powder Bed Fusion: Heat Treatment, Microstructure and Microhardness.

Tahmina Keya, Auburn University; Ilias Bikmukhametov, University of Alabama; Greyson Harvill, University of Alabama; Mohanish Andurkar, Kansas State University; Scott Thompson, Kansas State University ; Valentina O'Donnell, Kansas State University; John Gahl, University of Missouri.

Section I (Biological Sciences) Papers: Thursday AM

Additive manufacturing (AM) enables production of parts with complex geometry in a faster, easier and less expensive way. Laser powder bed fusion (LPBF) is a metal AM process that produces metal parts in a layer-by-layer fashion where powder layers are melted by a high energy laser beam and solidified once the laser is moved. Inconel 625 is a Ni-based superalloy that is widely used in LPBF process where parts with intricate geometry and superior mechanical performance are required in extreme environments. Despite having unique advantages over traditional manufacturing, LPBF comes with some challenges such as heterogeneous, anisotropic microstructure which is different than traditional such as wrought microstructure with equiaxed grains. Since additively manufactured microstructure cannot be mechanically altered, suitable heat treatment is the only option to tailor microstructure for desired mechanical properties. Since the as-printed microstructure is different than wrought microstructure, traditional heat treatment schedules cannot be applied to LPBF parts. Therefore, it is vital to study the effect of different heat treatment methods on the microstructure and mechanical properties of LPBF IN625. In this study, heat treatment at temperature range from 700-1050oC for 1-10 hours have been applied to LPBF IN625 to study the evolution of microstructure and microhardness on its way to complete recrystallization.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Effect of Dispersion Homogeneity and Formulation on Mechanical and Electrical Properties of Liquid Metal Polymer Composites.

Anh Hoang, University of Alabama; Amanda Koh, University of Alabama .

Section IV (Engineering and Computer Science) Papers: Thursday AM

Composites of eutectic room temperature liquid metals, such as alloy gallium-indium-tin (galinstan), have proven to be an effective solution for creating soft materials that have tunable mechanical and electrical properties. Due to their high relative permittivity and low modulus, liquid metal polymer composites (LMPCs) have demonstrated excellent performance as deformable dielectric materials for pressure sensors or soft capacitors. While prior work has demonstrated the high permittivity and low modulus of LMPCs, the dense liquid metal particles can settle prior complete elastomer curing, which may have an impact on the morphology, mechanical performance, and dielectric behavior of the material. In the research presented here, the settling of galinstan dispersions in polydimethylsiloxane (PDMS) at various concentrations, droplet sizes, and homogeneity is thoroughly evaluated. These findings will allow LMPCs to dielectrically customize deformable devices for use in particular applications.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

A Novel Magnetic Drug Screening Nanoplatform Based on Immobilized Transmembrane Proteins on Magnetic Superparticles.

Shomit Mansur, University of Alabama; Yuping Bao, University of Alabama; Sadanandan Velu, University of Alabama atBirmingham; Jesse Horne, University of Illinois-Urbana Champaign .

Section II (Chemistry) Papers: Thursday PM

Most current high throughput drug screening methods are designed for pure individual compounds and are not suitable for complex matrices. Here, we report a novel drug screening nanoplatform based on cell membrane encapsulated magnetic superparticles with the potential of identifying drug leads from a complex mixture using transmembrane proteins as our drug target. Previously, a magnetic drug screening nanoplatform using 15 nm size nanoparticles was proposed, but because of the slower magnetic response and uncontrolled number of nanoparticle encapsulation, their usage in biological separation gets limited. We have developed a method to synthesize 200 nm sized superparamagnetic iron oxide superparticles to be used as a drug screening nanoplatform, which overcomes these limitations by higher magnetic moment. Formation of superparticles and cell membrane encapsulated superparticles were characterized by transmission electron microscopy. Here, using voltage-gated sodium ion channel as a model

system, we specifically investigated the interfacial chemistry on the binding ability of these ion channels. Subsequently, these nanoplatforms were applied to screen a synthetic library mixture containing 71 individual small molecule compounds and the binding molecules were analyzed by ultrahigh performance liquid chromatography combined with mass spectrometry. Our future studies will focus on evaluating the

effectiveness of the molecules on modulating sodium ion channel activities. Further studies will be done to use our drug screening design in identifying potential leads for other transmembrane proteins.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Manufacturing and characterization of (PCL/GELMA) microstructure scaffolds for Periodontal tissue engineering applications. Rakesh Pemmada, University of Alabama at Birmingham UAB.

Section IV (Engineering and Computer Science) Posters: Thursday AM

3D Printing is an emerging fabrication technology with various applications in biomedical engineering, like biofabrication of tissue cellularized constructs to repair or replace damaged tissues. During this process, a solution of a biomaterial or composite biomaterials is used to develop tissue scaffolds. The complexity of scaffold architectural design imposes specific constraints, such as gradient pore size, pore shape, pore interconnectivity, and the spatial distribution of pores throughout the scaffold. 3D printing techniques show great potential for scaffold fabrication, owing to their ability to design any complex structure with precisely controlled dimensions. Bioactive scaffolds constructed of poly(-caprolactone) (PCL) were 3D printed using Fused Deposition Modelling (FDM) technology and surface modified with various non-thermal plasmas to create chemical moieties capable of crosslinking with a natural polymer such as GELMA. This research explores cutting-edge 3D-printing advancements 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 and thermal performance, porosity, and surface morphology. Technical limitations of 3D printing (PCL) will be examined with the help to feature the chance of future enhancements for newer 3D-printed materials development for periodontal tissue engineering. We hypothesize that some of the scaffold designs discussed here could be determined to be perfectly viable for their futuristic applications in vivo due to their dimensional accuracy and mechanical strength.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

The extended surface element integration method for the DLVO interaction energy of Janus superellipsoids with a planar wall..

Unmanaa Dewanjee, University of Alabama in Huntsville; Daniel Duke, University of Alabama in Huntsville; KaiLian Davis, University of Alabama in Huntsville; Isaac Torres-Díaz, University of Alabama in Huntsville .

Section IV (Engineering and Computer Science) Papers: Thursday AM

Janus colloids have unique characteristics on both sides of the particle. Janus colloids have recently attracted a lot of attention due to their multiple degrees of freedom for different applications, such as bio-sensing, imaging, drug delivery, tunable materials, etc. However, there is a lack on the quantifications of their interactions for the aforementioned applications. In this work, we use the extended Surface Element Integration (SEI) method to quantify the DLVO (Derjaguin, Landau, Verwey, and Overbeek) interaction energy of a Janus superellipsoid with a planar wall. Our approach takes into account the effect of particle position and orientation on the interaction energy of a Janus particle with a planar wall. We analyze Janus superellipsoids with different shapes and aspect ratios, which includes the following shapes: rounded octahedron, sphere, rounded cube, ellipsoid, and rounded rectangular prism. Results indicate that the particle Gaussian curvature, aspect ratio, orientation with respect to the wall strongly influences the DLVO interaction energy. Results show the DLVO interaction energy is inversely correlated with the Gaussian curvature, i.e., the interaction energy decreases as Gaussian curvature increases (sharp edges); oppositely, it increases as Gaussian curvature decreases (flat surfaces). Furthermore, the DLVO interaction energy increases with the aspect ratio since the Gaussian curvature decreases as the particle aspect ratio increases. Additionally, results show a variation of the interaction energy as a function of orientation due to the change of the local Gaussian curvature near the planar wall. Moreover, we analyze the effect of the material coating, which enhances the adhesion energy of the Janus side with Hamaker constant. These results are relevant to enhance the particle internalization in drug-delivery applications.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Manufacturing and characterization of (PCL/GELMA) microstructure scaffolds for Periodontal tissue engineering applications. Rakesh Pemmada, University of Alabama at Birmingham UAB.

Section IV (Engineering and Computer Science) Posters: Thursday AM

3D Printing is an emerging fabrication technology with various applications in biomedical engineering, like biofabrication of tissue cellularized constructs to repair or replace damaged tissues. During this process, a solution of a biomaterial or composite biomaterials is used to develop tissue engineered scaffolds. The complexity of scaffold architectural design imposes specific constraints, such as gradient pore size, pore shape, pore interconnectivity, and the spatial distribution of pores throughout the scaffold. 3D printing techniques show great potential for scaffold fabrication, owing to their ability to design any complex structure with precisely controlled dimensions. Bioactive scaffolds constructed of poly(-caprolactone) (PCL) were 3D printed using Fused Deposition Modelling (FDM) technology and surface modified with various non-thermal plasmas to create chemical moieties capable of crosslinking with a natural polymer such as GELMA. This research explores cutting-edge 3D-printing advancements 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 and thermal performance, porosity, and surface morphology. Technical limitations of 3D printing (PCL) will be examined with the help to feature the chance of future enhancements for the development of newer 3D-printed materials for periodontal tissue engineering. We hypothesize that some of the scaffold designs discussed here could be determined to be perfectly viable for their futuristic applications in vivo due to their suitability, dimensional accuracy and mechanical strength.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Influence of ZrC Dispersion in the Grain Size Control of Additively Manufactured Molybdenum.

Colton Gilleland, University of Alabama; Carly Romnes, University of Chicago- Urbana-Champaign; Omar Mireles, NASA Marshall Space Flight Center; Fernando Reyes Tirado, NASA Marshall Space Flight Center; Gregory Thompson, University of Alabama .

Section IV (Engineering and Computer Science) Posters: Thursday AM

Laser Powder Bed Fusion (L-PBF) is a form of additive manufacturing that can produce near net shaped parts by its ability to locally heat and solidify powders together. One of the advantages for using a laser is the high input power that can melt refractory elements, which can traditionally be difficult to consolidate through conventional sintering methods of near-net shaped parts. However, one of the challenges of L-PBF is the rapid solidification that occurs upon the removal of the laser. In most refractory metals, given the ductile-brittle transition temperature, this typically results in micro-cracks spanning the Z-axis interconnected by grain boundaries. If the grains are refined, this deleterious micro-cracking can be mitigated. We have coated spherical molybdenum powders (<45um) with ZrC particles of various sizes (20 nm to 1.2 um) to pin the solidified grain boundaries. After L-PBF, the specimens were cross-sectioned, polished, and characterized by Scanning Electron Microscopy – Electron Backscattered Diffraction (EBSD). The EBSD revealed that with the carbide dispersions, the grain sizes were refined by up to an order of magnitude as compared to a deposit with no carbides. However, the grains in all deposited revealed wide distribution of grain sizes, with clusters of smaller grain regions having a higher dispersion of the carbide content as compared to larger grain regions. For all the deposits, a random grain orientation was noted. This work will address the influence of carbide size, concentration and its dispersion on the effect of grain pinning behavior under the dynamic conditions of L-PBF.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Synthesis and self-assembly of folate-conjugated block copolymers of poly(ethylene glycol) and poly(amino acid) and their targeting efficiency.

Adekunle Titus Akinmola, University of Alabama in Huntsville; Carmen Scholz, The University of Alabama in Huntsville .

Section II (Chemistry) Posters: Thursday AM

Biocompatibility is essential when developing any material designed for insertion into the human system, and the reception of such material by the tissue is essential for the material to achieve its purpose. Ring-opening polymerization of amino acid N-carboxy anhydride was investigated, exploring α-hydroxy-ω-amino polyethylene glycol (PEG) and α-methoxy-ω-amino polyethylene glycol as macro initiators to achieve amphiphilic block copolymers of varied chain lengths. The block copolymers were processed into micelles which serve as delivery vehicles for drugs and imaging agents. PEG exhibits a stealth character, and amino acid functionality allows drug and imaging agent binding. Further conjugation of folic acid to the block copolymer enhances the binding efficacy of the micelles to targeted cells, increasing drug concentration on the targeted site. Folate-conjugated PEGylated poly(L-Leucine) with varying leucine monomer ratios were synthesized and processed into micelles to deliver iron oxide nanoparticles. The imaging characteristics of the micelles were investigated using magnetic particle imaging (MPI). The monomer ratio of the amino acid block was observed to determine the micelles' functionality, and the folic acid conjugation showed enhanced binding to targeted cells.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

INCORPORATION OF LOW TEMPERATURE PLASMA TREATMENT FOR THE EFFECTIVE UPCYCLING OF HIGH-DENSITY POLYETHYLENE (HDPE) WASTES.

Gautam Chandrasekhar, Tuskegee University; Vijaya Rangari, Tuskegee University Tuskegee University.

Section IV (Engineering and Computer Science) Posters: Thursday AM

The recycling rate of HDPE (HIGH DENSITY POLYETHYLENE) waste in the United States in 2018 was around 27.9% which is extremely low. In this work, HDPE distilled water cans were subjected to plasma treatment in the presence of oxygen and sulfur hexafluoride gases in order to study its scope of incorporation for the effective upcycling of HDPE. The effect of plasma treatment was studied using analytical techniques such as tensile testing, thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), fourier transform infra-red (FTIR) spectroscopy and scanning electron microscopy (SEM). The results evidently showed that the plasma treatment helped in the enhancement of properties of HDPE considerably.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Synthesis of Poly(L-Lysine) Dendrigraft Modified with Simple Sugars.

Felicia McCarty, University of Alabama in Huntsville .

Section II (Chemistry) Posters: Thursday AM

Dendrigrafts are an extension of the dendritic polymer family. These highly branched polymers have great structural flexibility. More specifically, poly (L-Lysine) dendrigrafts have good water solubility, comparatively low cytotoxicity, non-immunogenic potential, and biocidal activity due to their polycationic structure. In addition, poly(L-Lysine) based bioconjugates are effective synthetic antigens for immunization and monoclonal antibody production. They are also used as macromolecular carriers for target-specific drug delivery and are applied in cancer research. Due to advantages in biocompatibility and antimicrobial ability, poly (L-Lysine) has received considerable attention. Although these advantages increase their potential to be used in biomedical applications, modifications are necessary to reduce the possibility of cytotoxicity as a result of the dense cationic amine groups. The synthetic method of dendrigrafts is based on grafting reactions with polymeric side chains serving as building blocks. This method is not as controlled as the method used to synthesize dendritic polymers. For this reason, the synthesis of dendrigrafts yields rapid molecular increases as side chains are added which contributes to a densely charged polymeric dendrigraft. With focused strategies to achieve living polymerization through the ring opening polymerization of amino acid N-carboxyanhydrides; this study will focus on the preliminary studies of the synthesis, properties, and modification of poly (L-Lysine) dendrigraft (PLLD) with simple sugars like glucose (D-Glc) using the Maillard Reaction. Modifying the structure of poly (L-Lysine) Dendrigraft with a simple sugar and forming a new structure may allow the development of suitable materials that are useful in biomedical applications.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Synthesis of Poly(L-Lysine) Dendrigraft Modified with Simple Sugars.

Felicia McCarty, University of Alabama in Huntsville .

Section II (Chemistry) Posters: Thursday AM

Dendrigrafts are an extension of the dendritic polymer family. These highly branched polymers have great structural flexibility. More specifically, poly (L-Lysine) dendrigrafts have good water solubility, comparatively low cytotoxicity, non-immunogenic potential, and biocidal activity due to their polycationic structure. In addition, poly(L-Lysine) based bioconjugates are effective synthetic antigens for immunization and monoclonal antibody production. They are also used as macromolecular carriers for target-specific drug delivery and are applied in cancer research. Due to advantages in biocompatibility and antimicrobial ability, poly (L-Lysine) has received considerable attention. Although these advantages increase their potential to be used in biomedical applications, modifications are necessary to reduce the possibility of cytotoxicity as a result of the dense cationic amine groups. The synthetic method of dendrigrafts is based on grafting reactions with polymeric side chains serving as building blocks. This method is not as controlled as the method used to synthesize dendritic polymers. For this reason, the synthesis of dendrigrafts yields rapid molecular increases as side chains are added which contributes to a densely charged polymeric dendrigraft. With focused strategies to achieve living polymerization through the ring opening polymerization of amino acid N-carboxyanhydrides; this study will focus on the preliminary studies of the synthesis, properties, and modification of poly (L-Lysine) dendrigraft (PLLD) with simple sugars like glucose (D-Glc) using the Maillard Reaction. Modifying the structure of poly (L-Lysine) Dendrigraft with a simple sugar and forming a new structure may allow the development of suitable materials that are useful in biomedical applications.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

A Brief Explanation and Effects of Reduced Carbon in Inconel 718. Joey Scott, University of Alabama in Huntsville; Judith Schneider, University of Alabama in Huntsville .

Section IV (Engineering and Computer Science) Posters: Thursday AM

The properties of Inconel 718 (IN718) are dependent on the elemental composition and microstructure. IN718 is a precipitation strengthened, austenitic, nickel-based superalloy that is resistant to corrosion and creep. Carbide formation is reported to influence the grain size, especially at elevated temperatures. IN718 was developed to be used at temperatures approaching 0.7 of its homologous temperature. Some applications using IN718 include rocket and jet engine parts, rings and castings, and various sheet metal applications. These parts are often complex and difficult to machine, making IN718 ideal for additive manufacturing processes such as laser-powder bed fusion (L-PBF). The various phases that form in IN718 rely on the niobium (Nb) content including the carbides. The precipitates also include Nb in the strengthening phases of gamma prime (□') and gamma double prime (□''). The metastable □'' is primarily responsible for strengthening and has the potential to transform into the stable (□) phase, which also controls grain size. In this study, the carbon concentration was varied to evaluate its influence on the resulting formation of the various Nb phases.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Elastic SEBS beads as additives to enhance the eleasticity of iron-based Magnetorheological fluids. Sandhiya Thiagarajan, University of Alabama; Aubrey Dettman, The University of Alabama; Amanda S. Koh, The University of Alabama .

Section VII (STEM Education) Posters: Thursday PM

Styrene-ethylene-butylene-styrene, more commonly known as SEBS or synthetic rubber, is an elastomer that has applications such as soft robotics, and whose elastic properties have been extensively studied. The goal of this study was to develop elastic SEBS beads that can be used in magnetorheological fluids (MRFs) for piston-based applications, such as magnetic brakes and dampers. MRFs are mixtures of magnetic particles (iron), in a non-magnetic liquid, that transit from a liquid to a solid-like state due to the formation of chain-like structures in the presence of a magnetic field. However, MRFs lack elastic properties, which limits their energy dissipation behavior with respect to an applied load.

Elastic SEBS beads were developed for the first time by mixing SEBS with water and a surfactant at a temperature of 70℃, with subsequent cooling once droplets were formed. Elastic beads were imaged using optical microscopy and rheological properties, were examined. Initial results suggested that the elastic bead size and the rheological properties of the prepared SEBS mixture were a function of both SEBS and surfactant concentration. Bead size decreased with increasing SEBS concentration, while the best viscosity was obtained at 40 vol% volume SEBS and 30 vol% surfactant. The developed elastic beads were then used to develop SEBS-based MRFs. The rheological properties of the MRFs were studied as a function of both SEBS and iron concentrations. It was found that SEBS concentration had a significant effect on the iron chain-like structures, the yield stress and storage modulus of the resulting MRFs.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Evaluation of As-deposited Tensile Behavior and Microstructure of Additive Friction Stir Deposition 304L Stainless Steel.

Jessica Lopez, University of Alabama; Malcolm Brady, Baylor University; Ning Zhu, Baylor University; Brian Jordon, Baylor University; Paul Allison, Baylor University .

Section IV (Engineering and Computer Science) Posters: Thursday AM

Abstract

This research investigates the as-deposited microstructure and tensile behavior of multi-layer 304L stainless steel additive friction stir deposition (AFSD) builds. Tensile specimens were machined from 7 layer AFSD builds consisting of 0.5 mm individual layer heights, 30 mm layer widths, and 76 mm long. The AFSD 304L stainless steel deposit showed tensile strengths similar to wrought stainless steel, as well as uniform hardness throughout the layers and substrate. Characterization of the AFSD deposit revealed equiaxed grain structure compared to the substrate. Oxide formation was observed at the layer interfaces, which resulted in lower build-direction tensile ductility. The present study demonstrates AFSD technology as an emerging large scale solid-state, non-melting, additive manufacturing process building 304L stainless steel components.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Stabilization of Vacancy Ordered Transition Metal Carbides by Sputter Deposition.

Haas Blacksher, University of Alabama; Michael Large, Alabama; Gregory Thompson, Alabama; Christopher Weinberger, The University of Alabama.

Section IV (Engineering and Computer Science) Posters: Thursday AM

Transition metal carbides are a class of ceramics that offer various metal rich sub-stoichiometric phases depending on the transition metal type and carbon concentration. These phases can either be vacancy ordered, disordered, or stacking fault varieties. In particular, the vacancy ordered phases are stabilized at lower temperatures but can be difficult to stabilize through traditional powder-based fabrication methods. In this study we explore the use of reactive gas sputter deposition at stabilizing these types of phases. The Ta-C system is used as a case study as it can stabilize vacancy ordered, disordered, and stacking fault phases. By adjusting the ethylene precursor pressure during sputtering we have successfully formed the vacancy ordered Ta6C5 phase. In addition, we have formed a two-phase equilibrium between Ta6C5 and the stacking fault phase, Ta2C with the phases identified by electron diffraction. While we cannot discount stabilizing disordered TaC as it shares nearly equivalent reflections with Ta6C5, in the two-phase regime we do not identify the stacking fault phase Ta4C3 which is commonly identified in powder processing. First principal DFT calculations suggest that the true two-phase equilibrium is Ta6C5 and Ta2C. We will discuss how the process of pseudo-atom-by-atom growth coupled with high surface diffusivity and rapid creation and annihilation of defects during sputtering contribute to the phase stability.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Free-standing nanothin hydrogels. Maksim Dolmat, University of Alabama at Birmingham; Eugenia Kharlampieva, UAB; Veronika Kozlovskaya, UAB .

Section II (Chemistry) Posters: Thursday AM

Stimuli-sensitive hydrogels can alter volume dramatically and reversibly in response to external stimuli, which is essential in drug delivery, tissue engineering, and sensing applications. Free-standing nanothin hydrogels would be ideal for applications that necessitate substrate-free materials. sensors, wound dressings, Free-standing films can be employed as membranes, catalytic films, sensors, wound dressings, artificial organs, and micromechanical devices. The fragility of ultrathin hydrogels is a key restriction in their release from a substrate. To mitigate this limitation, we developed a method for producing nanothin free-floating poly(methacrylic acid) (PMAA) hydrogel films by dissolving a sacrificial SiO2 layer. The multilayer hydrogel films were produced by chemical crosslinking of PMAA in the spin-assisted hydrogen-bonded PMAA/poly(N-vinylpyrrolidone) (PVPON) film. Surface-anchored HB films and hydrogels were released into an aqueous solution from silicon templates by etching the templates' thick sacrificial SiO2 layer. Using Atomic Force Microscopy (AFM), we investigated the effect of the release method on the surface morphology, thickness, and elasticity of the released (PMAA/PVPON)60 and (PMAA)60 films and found that neither the film release nor the subsequent transfer onto Si wafers impacted these parameters. We demonstrated that 16-hour crosslinked (PMAA)60 hydrogels formed free-floating films with excellent mechanical integrity and strength, as did their more swollen 8-hour crosslinked counterparts. The Young's modulus of a 16-hour crosslinked (PMAA)60 hydrogel film decreased by ~25 and 136 times, respectively, during hydration at pH 5 and 6.5. Incorporating Zr(IV) into only 60 nm thick (PMAA)30 hydrogels increased film mechanical robustness and allowed for successful release and transfer onto supporting substrate. In contrast, Zr-free (PMAA)30 hydrogels are more mechanical fragile and less resistant to the release/transfer method. An EDTA chelator was employed to eliminate the transient coordination linkages between Zr(IV) and the hydrogel. The lift-off method presented here is straightforward, adaptable, and applicable to a wide range of polymer films.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Electrodeposition of Molybdenum from Water-in-Salt Electrolytes.

Quanhong Liu, University of Alabama .

Section I (Biological Sciences) Papers: Thursday AM

Superconducting quantum computer is believed to be far more powerful than classical computers. The central piece of a superconducting quantum computer chip must be operated below 1 Kelvin temperatures. This naturally poses challenges in forming the communication between this quantum chip and other control devices, which typically operate at much higher temperatures up to room temperature. For my project, we want to use the electrodeposition method to synthesize a new superconducting material that can improve this communication by eliminating Joule heating generated by electrical currents and mitigating performance perturbation. One of the highest Tc for metals has been reported for Re when it is alloyed with Mo. Thus, we want to investigate the co-electrodeposition of ReMo and determine how the presence of Mo impacts the superconductivity of the films. On the other hand, Mo is very difficult to electrodeposit from aqueous electrolytes due to its highly negative deposition potential and extremely high affinity with oxygen atoms. It has been thought to be impossible to deposit elemental Mo from aqueous solution unless it is co-deposited with some other metals. However, a few very recent studies have reported successful deposition of metallic molybdenum from highly concentrated acetate solutions as a thick coating on metallic objects for aeronautic applications. While the deposition was successful in these reports, an understanding of the mechanism and the roles of super high concentration of acetates are lacking. Here, we hope to provide a systematic study on Mo deposition using acetate electrolyte system under the umbrella of the water-in-salt concept.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Symmetry on the directed-assembly of binary suspensions of anisotropic particles. David Harris, University of Alabama in Huntsville; David Harris, The University of Alabama in Huntsville .

Section IV (Engineering and Computer Science) Posters: Thursday AM

Colloids, solid particles suspended in a fluid medium, are frequently seen in natural and synthetic suspensions, such as in paint, milk, and blood. Colloids are relevant for different applications, such as photonic and tunable materials, biomedical applications, and micro-robots. Colloidal particles move freely driven by Brownian motion, but they assemble into crystal structures with the application of external fields. The order and symmetry of colloidal crystals via external fields were quantified for structures composed of spherical and uniaxial particles, but not for structures composed of binary anisotropic particles. This research focuses on the assembly of binary suspensions composed of anisotropic particles of different shapes and material properties. We use the recently developed ellipsoid-dipole model and Monte Carlo simulations to predict the assembly of binary systems composed of anisotropic particles. We perform simulations predicting the interactions between paramagnetic and diamagnetic particles in binary colloids, varying the relative concentration, aspect ratio, and size of the components. Simulation results show that the dipolar interactions promote different structures around the paramagnetic ellipsoids with two-fold symmetry. The results show that the number of satellite particles assembled around a central particle changes with the magnetic permeability. Furthermore, results show four-fold and five-fold symmetry of diamagnetic ellipsoids around a large paramagnetic sphere. These results show that the symmetry of the assembled structures can be controlled based on the magnetic properties of the medium and the intensity of the applied magnetic field. These simulations have potential to establish the designing tools for micro-robot and tunable materials fabrication.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

PLASMA/ OZONE SURFACE ENGINEERED PEEK IMPLANTS FOR ENHANCED BIO INTERACTIONS.

Chandrima Karthik, University of Alabama at Birmingham; Vinoy Thomas, UNIVERSITY OF ALABAMA AT BIRMINGHAM.

Section IV (Engineering and Computer Science) Posters: Thursday AM

The success of any implant material in biomedical applications is greatly influenced by the bulk characteristics of the implant material. The biological response is determined by the surface chemistry and structure after implantation. Due to its superior bulk mechanical properties, PEEK has gained popularity over the past 15 years as a metal substitute in bio medical implants. Low surface energy is a fundamental issue with PEEK implants. This low surface energy caused by a moderately hydrophobic surface may be able to inhibit cellular adherence due to the orientation of cell adhesion proteins like fibronectin and vitronectin. progenitor cell osteoblastic reduction is the principle of peek implants. This results in the development of an inflammatory response, a type of biological reaction that may result in cell necrosis and apoptosis. The UV/ozone treatment has been utilized successfully to promote cellular attachment on polymer surfaces with a variety of cell types, and it has also been shown to increase attachment of biomolecules with higher surface oxygen concentration. Here in this proposed work, plasma, the fourth state of matter, that both encourage and discourage cellular adhesion have been applied to polymer surfaces and evaluating the efficiency of plasma modified surfaces along with the ozonated surfaces. Therefore, the main goal of our research has been to find a stable surface modification for PEEK that will boost surface energy and change cellular and cell interactions for orthopedic applications. The future of this work lies in grafting various functionalities on to the surface of the implant using plasma technology for improved cellular interactions.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Investigation Into Low-Defect Molybdenum Produced by Continuous and Pulsed Laser. Ernest Porterfield, Auburn University; Barton Prorok, Auburn University .

Section IV (Engineering and Computer Science) Posters: Thursday AM

Refractory metals have piqued the interest of many researchers as the solution to many high-temperature applications. These metals, however, tend to be difficult to manufacture and machine. The solution: additive manufacturing. Additive manufacturing has become well known for its ability to create complex or even personalized creations, but despite its advantages, many materials are not widely used. One such material is Molybdenum. Recent studies using laser powder bed fusion have printed crack-free Molybdenum with an achieved density greater than 90%. These results were obtained by using a heated print bed in conjunction with continuous laser. By modifying the laser parameters of a pulsed laser, it is hypothesized that the need for a heated print bed can be overcome in part due to improved input energy control. The information learned from Molybdenum can be applied to its alloy TZM or other refractory metals.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Simulation of Magnetic Hysteresis in Cobalt-Based Metal Amorphous Nanocomposites.

Kayla Cole-Piepke, University of Alabama; Prabandha Nakarmi, University of Alabama; Alicia Koenig, University of Alabama; Tim Mewes, University of Alabama; Gregory Thompson, University of Alabama ; Ronald Noebe, NASA Glenn Research Center; Alex Leary, NASA Glenn Research Center.

Section III (Physics and Mathematics) Posters: Thursday AM

We report on the development of a process to simulate magnetic hysteresis within metal amorphous nanocomposites (MANCs). This methodology involves the use of a Voronoi tessellation method [1] to simulate random crystal growth in a material. In our simulations, we include grain boundary regions that serves as the amorphous matrix of the material. The crystallites and the matrix can each be assigned different material parameters depending on the desired magnetic behavior. We aim for a crystallite to matrix ratio of 11%.

Utilizing experimental characterization results obtained by Srivastava et al. [2] as the baseline for crystallite properties, we simulate the hysteresis of a MANC using varying values for the saturation magnetization of the matrix to determine the effects of the matrix on coercivity. In addition, we perform calculations for a situation where there is no amorphous matrix present within the simulation volume. These calculations are performed on systems with a crystallite size of the order of less than 50[nm]. We find that the inclusion of an amorphous matrix shifts the peak coercivity to smaller crystallite sizes. We also find that a matrix with lower saturation magnetization tends to yield a more drastic peak and an overall higher coercivity than systems with a higher saturation magnetization within the matrix.

References

[1] T. Suzudo and H. Kaburaki, Phys. Lett. A 373 (2009).

[2] A. Srivastava, K. Cole, A. Wadsworth, T. Burton, C. Mewes, T. Mewes, G. B. Thompson, R. D. Noebe, and A. M. Leary, J. Magn. Magn. Mater. 500 (2020).

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Development of metal additive manufacturing processes for bi-metallic components. Michael Santangelo, University of Alabama in Huntsville

.

Section III (Physics and Mathematics) Posters: Thursday AM

Fabrication of multi material components that can withstand high pressure, high heat flux environments, such as those seen in rocketry applications, has traditionally relied on joining of multiple pieces. Implementation of metal additive manufacturing offers a method to accelerate production and expand design flexibility by the ability to directly print multi material components in one process. In these environments, bi-metallics combine materials with high strength to those with high thermal conductivity to regulate the heat flow. While applications for bi-metallic components continues to grow, the knowledge surrounding the selection of suitable alloys relies on experimental efforts, delaying the cost saving benefits of this technology. By using numerical modeling approaches to evaluate the potential interaction between alloying elements, this proposed research will further our current understanding of bi-metallic materials, primarily within copper-nickel alloy systems. If the interface between bi-metallic materials contains brittle intermetallic formations, this can be a potential location for failure. Thus a better understanding of the alloy interactions can predict the formation of specific deleterious intermetallic phases, providing a higher-throughput method to determine bi-metallic pair compatibility. The proposed numerical modelling approach is anchored by selected materials characterization and testing to verify its predictions. This expanded knowledge paves the way for designers to select suitable alloys with confidence in the resulting reliability and stability of their interface to accelerate the implementation of additively manufactured bi-metallic components."

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Nano-twin stability effects on strength of Cu-Al alloys via in-situ cryogenic indentation. Jarod Robinson, University of Alabama; Eric Homer, BYU; Gregory Thompson, UA .

Section IV (Engineering and Computer Science) Posters: Thursday AM

Twin boundaries are important defects in modern material design. Increasing presence of these boundaries has been shown to provide high strength in materials. However, recent experimental and simulation work has demonstrated that twins in some cases have decreased stability at cryogenic temperatures. In this work, copper alloyed with 2at% aluminum was fabricated via sputter deposition creating a columnar, highly twinned microstructure. Samples were deposited with twins parallel to the substrate and at an angle. Pillars were then milled from the material via a plasma Focused Ion Beam (pFIB). Finally, these pillars were compressed using a novel in-situ indenter at room temperature, -50°C, -100°C, and -150°C. The load-displacement measurements revealed no significant change in strength as a function of temperature. There was around a 15% decrease in strength in the tilted sample compared to the flat sample. Strain hardening increased as temperature decreased in the Cu-2Al alloy and was consistent between the two twin orientations. Comparing the load-displacement curves between the two samples reveals modulations in the tilted sample not present in the flat sample. The source of these modulations is revealed when observing the final microstructure as material bulges outwards from the pillars. In these bulges, significant microstructural evolution and detwinning is observed. In the flat sample, the deformation appears to be accommodated internally instead. The authors propose that shear stress on the twin plane in the tilted sample caused this detwinning softening the material thus resulting in the differences observed.

Special 3. Material Science and Engineering Graduate Students Symposium

A Poster

Plasma Modified Electrospun IR Reflective Coating for Thermal Regulative Textiles. RENJITH RAJAN PILLAI, University of Alabama at Birmingham; Kannatassen Appavoo, UAB; Claudiu Lungu, UAB; Vinoy Thomas, UAB UAB.

Section I (Biological Sciences) Papers: Thursday AM

A rapid increase in atmospheric temperature has been reported in recent years worldwide. The lack of proper aid to protect from exposure to the sun during working hours raised the number of sunburn cases among workers. It is important to promote productive workplaces without compromising safety and health concerns. In the present work, we report the low-temperature plasma (LTP) assisted tailoring of the surface properties of fabrics to reflect the IR radiation from the sun. The LTP technique can be adapted for thermally sensitive materials such as fabrics and textiles due to its lower working temperature range of 30 ˚C. We have modified commercially available fabric, regular, and boron nitride incorporated electrospun PET surfaces with TEOS plasma. TEOS plasma treatment can deposit reactive plasma-polymerized silane nanolayer on the surface of these substrates. The plasma-processed silane-nanolayer was systematically characterized using SEM, XPS, Keyence 3D-microscope, and TEM. From the SEM and TEM data, the size of nanoparticles was observed in the range of 100-200 nm. The IR reflection potential of the surface was analyzed using a thermal imaging system and the coating thickness was with the Keyence 3D-imaging. The data revealed that the plasma-modeled nano surface shows higher reflective potential toward IR rays, and it seems to be cooler than the unprocessed surface by approximately 15 ˚C. The stability and efficiency of the plasma-modified electrospun-nanolayer in water were satisfactorily examined with SEM and IR imaging. Taken together, these results suggest the excellent potential of this plasma processing to develop IR reflective coatings.

Special 5. Neuroscience

A Paper

Examining Neural Substrates of Emotion Processing: The Effect of Psychopathic Traits on Event-related Potential Independent Component Amplitude in College Students.

Emmy Ruff, University of South Alabama; Jack Shelley-Tremblay, University of South Alabama .

Section V (Social Sciences) Papers: Thursday AM,

This study investigated the neural substrates of emotional processing by use of human Event- related Potentials. To investigate the effect of self-reported personality traits on emotional processing as revealed by Event- Related Potentials (ERPs), each participant responded to a questionnaire and Lexical Decision Task with word stimuli from 5 major emotion categories. Forty-six participants were sorted into quartiles based on their Levenson Self-Report Psychopathy score (LSRP). Final participants were screened based on their scores and usable ERP data. A forty channel Lycra Quick Cap from ESI International using sintered Ag/AgC1 electrodes was worn by each participant and a forty Channel Neuroscan NuAmps amplifier recording at 500 Hz was employed. Subjects with the highest (n = 13) and lowest (n = 13) psychopathy scores were assigned to two groups. Behavioral, channel level, and cluster level data were analyzed. Statistically significant Late Positive Components were seen in independent components under cluster level results, as well in reaction and response times under behavioral results.

Special 5. Neuroscience

A Paper

Novel Case of Providencia rettgeri Osteomyelitis Presenting in the Frontal Bone: A Case Report. Sydney Grubb, Alabama College of Osteopathic Medicine; Keana-Kelley Swanner, Alabama College of Osteopathic Medicine; Carlos Cebollero, Tallahassee Memorial Hospital

.

Section IX (Health Sciences) Papers Thursday PM

Osteomyelitis of the skull is a particularly life-threatening condition. Infections are usually at the base of the skull, and typically occur following dissemination from another site, such as the external auditory canal. Typical organisms include Pseudomonas and Staphylococcus species. This paper demonstrates an unusual case of osteomyelitis of the frontoparietal bone, as well as the first published case of Providencia rettgeri causing cranial osteomyelitis in humans.

Special 5. Neuroscience

A Paper

Behavioral deficits in an aged Drosophila model of Alzheimer's disease respond to long-term ACE inhibition in a sex-specific manner.

Patricia Jumbo-Lucioni, Samford University; Amal Nasher, Samford University; Sameekshya Mainali, University of Alabama; Lori Coward, Samford University; Gregory Gorman, Samford University ; Stanislava Chtarbanova, University of Alabama; Jessica Hoffman, Augusta University.

Section IX (Health Sciences) Papers Thursday AM

Evidence arguing for a protective role of angiotensin-converting-enzyme inhibitors (ACEis) against Alzheimer's disease (AD) is inconsistent. Orthologues of human ACE are present in Drosophila melanogaster and the activity of the fly ACE, AnCE, is inhibited by the ACEi lisinopril. We have recently shown that treatment with 1mM lisinopril ameliorates physical and cognitive deficits in a young Drosophila AD model. Here, we tested the effect of long-term lisinopril treatment on the locomotion and cognitive deficits of an old fly AD model. We used a Drosophila line expressing the human amyloid precursor protein and the human ß-site APP-cleaving enzyme in neurons as AD model. Newly eclosed flies were supplemented or not with 1mM lisinopril for 30 days after which locomotion and memory were tested via negative geotaxis and an aversive phototaxic suppression assay, respectively. Fly heads were dissected to quantify brain neurodegeneration. Levels of tryptophan-derived metabolites and neuroinflammatory gene expression were measured in heads by LC/MS/MS and RT-qPCR, respectively. In this study, 1mM lisinopril significantly ameliorated locomotion deficits ($p=0.0320$) and decreased neurodegeneration in 30-days-old female flies ($p=0.002$) but not males, independent of genotype, compared to their untreated counterparts. Similarly, lisinopril mitigated memory deficits in 30-days old AD females but not males ($p=0.0214$). Our findings provide strong evidence that long-term ACE inhibition with lisinopril mitigates the age-associated behavioral deficits in our wild-type and fly AD model in a sex-specific manner. Differential activation of tryptophan metabolism and differential expression of neuroinflammatory genes in our fly AD model highlight potential new therapeutic targets of intervention.

Special 5. Neuroscience

A Poster

Transgenic model for Stochastic Expression in C. elegans Neurons. Jean-Pierre Arditi, University of South Alabama; Ryan Littlefield, University of South Alabama .

Section I (Biological Sciences) Papers: Friday AM

The nematode C. elegans is an excellent model organism for understanding neurobiology because it has a simplified nervous system of 302 neurons in the adult and an invariant network of connections. We used CRISPR-Cas9 gene editing and bicistronic tagging and severing (BiTS) to generate a novel transgenic strain (RSL111) that co-expresses GFP from the endogenous rab-3 gene. BiTS uses native trans-splicing pathways to enable transgene co-expression from endogenous promoters without modifying the endogenous protein product. In RSL111, GFP expression is visible through the entire nervous system similar to other strains that use exogenous rab-3 promoters to drive transgene expression. The GFP transgene in RSL111 also includes a high-efficiency CRISPR-Cas9 entry site (heCas9 site) that facilitates additional modification. In addition, the transgene sequence also encodes flanking inverted LoxP sites that will permit co-expression within stochastic subsets of neurons. This transgenic strain can help neurobiologists generate sophisticated neurodegenerative disease models and assist in functional mapping of behaviors.

Special 5. Neuroscience

A Poster

An Analysis of Cognitive Aging in Drosophila melanogaster. Julia Spruiell, Samford University; Katelynn Corder, Samford University .

Section I (Biological Sciences) Papers: Thursday AM

By 2050, the population of Americans over the age of 65 is projected to double by the year 2050. While diagnoses of dementia and mild cognitive impairment are relatively common, more subtle, normal age-related cognitive impairment may affect daily living in the aging population. It is important to understand this process both to improve the daily lives of those affected, but to also help distinguish these impairments from disease states. These age-related changes in cognition are not unique to humas. In order to gain a better understanding of this process, we seek to develop a behavioral profile model in the wild-type fruit fly, Drosophila melanogaster. Given that aging is generally characterized by impaired learning and memory in addition to motor deficits, we use both negative geotaxis assay and the aversive phototaxis suppression assay to assess changes in cognitive behavior across the lifespan.

Special 5. Neuroscience

A Poster

Oral Supplementation With 1,2,3,4,6-Penta-O-Galloyl-β-D-Glucose Confers Locomotion Advantages in a Drosophila melanogaster Model of Alzheimer's Disease. Ezaldean Kahil, Samford University; Anisha Jackson, Samford University McWhorter School of Pharmacy; Patricia Jumbo-Lucioni, Samford University McWhorter School of Pharmacy No.

Section I (Biological Sciences) Papers: Thursday AM

Alzheimer's Disease (AD) is the seventh leading cause of death for all adults in the United States. This neurodegenerative disorder, characterized by increased neuroinflammation and oxidative stress, leads to a progressive decline in mobility and cognitive functions. Despite extensive efforts, efficacious therapy remains elusive. In vitro studies have provided evidence that 1,2,3,4,6-Penta-O-Galloyl-β-D-Glucose (β-PGG), a hydrolysable tannin, increases oxidative stress tolerance, reduces inflammation, and has neuroprotective properties. In vivo evidence is limited. This study aimed to demonstrate that β-PGG supplementation preserves physical function in a Drosophila melanogaster model of AD. We used a Drosophila line overexpressing the human amyloid precursor protein and the human ß-site APP-cleaving enzyme in neurons as AD model. Newly eclosed flies were supplemented or not with 10μM β-PGG. Locomotion was tested via a negative geotaxis assay at 7, 14, 21, and 30 days. The number of flies passing a 2, 4, and 8-cm mark in 10 seconds was recorded by sex, genotype, and treatment. Compared to untreated cohorts, β-PGG supplementation significantly improved locomotion of AD-flies at 7 (0.44±0.03 vs. 0.70±0.03, $p<0.0001$) and 14 days (0.24±0.03 vs. 0.46±0.03, $p<0.0001$), regardless of sex. β-PGG-supplemented males, regardless of genotype, were significantly movement impaired at 21 days compared to unsupplemented males. We continued supplementation for 30 days only in females and found that a higher proportion of β-PGG-supplemented females passed the 2- ($p=0.0193$) and 4-cm ($p=0.0147$) marks independent of genotype. Our findings provide strong evidence that β-PGG supplementation preserves physical function in our pre-clinical AD model in an age-specific manner.

Special 5. Neuroscience

A Poster

Deciphering The Reality Behind CBD Supplementation In A Pre-clinical Model Of Alzheimer's Disease.

Vishva Patel, Samford University; Mason Snell, McWhorter School of Pharmacy, Samford University; Lori Coward, McWhorter School of Pharmacy, Samford University; Gregory Gorman, McWhorter School of Pharmacy, Samford University; Patricia Jumbo-Lucioni, McWhorter School of Pharmacy, Samford University; University of Alabama at Birmingham McWhorter School of Pharmacy.

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Recently, hemp-derived CBD has gained substantial popularity as a treatment for various disorders, including Alzheimer's disease (AD), but the evidence is lacking. Our lab has previously shown that CBD supplementation worsens locomotion in a male Drosophila melanogaster model of AD. This project aimed to assess the dose-dependent effect of hemp-derived CBD on the physical function of a female Drosophila model of AD. A fly model overexpressing the human amyloid precursor protein and the β-site APP-cleaving enzyme in neurons was used as AD model. Females were randomized to receive four 24-hour doses of 0, 0.2, 0.4 and 2 mg/ml oral CBD oil in 5% sucrose over 14 days. Food intake was recorded and locomotion was tested via a negative geotaxis assay. CBD metabolites, 7-OH-CBD and 7-COOH-CBD, were measured in whole flies by LC/MS/MS. Regardless of genotype, the average food intake was significantly affected by CBD supplementation ($p=0.0206$). Control and AD flies fed 0.2 mg/ml CBD ate significantly less than those fed sucrose alone ($p=0.0109$). Controls treated with 0.2 mg/ml CBD were significantly movement impaired compared to controls fed sucrose ($p=0.055$), 2 mg/ml ($p=0.0004$) and 0.4 mg/ml CBD ($p=0.0108$). Climbing in AD females worsened when treated with 0.2 mg/ml CBD compared to their sucrose-fed counterparts. We detected all the CBD metabolites in females, but levels were indistinguishable between genotypes. Our preliminary findings do not support the use of hemp-derived CBD to treat AD. Our findings indicate that CBD is bioavailable in flies, which underscores the translational potential of our model system.

Special 5. Neuroscience

A Poster

Skull Lesions in Student Cadaveric Dissections.

Sharyl Payne, Samford University; Mark Caulkins, Samford University; Nicholas Washmuth, Samford University; Will Scogin, Samford University; Heather Hallman, Samford University .

Section IX (Health Sciences) Papers Posters: Thursday AM, PM

Cadaveric dissection has long been a part of the education and training for students in medicine. It allows appreciation of the three-dimensional structure and different textures of the human body. One of the advantages of cadaveric dissection is the anomalies found in every cadaver.

We present lesions found in skulls of cadavers dissected in the Samford University Cadaver Lab.

V. SOCIAL SCIENCES

A Paper

Does Cellphone Banking Change Lives? Fintech, Poverty, and Remittances in Kenya. Derick Adu, Auburn University; Valentina Hartarska, Auburn .

Section V (Social Sciences) Papers: Thursday AM,

Fintech is transforming financial markets in both developed and developing countries by opening up opportunities for people with limited access to traditional financial services. While some researchers are pessimistic about Fintech, others have likened its potential impact to that of the industrial revolution. Yet few studies offer evidence of a causal effect. We estimate the causal impact of Fintech on poverty and remittances in Kenya. We use data for the period from 2000-2017 and use the synthetic control method as well as multiple robustness checks. Specifically, we evaluate the effect of the introduction of M-Shwari that is a widely used, cellphone-based, fully-digital account created through collaboration between the Commercial Bank of Africa and Safaricom Plc. The results show that the use of M-Shwari reduces the per capita poverty ratio by an annual average of 5.5% and increases the inflows of annual remittances into Kenya by about 24%.

V. SOCIAL SCIENCES

A Poster

Descriptive Representation in State Legislatures: Exploring the Educational Backgrounds of State Representatives and Senators. Skylar Dykes, University of South Alabama .

Section V (Social Sciences) Posters: Thursday AM

This project will investigate the influence of descriptive representation as it pertains to efficacy in a democratic system. It is possible that policy outputs are heavily dependent upon motivations of an elected official, even more so than the anticipated or predictable effects of an ideological stance. We expect that, following the juxtaposition of a state legislator's voting records with his or her biographical data, these claims will be supported by data related to higher education and its funding allocations. We are especially interested in the specific relationship between the educational background of state legislators, and whether or not a correlation exists with regard to their respective legislature's spending on higher education. This research question will also prove to involve measures of professionalization for state representatives and senators. Such a dichotomy is essential to effective representation of a legislator's constituency, seeing as legislatures with higher professionalization scores are equipped with better resources. However, the attainment of a bachelor's degree is much more accessible at public institutions for most Americans.

V. SOCIAL SCIENCES

A Poster

A confirmatory factor analysis of the Broad Autism Phenotype Questionnaire.

Hayley Mullinax, University of South Alabama; Ryan Haik, University of South Alabama; Devin Dickinson, University of South Alabama; Lisa Turner, University of South Alabama .

Section I (Biological Sciences) Papers: Thursday AM

The broad autism phenotype (BAP) refers to a cluster of psychological characteristics associated with autism spectrum disorder, which vary along a continuum in the typical population (Landry & Chouinard, 2016). The broad autism phenotype questionnaire (BAPQ) was designed to measure personality and language characteristics that define features of the BAP, such as social personality, rigid personality, and pragmatic language deficits, in first degree relatives of individuals with autism (Hurley et al., 2007). We wanted to identify if the traditional 3-factor structure of the BAPQ holds for neurotypical populations. Our sample included 319 neurotypical undergraduate students (74.7% female, 66.4% white). A confirmatory factor analysis was performed to identify whether the three subscales of the BAPQ (aloofness, pragmatic language, rigidity) are adequately measured by their items. Using guidance from Hu and Bentler (1999) and Kline (2016) regarding acceptable levels of fit for structural equation modeling procedures, results of the factor analysis indicated poor fit of the 3-factor model, $\chi 2 = (525) = 1278.54$, $p < .001$, CFI = .794, TLI = .753, RMSEA = .067 (90% CI = .062, .072), SRMR = .057. Additionally, two items (7 and 15) did not load significantly onto any factor, and only items 34 and 8 loaded significantly onto factor 3; however, item 8 loaded more strongly, and positively, onto factor 2. Our findings yield preliminary evidence against the traditional 3-factor model of the BAPQ. Because of its popularity with undergraduate samples, it will be important for future research to explore if different factor structures may better suit these types of populations.

V. SOCIAL SCIENCES

A Poster

Testing the Interpersonal Theory of Suicide. Boriana Lassiter, University of South Alabama; Jack Shelley-Tremblay, University of South Alabama

.

Section V (Social Sciences) Posters: Thursday AM

Suicide poses a significant public health problem. Even the strongest risk factors are weak predictors of future suicidal behaviors. This may be due to risk factors having failed to meaningfully differentiate between suicide ideation and attempt. The Interpersonal Theory of Suicide (IPTS; Joiner, 2005) posits that for suicidal desire to progress from ideation to attempt, one must acquire the capability to make a suicide attempt. Suicide capability (SC) is characterized by greater pain tolerance (PT) and fearlessness about death (FAD) such that the suicide is no longer perceived as alarming. We sought to test the construct validity of the IPTS by examining whether objectively measured PT and self-report measures of SC would differentiate those with and without a history of suicide attempt.

Data collection is in progress. Five SC self-report measures will be used to assess suicide capability. Pain tolerance will be measured using a pressure pain algometer. Suicidal history will be obtained using the SBQ-R. Using MANOVA, mean differences comparing suicide history groups (attempters, ideators, controls) will be obtained on SC self-report measures and PT. The ability of SC and PT to predict suicide attempt history will be tested via logistic regression. We predict that suicide attempters will have higher pain tolerances and score higher on all suicide capability measures than ideators and controls. Results may provide support for the relation between pain sensitivity and capability for suicide. Results may also show that pain sensitivity can be used as one method of assessing suicide risk.

VI. ANTHROPOLOGY

A Paper

Recognizing an Artificial Collection Bias in the Sterkfontein Cercopithecoid Sample. Jason Heaton, Birmingham-Southern College

.

Section I (Biological Sciences) Papers: Thursday AM

Fossil Cercopithecoids, or Old World monkeys, have received renewed interest as potential biochronology indicators. At sites with a long excavation history, it is simplistic to assume that the deposits represent a homogenous sample. Beyond the typical taphonomic variables, one must consider humans' role in their collection. This analysis examined four samples of cercopithecoid remains (n = 3141) from Sterkfontein (South Africa), representing 89 years of excavation. A comparison of pre-and post-1966 fossil collections revealed a strong predominance of cranial specimens in the earlier collections, with a ratio of 20:1 (crania: postcrania). A chi-square test for independence was computed to determine whether skeletal element preservation (crania, postcrania, isolated teeth) is independent of collection (SP, Sts, SWP, Member 2). The results were significant, $\chi 2(6) = 522.12$, $p < 0.001$. Therefore, the null hypothesis that preservation is the same across the Sterkfontein collections (pre- and post-1966) is rejected. Moreover, the presence of large-bodied Papio species in Sterkfontein Member 4 results from this artificial bias or, in some cases, misidentifications. Future taxonomic and biostratigraphical studies must account for this discrepancy and control for provenance attribution.

VI. ANTHROPOLOGY

A Paper

Primates, Pets, and Perceptions: Refining descriptions of captive primates to improve conservation outcomes. Sherrie Alexander, University of Alabama at Birmingham .

Section VI (Anthropology) Papers: Friday AM

Keeping a wide variety of non-domesticated animals as pets has been accepted practice across numerous past and present human cultures. Because this activity is not limited to any one class or culture, pet keeping is often conflated with other, more utilitarian uses of wild animals, including nonhuman primates. Moreover, there is a substantial trade in pet primates, both legal and illegal, and wild primates may be extracted in unsustainable numbers. In the case of primates considered as pets, descriptions used by primatologists and anthropologists vary widely. As a result, we argue that each cultural context, and more importantly, intended use, should be considered. To explore this range of uses and descriptions, we searched anthropology and primatology publications presenting a range of circumstances in which wild primates are kept or utilized outside of institutions. We then categorize these descriptions and suggest ways to define primate uses in a more contextually accurate manner. Differentiating such uses is an important step when considering the human dimension of conservation. Consistent and highly contextual descriptions would also distinguish important cultural practices requiring nuanced conservation approaches.

VI. ANTHROPOLOGY

A Paper

Rituals of Reconciliation: The Use of Peaceful Interactions to Repair Relationships. Renee Gainer, Alabama A&M University .

Section VI (Anthropology) Papers: Friday AM

Reconciliation is the process by which social animals maintain valuable social relationships. It has been documented in many species including humans and nonhuman

primates. While evidence of rituals has been seen in other species, the primary aim of this research is to explore how ritual behaviors are interconnected to human acts of reconciliation. Rituals are habitual activities closely linked to important events and reaffirm the identity of those who practice them as a group or a society. They are found in every society, culture and religion. In this study, rituals specifically related to reconciliation were exhibited in 27 of 138 coded preindustrial societies, all of which practice some form of reconciliation. The sample was taken from Murdock and

White's Standard Cross Cultural Sample of 186 societies. These rituals were identified as belonging to three specific types of relationships: spousal, interpersonal, and intergroup. Although the total number of societies with rituals of reconciliation constitute a small percentage of the societies known to practice reconciliation, an emphasis on rituals might provide insight into the necessary components of reconciliation in time and space. Thus, this research may shed light on the integral role of ritualized behavior in the maintenance and repair of valuable human relations.

VII. STEM EDUCATION

A Paper

Transition of a Hybrid Course-based Undergraduate Research Experience (CURE): Lessons from the GENE-CURE.

Ashley Turner, Jacksonville State University; Natalie Forte, Jacksonville State University; Virginia Veasey, University of Alabama at Birmingham; Bethany Christie, Jacksonville State University; Amira Carter, Jacksonville State University ; Marli Hanks, Jacksonville State University; Alan Holderfield, Jacksonville State University.

Section VII (STEM Education) Papers: Thursday PM

With the intent to engage students in research and explore disease biology utilizing the nematode Caenorhabditis elegans model, we developed a semester-long course-based undergraduate research experience (CURE) in a hybrid (online/in-person) learning environment, the gene-editing and evolutionary nematode exploration (GENE) CURE or GENE-CURE. Using a combination of bioinformatics and molecular genetic tools, students performed structure-function analysis of disease-associated variants of unknown clinical significance (VUS) in human orthologs. With the aid of a series of workshop-style research sessions, students worked in teams to identify a conserved VUS and design and test a PCR-based assay for targeted editing of a gene in the nematode. The GENE-CURE was first designed and offered during fall 2020 at the height of the pandemic as a hybrid synchronous course. Over the following semesters, the course transitioned from hybrid synchronous to in-person. Self-reflections were collected from students to assess engagement, science identity, and science efficacy. Qualitative analysis of these reflections indicated several gains suggesting that all students found many aspects of the GENE-CURE rewarding (learning process of research, self-confidence in research and science identity, personal interest) and challenging (iterative research and failure, time management, COVID-19 pandemic, and life situations). CUREs can be designed, adapted, and implemented to provide flexibility in hybrid learning to meet the evolving demands and needs of students and instructors.

VII. STEM EDUCATION

A Paper

Expert-Led Module Improves Non-STEM Undergraduate Perception of and Willingness to Receive COVID-19 Vaccines.

Christina Morra, University of Alabama at Birmingham; Sarah J. Adkins-Jablonky, 3Alabama College of Osteopathic Medicine; M. Elizabeth Barnes, Middle Tennessee State University; Obadiah J. Pirlo, University of Alabama at Birmingham; Sloan E. Almehmi, University of Alabama at Birmingham ; Bianca J. Convers, University of Alabama at Birmingham; Samiksha A. Raut, University of Alabama at Birmingham.

Section VII (STEM Education) Papers: Thursday PM

As evidence mounted that existing prevention methods would be insufficient to end the COVID-19 pandemic, it became clear that vaccines would be critical to achieve and maintain reduced rates of infection. However, vaccine-hesitant sentiments have become widespread, particularly in populations with lower scientific literacy. The non-STEM majors represent one population with the potential for minimal intervention to result in impactful improvements in scientific literacy. Here, two concurrent non-major biology courses (N = 98) in Spring 2021 completed Likert questionnaires with open-ended questions prior to and after an expert-led Vaccine Awareness educational intervention addressing vaccine-related concerns. In the module, experts gave presentations about COVID-19 related to microbiology, epidemiological factors, and professional experiences relating to COVID-19. Ten students agreed to participate in post-semester one-on-one interviews. Student interviews revealed that students perceived guest lecturers as providing more information and assurance. Questionnaire data showed an increase in student willingness to accept a COVID-19 vaccine as well as increased student perception of the COVID-19 vaccines as both safe and effective. However, the questionnaire data revealed 10 of 98 students remained vaccine-resistant, and these students expressed insufficient research and side effects as leading vaccination concerns. Overall, we show expert-led modules can be effective in increasing non-STEM majors willingness to accept COVID-19 vaccines. Future research should explore the experiences of non-majors and guest lectures, particularly as they relate to vaccination and vaccine concerns.

VII. STEM EDUCATION

A Paper

Teaching About Light Pollution: Curriculum by a Southeast Collaboration.

Michelle Wooten, University of Alabama at Birmingham; Mel Blake, University of North Alabama; Tom English, Guilford Technical Community College .

Section VII (STEM Education) Papers: Thursday PM

Light pollution is defined as artificial light that alters the nighttime landscape from natural sources of light, such as starlight and moonlight. The experience of artificial light at night negatively impacts all species studied, and also our natural heritage: being able to see the beauty of the night sky and the Milky Way. To mitigate the impact light pollution, lighting engineers have designed lighting that promotes safety and is also dark-sky friendly. Five astronomy faculty members from across the Southeast share example light pollution curricula that can be used in astronomy, environmental studies, public health, and engineering courses. These curricula contain exercises and research studies that can be enacted in both small in-person classes and large, asynchronous online courses.

VII. STEM EDUCATION

A Paper

“EmpowHER”-ing the next generation of girls in STEM. Cara Brittain, Auburn University; Jessica Gilpin, ; Mary Lou Ewald, .

Section VII (STEM Education) Papers: Thursday PM

Hearing about the scientific process from scientists in addition to hands on learning inspires students to pursue STEM careers. Particularly for students in underrepresented groups, learning from mentors with whom they can identify is imperative. For three years, the Auburn University’s College of Science and Mathematics (COSAM) STEM Outreach Center has held EmpowHER, a mini-conference for middle and high school girls and their teachers, with the aim of encouraging these students and building their STEM confidence and identity. We found that 80.8% of survey responders identified listening and talking to women in STEM (30.4%), learning something new (30.4%), and participating in hands on activities (20%) as important factors in maintaining or increasing their interest and confidence in pursuing STEM majors in college. We propose EmpowHER as a model that can be applied at other colleges and universities to increase participation of underrepresented groups in STEM.

VII. STEM EDUCATION

A Paper

STEM in Elementary Education. Ellie Lunsford, Samford University .

Section VII (STEM Education) Papers: Thursday PM

Elementary school is a pivotal moment for children to learn about STEM education. STEM stands for science, technology, engineering, and mathematics. Today, technology is becoming more and more dominant in schools throughout the nation. We see technology being used daily in the class to convey lessons, activities, audiobooks, and more. Technology also can enhance science education. STEM education can also be used in social studies, English language arts, and more (Ashley Chiu, 2015). The early years in students are vital for teaching STEM and learning about STEM concepts. It is also important to note that all teachers can participate in teaching STEM education in the elementary schools. STEM is not a limited concept. This leads to the concept of collaboration through STEM. STEM is also hands-on learning. STEM involves projects, experiments, simulations and so much more. Students can visualize their learning. Based off research, robotics is another way that teachers can incorporate STEM education into elementary schools. Robotics has been proven to help students excel in the field of science, and not as much in the mathematics field (Ahmad Khanlari, 2015). STEM education is overall more effective If it begins in early childhood; therefore, it is so important that schools make it a priority to ingrain the idea of STEM into their classrooms from the get-go. Students' brains are still growing at the elementary age; therefore they are able to overall maintain the information well. When students learn STEM early on, they are prepared for what is to come in middle school and high school. Overall, based off research, STEM education is more effective if teachers and schools begin teaching it at the elementary school level. In this session I will share why STEM education is important in the elementary classroom.

VII. STEM EDUCATION

A Paper

Benefits of STEM Education. Hannah Pulley, Samford University; Gracie Patterson, Samford University .

Section VII (STEM Education) Papers: Thursday PM

STEM in the classroom not only promotes critical thinking but also encourages students to become lifelong learners and thinkers. We believe STEM is a very important and resourceful form of education that promotes curiosity, engagement, and communication in students (The Benefits of STEM Education for Children, n.d.). The skills taught in STEM education are very beneficial to students because it challenges them to be innovative starting at a young age. Students in the elementary classroom should be given the opportunity to think and reason in their own brain. Beginning to expose students to STEM at a young age is an important aspect of teaching them to critically think. It also prepares them to be successful in their future careers, regardless of what career they one day choose. Teachers must understand that the future of the workforce is sitting in their classrooms daily. Future world changers are the students who walk the halls of their school. Therefore, teachers must prepare their students to critically think through STEM. STEM education also builds character in students. It teaches students to be adaptable and resilient problem solvers. Students must figure out a way to solve problems and create solutions that make sense and are feasible. When participating in STEM experiments, students must create a plan to follow and adapt if that plan does not work. This fosters creativity as well as communication with whoever the student is working with. Students build social and critical skills that last a lifetime. STEM is an important aspect of the elementary classroom that should be studied and discussed. We would like to create a poster on the benefits of STEM education for students in the elementary school classroom due to the benefits that research shows.

The Benefits of STEM Education for Children. (n.d.). Www.invent.org. https://www.invent.org/blog/trends-stem/value-stem-education#:~:text=Skills%20Derived%20from%20STEM%20Education&text=Other%20skills%20attained%20through%20STEM.

VII. STEM EDUCATION

A Paper

The Indispensable Need For Introducing STEM in Early Education.

Rileigh Dietter, Samford University .

Section VII (STEM Education) Papers: Thursday PM

The Indispensable Need For Introducing STEM in Early Education

STEM education benefits students greatly as it challenges them to think critically and participate in hands-on activities. Although notable challenges and barriers exist to implementation, integrating STEM education would set students up for the highest probability of success after graduation. According to JD Chesloff, “Young children are natural-born scientists and engineers. Research has shown that high-quality pre-K cuts the rate of children being held back a grade in half; decreases juvenile arrests by a third; and increases high school attendance by a third, college attendance by a whopping 80 percent, and employment by 23 percent.” (Chesloff, 2013) The integration of STEM education allows for a high-quality education that would serve early students as they would thrive and see lasting benefits as their education continues. McClure and colleagues (2017) discuss that “Studies are pointing to the importance of STEM for children’s success in school and in their ability to attain good jobs as adults. A 2016 study, for example, examined learning experiences in more than 7,750 children from kindergarten entry to the end of eighth grade and found that early acquisition of knowledge about the world was correlated with later science success.” (Mcclure et al., 2017, p. 11) There is an undeniable need for the integration of STEM in early grades in elementary schools. The integration would set students up for success and allow the workforce to thrive. This session/poster will argue for the indispensable need for introducing STEM in early education.

Mcclure, Elisabeth, et al. The Joan Ganz Cooney Center at Sesame Workshop New America Grounding Science, Technology, Engineering, and Math Education in Early Childhood STEM Starts Early. https://files.eric.ed.gov/fulltext/ED574402.pdf

Chesloff, JD. “STEM Education Must Start in Early Childhood.” Education Week, 5 May 2013, https://d1wqtxts1xzle7.cloudfront.net/72533316/1303_EdWeek_STEMEarlyChildhood-libre.pdf?1634226389=&response-content-disposition=inline%3B+filename%3DScenario_based_elearning_and_stem_educat.pdf&Expires=1674260329&Signature=Grg4kxZpOaR3VgNEsrZoSBUHwN2DnAijQDeiKVV8J5YQF8Nc6uS6WZecCbWAL7VXzwuYZKGgzBZB5Q8tZQzNAbJRXmLIn6UWioaMSVs2MHawJ8or1o6JWgx2lzxF7jCxTydTvrJ9eSESye0oOWJEwaxx3pD2e9mCXAAF7ViHbuUj2dzbw6Miqm0CHY63nmzyDdcuI9B2w6TKckWbqkmZOWL5sSbAd58B9C-

gcNrm8FQY0otDmWpSYgp2kzYbR0ClYWpmCuytW1IHHcG02paQl7~uiDvUcRFgVvDkTtnz1zuc~ayf2fVtKy
HHBSf-3zZiAT2Tz5tSelw~ak41P8GQ0g__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA

VII. STEM EDUCATION

A Paper

Playing with STEM. Maggie Johnson, Samford University .

Section VII (STEM Education) Papers: Thursday PM

Since education began teachers are always looking for ways to improve student learning. One of the more recent tactics towards improving student learning has been through STEM or STEAM education. Recent research has found that STEM is a form of education that is beginning to take the stage because it is an area that many students are only mediocre at. Allowing this education allows for more students to become reengaged in science, technology, engineering, and mathematics (Adams et al. 2014). Additionally, improvements have been found in allowing students to learn through play. Research indicates that play scaffolds student learning and allows students to connect more content. (Hedges, 2019) If we know these two things to be true, combining play and STEM allows for effective teaching and learning where students are able to learn more complex topics through investigation and play. (Marisel et al. 2014) Students through STEM and play begin to engage in curiosity of the world and how to solve problems that are in our modern world. Additionally, students become involved in more problem based learning as well as cooperative learning to build plentiful skills for their future. In this presentation I will discuss the benefits of teachers allowing students to play through STEAM as well as the profits that students receive from this education.

VII. STEM EDUCATION

A Paper

Development of an on-line general chemistry course for high school and undergraduate classes. Brian Burnes, Mississippi University for Women.

Section VII (STEM Education) Papers: Thursday PM

The Coronavirus Aid, Relief, and Economic Security Act, also known as the CARES Act, is a $2.2 trillion economic stimulus bill passed by the 116th U.S. Congress and signed into law by President Donald Trump on March 27, 2020, in response to the economic fallout of the COVID disease. In early 2021, the Mississippi State University Research and Curriculum Unit used CARES funds to implement the CARES Online High School Course Project. The CARES courses were designed by award-winning teachers in Mississippi and are freely available online courses covering almost the entire high school curriculum. The details of the 2-semester General Chemistry course are shown with demonstrations of activities and suggestions for how the course can be used int any high school or undergraduate class in Mississippi.

VII. STEM EDUCATION

A Paper

Using Themes to Teach General Biology to Non Science Majors in an Engaging Format with Improved Student Outcomes. Diann Jordan, Alabama State University .

Section VII (STEM Education) Papers: Thursday PM

Theme-based teaching and online teaching were utilized at Alabama State University to keep students engaged in the learning process during and after the COVID pandemic. It was beneficial to explore new strategies of teaching and to improve existing strategies for students during these challenging times. The COVID-19 Pandemic has forced educators to become more innovative in providing learning opportunities on every level of matriculation. The effectiveness of a less lecture approach and developing a strong pedagogy to connect students around academic concepts proved successful during and after COVID pandemic. The first theme course, Biology 127, course was built around 3 major themes: Cancer, Energy Drinks and Sickle Cell. Students used writing modes like case studies, journal writing, storytelling to understand concepts. The second theme course was biology 128, the 2nd part of the general biology survey course. Students in Biology 128 used five main themes: Evolution, Energy Drinks, Fitness Trackers, Influenza and COVID-19. The writing modes became the major assessment instrument instead of the traditional exams. Initial results indicate that students prefer this method of teaching, if they were given ample time to write and clear instructions. Regardless of the biology 127 or 128 classes, students appreciated that less emphasis on the exam and less lecturing and more on the learning process improved their overall experience. Biology 128 was selected as the most effective class for this teaching approach. Students in the first biology 128 theme trial, grades were dramatically improved with 70% of the students passing the class with an A and 20% with a B. The only student who failed the class did not attend the class in person or virtually. As the instructor, teaching became a more enjoyable and rewarding experience. Whether in-class or online, the theme approach with engaging writing assignments worked well in general biology 128 class with improved learning outcomes for students.

VII. STEM EDUCATION

A Poster

Importance of STEM Education. Betsy Walker, Samford University; Bailey Rogers, Samford University .

Section VII (STEM Education) Posters: Thursday PM

In schools today, the importance of STEM education is growing into a popular topic of discussion when thinking about how to develop students at the early childhood level. Typically, STEM is not incorporated in the early childhood classroom, but teachers are discovering the necessity of leading STEM discussions in these classrooms because of the foundational benefits this kind of education has on early childhood students. Developing inquiring skills through STEM education has proven to be beneficial in early childhood classrooms because students are learning important observation skills at a young age and these skills will serve them throughout the entirety of their education (MacDonald et al., 2021). STEM allows students to engage with meaningful but challenging problem-solving situations that can lead to the application of higher levels of cognitive reasoning. STEM provides a meaningful, practical, active and authentic shared learning experience. Students also develop important decision-making skills through STEM experiences (Elfrida Yanty Siregar et al., 2019). Through STEM education, young students will learn skills that will serve them throughout their entire educational career. In this session we will discuss the purpose of STEM in education and examples of how to implement it in the classroom.

VII. STEM EDUCATION

A Poster

STEM through Play. Margaret Ann Sanders, Samford University .

Section VII (STEM Education) Posters: Thursday PM

With more jobs centered around technology and engineering, STEM education is becoming more important and relevant in K-12 education. Research from Binghamton University in New York notes that students need proper experience with science, technology, engineering, and math, as many jobs in the workforce pertain to these subject matters (Simpson, 2023). Although students need experience in STEM, oftentimes the traditional elementary classroom setup leaves little room for STEM education. One way to combat the lack of STEM education and incorporate STEM in the classroom is through play. The Journal of International Research and Development finds that teachers can help young students become engaged through STEM through a play-based teaching model (Stephenson, 2021). Teachers can incorporate engineering through allowing students to play with building materials, they can incorporate science through age appropriate experiments, and they can incorporate technology through various types of media. Many teachers have STEM buckets in which students spend the first ten to twenty minutes of the day building with materials in the STEM bucket. Many teachers also incorporate technology by teaching how to use QR codes, read books online, and upload work online. Through play-based teaching, STEM education can thrive in the early education classrooms, leading children to be more prepared and equipped to take STEM based jobs in the future workforce. In this session, I will share how teachers can incorporate STEM into their classroom through play.

VII. STEM EDUCATION

A Poster

Women in Stem. Anna Beaudry, Samford University; Grace Davis, Samford University; Haley Galbreath, Samford University .

Section VII (STEM Education) Posters: Thursday PM

STEM has been viewed as a concept strictly left to males. Only, as time has progressed, they have found that women can be just as successful in these areas as men. Tandrayen-Ragoobour and Gokulsing (2022) express that young women often choose STEM degrees over their male counterparts, when provided with the amount of support necessary. The key is that the necessary support is provided for women, especially given the significant challenges in the STEM workplace in comparison to men. Even so, there continues to be pioneer women in STEM and continue to pave the way for young women who dream of one day working in the field. The same persistence required in the classroom is what is exhibited on another level within these women as they purely rely on their own internal motivation and/or commitment (Blackburn 2017). This poster will dive deeper into the lives of 2 women in STEM, Barabara Askins and Carolyn R. Bertozzi, and their major achievements.

VII. STEM EDUCATION

A Poster

Stem in Early Childhood Education. Caroline Thompson, Samford University .

Section VII (STEM Education) Posters: Thursday PM

The power of play is crucial in the early years of education, and at a young age, students are curious and ask why questions. So what better time to add Steam activities than during the child's peak years of curiosity? "It is imperative that science education begins early, as society is experiencing rapid, groundbreaking changes." (Vartianinen p.56, 2021). In this ever-changing world that we live in, children need to change with it, and through the introduction of science, we can teach our students to find curiosity throughout the world and investigate it. With early childhood education, play is a crucial part of a child's development, and as a future educator incorporating steam into a child's play is essential. According to Tracy Hunter- Doniger, "Because no career choice or discipline is completely isolated or siloed, the interdependence among the STEAM subjects mirrors real-life scenarios" (Hunter- Doniger p. 22, 2021). Through Steam play in early childhood education, students receive those first opportunities to interact with science and technology and can be immersed in a possible job in the future. Some beginning ways that teachers can work steam in is through role play and hands-on activities such as playing a scientist who investigates. However, as facilitators, we must direct our students and teach them to look for these items in the world and go off their interests and curiosity. In this session, we will focus on and discuss more ways to integrate stem into your classroom.

VII. STEM EDUCATION

A Poster

STEM in Early Childhood Education. Marigrace Dunn, Samford University .

Section I (Biological Sciences) Papers: Thursday AM

STEM education is a vital aspect of early childhood because it prepares young scholars for the challenges they will one day face, challenges that we do not know exist yet. So we must instill inquiry, resilience, and creativity in their thinking processes. STEM education aims to cultivate the skills students need to succeed in an ever-changing world, and why should young students be left out of this opportunity? Many say behavior, lack of content knowledge, or lack of skills prevent young students from inclusion in STEM opportunities. However, STEM provides the opportunity for students to grow in these areas. In a 2016 study it was found that early knowledge of science predicted student success for many years (McClure et. al. 2017). Because of this, and the increasing emphasis on science in the workforce today, early childhood educators should see the utmost importance of including STEM education. STEM in early childhood often looks like play, but it is expertly planned to develop early thinking and reasoning skills, skills that are essential in the 21st century. Many teachers do not feel prepared to provide STEM learning opportunities, thus, more professional learning for early childhood educators in STEM is needed (Campbel and Speldewinde 2022). Early childhood STEM activities can be as simple as a shape hunt through the classroom, or as complex as investigating insulation materials. Through my poster, I will explain the necessity of early childhood STEM education and provide practical ways that it can be incorporated in the classroom.

VII. STEM EDUCATION

A Poster

STEM Cafe'. Lindsey Brewer, Samford University; Meera Money, .

Section VII (STEM Education) Posters: Thursday PM

As STEM education is a current hot topic in the educational community, teachers and administrators are constantly looking for new ways to effectively integrate STEM into the general education classroom. As technology in society continues to evolve, schools are preparing students for jobs that do not currently exist in the field. Because new problems and solutions arise every day in STEM, creativity is understood to be crucial to success in the field (Han, 2021). In elementary schools, students' curiosity must be piqued in these topics in order to boost motivation and creativity. Science cafes have been utilized as an affordable and effective method of exposing students to a variety of STEM topics in the field today (Bazilio, 2016). These cafes can be used in two avenues for the advancement of STEM in schools: community-based and student-based. In community-based science cafes, members of the community come into the school and provide interactive, engaging STEM presentations. Each presentation will have a separate STEM activity that will appeal to various branches of STEM, so more students are likely to discover an interest. Students can walk around the cafe and choose presentations to look at and engage with, earning stamps on a ticket they must present to their teacher at the end of the café experience. The second avenue for this STEM opportunity is student-based, in which upper elementary or higher students can create a presentation for a science cafe where lower elementary classes walk around. Through light refreshments or door prizes, the event can be made even more special (Bazilio, 2016), and it can become a great community-building opportunity for a school or district. In this session we will present a creative form display that can be used to encourage student interest in STEM.

References:

Bazilio, A., Ryan, A., & Welborn, J. (2016). Science cafes: an affordable, easy-to-implement model that introduces young girls to STEM-related topics, careers, and role models. Science Scope, 40(3), 14+.

Han, J., Park, D., Hua, M., & Childs, P. R. N. (2022). Is group work benefcial for producing creative designs in STEM design education? International Journal of Technology and Design Education, 32(5), 2801-2826.

VII. STEM EDUCATION

A Poster

STEM in SPED. Hallie Mullen, Samford University; Caroline Bechtold, Samford University .

Section VII (STEM Education) Papers: Thursday PM

Caroline Bechtold and Hallie Mullen

STEM in SPED

In a world where we are constantly improving and growing in STEM fields, it is important for all students to be prepared by having inclusive STEM education in schools. STEM is an important part of all student's education- disabilities or not. All students deserve a quality and comprehensive education and STEM is a part of that. Incorporating STEM in Special Education classrooms can encourage creative learning and help them achieve their individual educational goals. Projects that are STEM based can also be very beneficial to students that have special learning and development needs. Hands-on activities and projects encourage collaboration in the classroom, cooperation between classmates, and the life skill of working hard. (Fultcher, 2023) These activities are fun and exciting for students with special needs and if they enjoy them, they will want to continue to participate in them and retain the information. Some hands on activities include experiments, projects, and field trips. The nature of STEM is very engaging and interesting for many students with disabilities and would therefore aid in the learning process of students. STEM instruction opens up more opportunities in life for students and students with disabilities. (Watson Institute, 2020) All students should be able to participate in STEM learning and activities. Inclusive STEM education is very beneficial for students in special education. In this session we will go into more depth about the importance of incorporating STEM into special education and how to successfully do that.

Sources:

Watson Institute. (2020, May 14). Benefits of steam in special education. Watson Institute. Retrieved January 26, 2023, from https://www.thewatsoninstitute.org/incorporating-steam-learning-into-special-education-curriculum/

Fulcher, T. (2023, January 17). STEM education: Will it work with my child with special needs? Special Ed Resource. Retrieved January 26, 2023, from https://specialedresource.com/stem-education-can-help-children-with-special-needs

Rossi, L. A., III. (2018). Special Education and STEM Education Teacher Credentials and Instructional Preparedness for Inclusive STEM Education.

Firestone, J. B., & McMahon, D. (2022). Using Technology to Provide Access to STEM for Students With Disabilities. Teaching Exceptional Children, 55(2), 142–145. https://doi-org.ezproxy.samford.edu/10.1177/00400599211051390

VII. STEM EDUCATION

A Poster

PBL. Why is it important with STEM education?.

McKenna Ratliff, Samford University; Katie Hoaglund, Samford; Olivia Conklin, Samford; Jordan Gaddy, Samford; Kari Jergunson, Samford .

Section VII (STEM Education) Posters: Thursday PM

PBL, or project-based learning, can be implemented in a variety of subjects. Students engaging in a STEM PBL harnesses key characteristics of STEM. Students create and design their own project to follow whatever prompt is presented to them. STEM activities teach students more than simply math and science. STEM activities allow students to develop a variety of skill sets through hands-on learning with real world applications including problem solving, working alongside peers, and learning to collaborate with others in their near future. One example of STEM PBL is the Egg Drop Project is a great STEM activity for students to design their own contraption to protect a raw egg from a high drop (Rosales, Sulaiman 2016). Through trial and error, students will be able to test out various contraptions that they design to determine the most premier materials and configuration of materials to best protect the egg. Another example of STEM PBL is a Cloud in a Jar. Students make their own cloud in a jar using hairspray and water by using their judgment, along with trial and error to determine the proper amount of water and hairspray to make the thickest cloud. Activities like this allow for students to pursue deeper conceptual knowledge through trial and error, and encourage them to reason and support their work (Project Based Learning n.d.). In this session, we will discuss the importance of project based learning in regards to STEM.

VII. STEM EDUCATION

A Poster

Literature in STEM. Maddie Neas, Samford University; Julie Clevenger, ; Kari Jurgenson, .

Section VII (STEM Education) Papers: Thursday PM

STEM education is something that all students should be exposed to in class. We can use literature to introduce STEM into our classrooms. There are lots of different examples of literature that you can use in your classroom when teaching STEM. Some examples include, The Magnificent Thing; Aaron Slater, Illustrator; Iggy Peck Architect; and Rosie Revere, Engineer. According to iheartsteam (2022), we should use literature when teaching STEM because it introduces children to scientists and artists in a kid friendly language and in a way that they will understand. Matthew Lynch (2018), in his article, says that reading books in STEM will help students grow their vocabulary and learn words that might be specific to STEM. In today's world, teachers are all about technology. Lynch (2018) says that that is a good thing, but also that some students are missing the gap of reading physical books and being able to pull out words that they don't know and might struggle. Using books in STEM will not only grow their vocabulary, but they will learn how to use context clues to figure out what the words mean. Reading Rockets article (2018), says that making predictions start with reading books and predicting the ending. Predictions are something that you use a lot in STEM, so starting children with literature early and using it within your STEM education will re-emphasize those skills. Teachers should consistently be using literature when teaching STEM in their classroom to grow their students learning to new levels. In this presentation we will discuss the importance of including literature in STEM and give some ideas on how to incorporate this into the classroom.

VII. STEM EDUCATION

A Poster

Girls in STEM!. Eva Goldbach, Samford University; Kari Jurgenson, Samford University .

Section VII (STEM Education) Posters: Thursday PM

According to the U.S. Bureau of Labor Statistics, the percentage of men occupying jobs in STEM related categories is significantly higher than women. As of 2020, only 16.5% of people working as Engineers and Architects were women (American Association of University Women, 2020). In this male-dominated workforce, women need to be given the proper skills to succeed and excel is STEM focused careers. This can start as early as elementary school, by nurturing the love for science, technology, engineering, and math among all students. Because males have dominated this content area for so long, teachers, parents, and even students themselves can have a negative bias towards girls' abilities (American Association of University Women, 2020). One way to combat this narrative is to prioritize and foster girls' abilities from the start through single-sex education. Single-sex education has shown to have positive impacts on the self-efficacy and confidence of girls by engaging them in STEM activities without the pre-conceived notion that boys will succeed above (Schilling & Pinnell, 2019). The gender gap begins at a very young age, and single-sex education has positive impacts not only on students' achievement in school, but also their attitude towards excellence (Hart, 2015). Studies show that girls had higher achievement and self-esteem when completing math tests in a single-sex education school (Cherney & Campbell, 2011). In this session I will share ways that single-sex education benefits girls' engagement and futures in STEM.

VII. STEM EDUCATION

A Poster

STEM vs. STEAM. Carson Osborne, Samford University .

Section VII (STEM Education) Papers: Thursday PM

STEM is science, technology, engineering, and math, but now we hear more about STEAM which adds in art. This is an important change because it adds in the hands-on aspect that STEM was missing. STEM is more hands-on while STEAM adds in the art component (Henriksen). STEAM creates opportunities for students to be creative and think critically. STEM disciplines are used to make STEAM-based innovations (Henriksen). Integrating STEAM can push students to think deeper, be more creative, and ask better questions (Radziwill). It's important to integrate the art aspect of STEAM instead of just STEM (Henriksen). Allowing students the opportunity to be creative and think of great ideas through STEM is very needed, but creating their ideas through STEAM takes it to a new level. STEAM-based approaches allow people to learn about scientific topics in a fuller way (Henriksen). STEAM opens up new doors to allow for more powerful learning experiences (Akturk). For example, if students are doing a great STEM activity is magnetic slime. When STEAM comes into play with magnetic slime, students could work on combining colors to make the slime a different color and this can help the students learn and understand the color wheel. Teachers need to allow students to use STEAM ideas so that they can have more creative ideas and implement those ideas for an overall better understanding of the content (Akturk). In this session, I will explain the importance of both STEM and STEAM and the similarities and differences between both.

VII. STEM EDUCATION

A Poster

The Strength of STEM. Grace Patterson, Samford University; Hannah Pulley, Samford .

Section VII (STEM Education) Posters: Thursday PM

STEM in the classroom not only promotes critical thinking but also encourages students to become lifelong learners and thinkers. We believe STEM is a very important and resourceful form of education that promotes curiosity, engagement and communication in students (The Benefits of STEM Education for Children, n.d.). The skills taught in STEM education are very beneficial to students because it challenges them to be innovative starting at a young age. Students in the elementary classroom should be given the opportunity to think and reason in their own brain. Beginning to expose students to STEM at a young age is an important aspect of teaching them to critically think. It also prepares them to be successful in their future careers, regardless of what career they one day choose. Teachers must understand that the future of the workforce is sitting in their classrooms daily. Future world changers are the students who walk the halls of their school. Therefore, teachers must prepare their students to critically think through STEM. STEM education also builds character in students. It teaches students to be adaptable and resilient problem solvers. Students must figure out a way to solve problems and create solutions that make sense and are feasible. When participating in STEM experiments, students must create a plan to follow and adapt if that plan does not work. This fosters creativity as well as communication with whoever the student is working with. Students build social and critical skills that last a lifetime. STEM is an important aspect of the elementary classroom that should be studied and discussed. We would like to create a poster on the benefits of STEM education for students in the elementary school classroom due to the benefits that research shows.

The Benefits of STEM Education for Children. (n.d.). Www.invent.org. https://www.invent.org/blog/trends-stem/value-stem-education#:~:text=Skills%20Derived%20from%20STEM%20Education&text=Other%20skills%20attained%20through%20STEM.

VII. STEM EDUCATION

A Poster

Effect of Shielding Gas on L-PBF process stability. Andrii Shmatok, Auburn University PhD Candidate, Auburn University.

Section IV (Engineering and Computer Science) Papers: Thursday AM

Additive manufacturing is a powerful tool that allows prototyping parts with any complexity and geomerty. However, the manufacturing process is not fully robust and still has room of improvements. There are alot of improvements have been made in terms of parameter study to achieve the highest density, however, the effect of shielding gas still remains unclear and need to be investigated further. This work provides the insight on the L-PBF process stability under different shielding gases and its mixtures. Within the help of the X-ray CT it was shown how the addition of Helium to the atmosphere reduces the chance of specific defects. Plasma monitoring has been performed with the high-speed camera to prove more stable process under helium.

VII. STEM EDUCATION

A Poster

Impact of Professional Development Workshops on Increasing Plant Biology the Curriculum.

Sloan Almehmi, University of Alabama at Birmingham; Regina Bedgood, UAB; Katie Busch, UAB; Karolina Mukhtar, UAB .

Section VII (STEM Education) Posters: Thursday PM

Introduction: Climate change can have detrimental effects on the rich diversity of plant life found in the state of Alabama. However, the topic of plant biology is rarely covered in the state's public schools. PlantGIFT (Plant Genomics Internship for Teachers) was designed to educate public school teacher so that they are comfortable and capable of conducting cutting edge plant biology experiments in their classrooms. The overall goal of this workshop is to facilitate the incorporation of plant science into the curriculum at Alabama public schools.

Methods: The study included science teachers from local Alabama middle and high schools. The study used a workshop format to provide teachers with the needed tools to efficiently teach plant-related sciences. This workshop was held at the McWane Science Center's GENEius lab in collaboration with UAB CORD (Center for Outreach and Research Development).

Results: Sixteen teachers participated. All participants demonstrated proficiency in plant anatomy and were able to conduct their own experiments examining the effect of heat stress of plants, a model that mimics the elevated temperatures seen in global warming. Two participants incorporated plant-based laboratory experiments in their classrooms in collaboration with the PlantGIFT team. Additionally, one teacher added an entire unit on plants into their curriculum.

Conclusions: Plant biology is missing from the current curriculum. Teacher workshops can be used to facilitate authentic plant research in a school setting. Larger scale studies that involved state level participation are needed to fully assess the efficacy of such programs.

VII. STEM EDUCATION

A Poster

STEM Education at Home. Luci Sobanski, Samford University .

Section I (Biological Sciences) Papers: Thursday AM

STEM education is gaining increased attention in education . Students can make a better connection to the subjects they are learning when they engage in STEM. STEM also introduces students to the fields of science, technology, engineering, and math. By introducing students to STEM education at a young age, “teachers were effective at directing elementary students’ interest in STEM subjects and pursuing STEM careers.” (Daughtry, 2014, p.47) If teachers and parents can make STEM education accessible at home, then students can make connections across subjects and their interest in STEM may be piqued. Parents and teachers alike can find STEM activities that use common household items. For example, if students are working on multiplication or fractions the parents could have them help cook dinner only using a half-cup measuring cup. This would allow students to use math skills for counting fractions and spending more time with family. If students use STEM at home, then they can have more of a connection to what they are learning in school. Teachers can send home monthly STEM projects that connect to the standards they are learning in class, or it can be even simple ways that students can help around the house every night for homework. Parents can send the necessary materials and or instructions home to help parents teach and use STEM in their homes. STEM can also allow parents to spend more time with their children while working on homework and making it fun. According to Milner-Bolotin and Marotto (2018), some parents are not equipped to help with their student's education. If teachers are able to send instructions and ways to incorporate STEM activities at home, then families can grow to love STEM and use it more frequently and naturally with their children at home. In this presentation, I will discuss ways that STEM education can be conducted at home for both parents and teachers.

Sources:

Daugherty, M. K., Carter, V., & Swagerty, L. (2014). Elementary STEM education: the future for technology and engineering education?. Journal of STEM teacher education, 49(1), 7.

Milner-Bolotin, M., & Marotto, C. C. (2018). Parental engagement in children’s STEM education. Part I: Meta-analysis of the literature. LUMAT: International Journal on Math, Science and Technology Education, 6(1), 41-59.

VII. STEM EDUCATION

A Poster

STEM Education in Early Childhood. Melissa Goolsby, Samford University .

Section VII (STEM Education) Posters: Thursday PM

Science, technology, engineering, and math (STEM) in education is a multidisciplinary method of teaching that employs the use of science, technology, engineering, and math concepts in all core subjects as well as in isolation. STEM is often a major initiative in elementary and secondary schools. Although STEM is important to consider with the aforementioned age groups, STEM can even be incorporated into the early childhood classroom. Early childhood educators often feel underprepared to incorporate STEM concepts in their classrooms due to a perceived lack of knowledge of science, technology, and engineering content (MacDonald et al., 2021). Some ways to incorporate STEM into the early childhood classroom will be highlighted through this poster presentation. Using STEM in the classroom does not necessarily mean teaching math, science, technology, and engineering content; instead, using STEM in the classroom often involves using related concepts rather than explicitly teaching those concepts (McClure et al., 2017). For example, one use of STEM in the classroom could be using an adapted version of the scientific method more suited for early childhood to identify problems and find solutions. Incorporating STEM into a classroom can be as simple as teaching through problem-solving or inquiry-based activities. STEM is a framework that is meant to guide instruction to be more problem-focused and analytical. Since children in early childhood are naturally inquisitive, incorporating STEM concepts into the classroom can be a seamless way to use children's innate curiosity to further learning (Tippett et al., 2017).

VII. STEM EDUCATION

A Poster

Analyzing the impact of cultural competency training of Learning Assistants in a large enrollment STEM gateway course.

Jordin Payton, University of Alabama at Birmingham; Mallorie Turner, University of Alabama at Birmingham; Christina Morra, University of Alabama at Birmingham; Samiksha Raut, University of Alabama at Birmingham .

Section VII (STEM Education) Posters: Thursday PM

A Science, Technology, Engineering and Mathematics (STEM) bachelor's degree gateway courses propagate many inequities that significantly affect students with marginalized identities. These courses are often supplemented with undergraduate Learning Assistant (LAs), whose role requires that they have far more direct interactions with the students. We, therefore, developed diversity, equity and inclusion training focused on evidence-based instructional pedagogies to improve the cultural competence of our learning assistants. In designing the cultural competence training, we sought to 1) generate leaders with the skills to promote inclusion during their time at the university and in their future roles, and 2) to support LAs with marginalized identities. The training occurs via a mandatory, semester-long online course, which covers, among other topics, accessibility in education, and the effect of microaggressions, and the impact of personal identities including LGBT+, first generation college students, transfer and international student on the college experience. Besides completing a weekly reflection prompt, LA's completed pre- and post-semester open-ended responses addressing their knowledge and opinions of cultural competency. At the end of the semester, LAs completed one on one interviews. Between 70.3% and 100% of students agreed with statements reflecting students' positive impressions of the match module. Furthermore, 64%-79% of students indicated that they continue to reflect on the module even after the semester ended, with the module covering the history of inequities and injustices in STEM. Based upon our findings, we suggest active implementation of cultural competency training for LAs to reduce the existing inequities affecting marginalized student populations.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Paper

Nanoplastics Removal from Water Based on the Liquid-Liquid Extraction Method.

Ashish Srivastava, University of Alabama; Dr. Milad Esfahani, University of Alabama .

Section VIII (Environmental and Earth Science) Papers: Thursday PM

Nanoplastics (NPs) are an emerging concern as the new class of hazardous materials spreading across all the environmental media, including fresh water. The occurrence of nanoplastics can be of inclusion in cosmetics, paints, thin film coatings, and their biological and ecological impacts are more complicated. Nanoplastics toxicity is extremely harmful to humans because of cell damage, liver failure and cell death. The current conventional water treatment methods such as coagulation, flocculation, filtration, photocatalytic degradation, microbial bioremediation showed lack of efficiency for the removal of different nanoplastics. .The liquid-liquid extraction method using ionic liquid as extractants is a promising separation technique for efficient removal of nanoplastics in water treatment . In the present work, the removal of polystyrene nanoplastics (PSNPs) using 1-methyl-3-octylimidazolium bis(trifluoromethyl)imide) ({C8C1Im} {NTf2}) was studied. ({C8C1Im} {NTf2}) showed more than 99% removal of PSNPs from water.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Paper

Catalysis of the Chemical Recycling of Polyethylene Terephthalate (PET) with Metal-organic Framework Compounds Derived from Waste Water Bottles. Meet Chapani, Troy University; Somayeh Mohammadi, Troy University; Mojtaba Enayatinook, Troy University; Zhiyong Wang, Troy University .

Section I (Biological Sciences) Papers: Thursday AM

As one of the most widely adopted ways to chemically recycle polyethylene terephthalate (PET), PET glycolysis involves the transesterification of PET using ethylene glycol (EG) as the alcohol and solvent to generate bis(2-hydroxyethyl)terephthalate (BHET). The reaction can be catalyzed by various metal salts, hydrotalcites, ionic liquids, and metal-organic framework (MOF) compounds. Water bottles, which are made primarily of PET, can serve as a resource of terephthalic acid to construct MOFs, a recent but well-developed class of porous compounds with highly crystalline structure that contains tunable pore sizes and unusually high surface areas. In this work we demonstrate that MOF-5 can be synthesized from zinc salts and shredded waste water bottles, and it can in turn catalyze the quantitative glycolysis of PET to BHET at 200 oC after 1 h with catalyst loading as low as 0.5%. We are expanding our work to generate additional MOFs and compare their catalytic activities for PET glycolysis.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Paper

Systematic Investigation of PFOS Adsorption from Water by Metal Organic Frameworks, Activated Carbon, Metal Organic Framework@Activated carbon, and Functionalized Metal Organic Frameworks.

Jasneet pala, University of Alabama; Tin Le, University of Alabama; Medha Kasula, University of Alabama Chemical and Biological department.

Section VIII (Environmental and Earth Science) Papers: Thursday PM

Per- and polyfluoroalkyl substances (PFAS) have long-term negative impacts on both human and animal health. The adsorption methodology has demonstrated effective efficacy in eliminating PFAS from water among all strategies. For the removal of short-chain (C<6) and long-chain (C>7) PFAS, a variety of adsorbents have been utilized, including conventional powder, activated carbon (AC), and metal organic frameworks (MOFs). The efficiency and ongoing sorption mechanisms for each of these adsorbents have not yet been extensively examined and compared due to the complexity of the adsorption process, the diversity of adsorbents and PFAS compounds, and the lack of a standardized experimental technique. In this work, we synthesized and characterized the adsorbents and then performed a systematic isotherm adsorption protocol to study the adsorption mechanisms and performance of adsorbents, including nanosized activated carbon AC, MIL-101 (Cr), MIL-101 (Cr)-NH2 and novel hybrid adsorbents of MIL-101 (Cr)@AC for the removal of perfluorooctane sulphonic acid (PFOS) from water. Based on the comparative analysis to investigate the effective parameters governing the PFOS adsorption with respect to each adsorbent, AC with around 93% PFOS removal showed supreme performance over other MOFs; however, MOF-based adsorbents showed faster adsorption compared to AC. The MIL-101(Cr)@AC (with 80% removal performance and 2h adsorption time) possessed the advantages of both AC and MIL-101 (Cr). The hydrophobic-hydrophobic and electrostatic interactions were the main dominant adsorption interactions for AC and MOFs, respectively, while both interactions were influential in the MIL-101 (Cr)@AC adsorption.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Paper

Growth-drought relationships of two southern pine species in northern Alabama.

Austen Johnson, Alabama A&M University; SHAIK HOSSAIN, Alabama A&M University; KOZMA NAKA, Alabama A&M University .

Section VIII (Environmental and Earth Science) Papers: Thursday PM

Climate change projections for the southern USA predict increased frequency and severity of droughts, which are expected to impact tree growth profoundly. As such, growth-drought relationships can help predict species' response to climate change which is considered an integral part of adaptive forest management. In this study, tree radial growth in relation to historical drought events will be estimated for two southern pine species, shortleaf (Pinus echinata Mill.) and loblolly (P. taeda L.) pines. Due to their occurrences in a large geographic range, these two pines are suitable candidate species to explore growth-drought relationships. In the summer of 2022, three study sites were located in two northern Alabama counties, where several drought events have occurred recently. Using increment borers, Alabama A&M University undergraduate students collected cores from naturally regenerated and mature (>15 cm DBH) pine trees, resulting in 10-15 core samples from each species per site for a total of 70 cores from three sites. Tree cores were processed using dendrochronological techniques to measure radial extension as a function of tree ring widths. Radial extensions pre- and post-drought (5-year) events will be compared to examine if droughts negatively affect tree growth. This research will inform forest managers about the impacts of droughts on tree growth and the potential for selecting species that are more tolerant to droughts. This work also exposes HBCU students to scientific research and helps improve their technical and communication skills.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Paper

Upcycled Polyvinyl Chloride (PVC) Electrospun Nanofibers from Waste PVC Pipe for Water Treatment.

ATTA UR RAZZAQ, University of Alabama; DJ McEachern, University of Alabama (Department of Chemistry & Biochemistry) .

Section VIII (Environmental and Earth Science) Papers: Thursday PM

In recent decades, the increased use of polyvinyl chloride (PVC) in industries and households has led to a surge in PVC waste pollution. We report upcycling of PVC-based products as waste material to a high-value-added product of membranes by electrospinning technique. Waste PVC pipe and waste PVC pool float were selected as the two common PVC products and were upcycled to electrospun membranes for water treatment. The properties such as membrane morphology, fiber diameters, composition, functional groups, hydrophobicity/hydrophilicity, surface charge, maximum bearable stress, etc. of upcycled membranes were compared to the upcycled membranes fabricated from research grade (RG) PVC. In addition, the effect of additives such as calcium carbonate in PVC waste products on the physicochemical properties of upcycled membranes were evaluated. The results showed that upcycled waste PVC electrospun membranes had superior properties such as mechanical stability and more negative surface charge. The upcycled membranes from waste PVC pipe and pool float outperformed the RG PVC membranes in the removal of dye (methylene blue (MB)) from water by showing more than 97% removal efficiency.

A Paper

Plasma Modified Electrospun IR Reflective Coating for Thermal Regulative Textiles.

RENJITH RAJAN PILLAI, University of Alabama at Birmingham; Kannatassen Appavoo, UAB; Claudiu Lungu, UAB; Vinoy Thomas, UAB .

Section VIII (Environmental and Earth Science) Posters: Thursday PM

A rapid increase in atmospheric temperature has been reported in recent years worldwide. The lack of proper aid to protect from exposure to the sun during working hours raised the number of sunburn cases among workers. It is important to promote productive workplaces without compromising safety and health concerns. In the present work, we report the low-temperature plasma (LTP) assisted tailoring of the surface properties of fabrics to reflect the IR radiation from the sun. The LTP technique can be adapted for thermally sensitive materials such as fabrics and textiles due to its lower working temperature range of 30 ˚C. We have modified commercially available fabric, regular, and boron nitride incorporated electrospun PET surfaces with TEOS plasma. TEOS plasma treatment can deposit reactive plasma-polymerized silane nanolayer on the surface of these substrates. The plasma-processed silane-nanolayer was systematically characterized using SEM, XPS, Keyence 3D-microscope, and TEM. From the SEM and TEM data, the size of nanoparticles was observed in the range of 100-200 nm. The IR reflection potential of the surface was analyzed using a thermal imaging system and the coating thickness was with the Keyence 3D-imaging. The data revealed that the plasma-modeled nano surface shows higher reflective potential toward IR rays, and it seems to be cooler than the unprocessed surface by approximately 15 ˚C. The stability and efficiency of the plasma-modified electrospun-nanolayer in water were satisfactorily examined with SEM and IR imaging. Taken together, these results suggest the excellent potential of this plasma processing to develop IR reflective coatings.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Paper

Plasma Modified Electrospun IR Reflective Coating for Thermal Regulative Textiles. RENJITH RAJAN PILLAI, University of Alabama at Birmingham; Kannatassen Appavoo, UAB; Claudiu Lungu, UAB; Vinoy Thomas, UAB UAB.

Section VIII (Environmental and Earth Science) Papers: Thursday PM

A rapid increase in atmospheric temperature has been reported in recent years worldwide. The lack of proper aid to protect from exposure to the sun during working hours raised the number of sunburn cases among workers. It is important to promote productive workplaces without compromising safety and health concerns. In the present work, we report the low-temperature plasma (LTP) assisted tailoring of the surface properties of fabrics to reflect the IR radiation from the sun. The LTP technique can be adapted for thermally sensitive materials such as fabrics and textiles due to its lower working temperature range of 30 ˚C. We have modified various substrates such as commercially available fabric, regular, and boron nitride incorporated electrospun PET surfaces with tetra ethoxy orthosilicate (TEOS) plasma. TEOS plasma treatment can deposit reactive plasma polymerized silane nanolayer on the surface of these substrates. The plasma-processed silane nanolayer was systematically characterized using Scanning Electron Microscopy (SEM), X-ray Photoelectron Spectroscopy (XPS), Keyence 3D-microscopic imaging, and Transmission Electron Microscopy (TEM). From the SEM and TEM data, the size of nanoparticles was observed in the range of 100-200 nm. The thermal regulation coating thickness was examined with the Keyence 3D imaging technique. The IR reflection potential of the surface was analyzed using a FLIR thermal imaging system. The data revealed that the plasma-modeled nano surface shows higher reflective potential toward IR rays, and it seems to be cooler than the unprocessed surface by approximately 15 ˚C. The stability and efficiency of the plasma-modified electrospun nanolayer in water were satisfactorily examined with SEM and IR imaging. Taken together, these results suggest the excellent potential of this plasma processing to develop IR reflective coatings.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Poster

Light Pollution and What You Can Do About It. Mel Blake, University of North Alabama; Michelle Wooten, UAB; Tom English, GTCC; Martha Leake, Valdosta State; Dan Caton, Appalachian State .

Section I (Biological Sciences) Papers: Thursday AM

Light pollution is the artificial light that shines up in the sky that affects views of the night skies, and has negative effects on insects, turtles, fish, birds and other wildlife. It also has impacts on human health in addition to that fact that poorly designed lighting can create safety issues. We will describe the causes of light pollution, and its impacts, and describe how to measure local light pollution and actions to minimize the problem. We will invite people to join Starry Skies South to advocate for improved lighting.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Poster

The Characteristics of Hand-transmitted Vibration(HTV) from an Electric-powered Grass Trimmer.

SEUNGHYEON YANG, University of Alabama at Birmingham; Nathan Chen, University of Alabama at Birmingham; Jonghwa Oh, University of Alabama at Birmingham .

Section VIII (Environmental and Earth Science) Posters: Thursday PM

Recently, electric-powered tools have been gaining popularity in grounds maintenance industry. While electric-powered tools are more likely to produce less vibration compared to gasoline-powered tools, few studies have evaluated occupational exposure to hand-arm vibration (HAV) from electric-powered tools. In this study, the power tool operators' exposure to HAV and the transmission of vibration from the tool to the operators were evaluated by simulating electric grass trimmer operation. A battery-powered grass trimmer (FS-KM, STIHL KMA 135 R KombiSystem, Waiblingen, Germany) was used in this study. Two participants alternatively simulated the cutting operation by swinging the tool head side to side approximately 30 inches for five minutes at 1 to 1.5-second intervals at full throttle, and the simulation was in triplicate for each participant. To measure the vibration of the tool, three accelerometers (Brüel & Kjær 4524-B-001, Nærum, Denmark) were placed on the tool handles; the mounting locations were determined based on the ISO 5349-2 standard. The HAV exposure was measured using vibration dosimeters (SVANTEK SV103, Bedford, UK) attached to the operators' palms. The vibration magnitudes in vibration total value (ahv) were obtained and 1/3 octave band analysis was conducted at center frequencies from 0.8 to 1.6 kHz. The dosimeters showed lower vibration levels compared to the accelerometers mounted on the tool: 0.92 m/s2(104.8%) and 6.53 m/s2(180.5%) lower for the right hand/handle side and left hand/handle side, respectively. The vibration reduction was higher in the center frequency range of 100-160 Hz. Further investigations are needed to examine HTV from other electric-powered tools.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Poster

Nanoplastics Removal from Water Based on the Liquid-Liquid Extraction Method.

Ashish Srivastava, University of Alabama; Dr. Milad Esfahani, The University of Alabama .

Section VIII (Environmental and Earth Science) Posters: Thursday PM

Nanoplastics (NPs) are an emerging concern as the new class of hazardous materials spreading across all the environmental media, including fresh water. The occurrence of nanoplastics can be of inclusion in cosmetics, paints, thin film coatings, and their biological and ecological impacts are more complicated. Nanoplastics toxicity is extremely harmful to humans because of cell damage, liver failure and cell death. The current conventional water treatment methods such as coagulation, flocculation, filtration, photocatalytic degradation, microbial bioremediation showed lack of efficiency for the removal of different nanoplastics. .The liquid-liquid extraction method using ionic liquid as extractants is a promising separation technique for efficient removal of nanoplastics in water treatment . In the present work, the removal of polystyrene nanoplastics (PSNPs) using 1-methyl-3-octylimidazolium bis(trifluoromethyl)imide) ({C8C1Im} {NTf2}) was studied. ({C8C1Im} {NTf2}) showed more than 99% removal of PSNPs from water.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Poster

Systematic Investigation of PFOS Adsorption from Water by Metal Organic Frameworks, Activated Carbon, Metal Organic Framework@Activated carbon, and Functionalized Metal Organic Frameworks.

Jasneet pala, University of Alabama; Tin Le, University of Alabama; Medha Kasula, University of Alabama .

Section VIII (Environmental and Earth Science) Posters: Thursday PM

Per- and polyfluoroalkyl substances (PFAS) have long-term negative impacts on both human and animal health. The adsorption methodology has demonstrated effective efficacy in eliminating PFAS from water among all strategies. For the removal of short-chain (C<6) and long-chain (C>7) PFAS, a variety of adsorbents have been utilized, including conventional powder, activated carbon (AC), and metal organic frameworks (MOFs). The efficiency and ongoing sorption mechanisms for each of these adsorbents have not yet been extensively examined and compared due to the complexity of the adsorption process, the diversity of adsorbents and PFAS compounds, and the lack of a standardized experimental technique. In this work, we synthesized and characterized the adsorbents and then performed a systematic isotherm adsorption protocol to study the adsorption mechanisms and performance of adsorbents, including nanosized activated carbon AC, MIL-101 (Cr), MIL-101 (Cr)-NH2 and novel hybrid adsorbents of MIL-101 (Cr)@AC for the removal of perfluorooctane sulphonic acid (PFOS) from water. Based on the comparative analysis to investigate the effective parameters governing the PFOS adsorption with respect to each adsorbent, AC with around 93% PFOS removal showed supreme performance over other MOFs; however, MOF-based adsorbents showed faster adsorption compared to AC. The MIL-101(Cr)@AC (with 80% removal performance and 2h adsorption time) possessed the advantages of both AC and MIL-101 (Cr). The hydrophobic-hydrophobic and electrostatic interactions were the main dominant adsorption interactions for AC and MOFs, respectively, while both interactions were influential in the MIL-101 (Cr)@AC adsorption.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Poster

Monitoring Calcium Carbonate Content in Recycled Polypropylene with Raman Spectrometry. Dayne Long, Troy University; Pixiang Wang, Troy University; Shaoyang Liu, Troy University .

Section VIII (Environmental and Earth Science) Posters: Thursday PM

Calcium Carbonate (CaCO3) is a common additive to polypropylene (PP) and needs to be monitored for recycling PP properly. In the current work, Raman spectrometry was employed to establish convenient and accurate methods to analyze CaCO3 content in recycled PP. Various spectrum pretreatment methods, including multivariate scattering correction (MSC), standard normal variate transformation (SNV), and baseline correction, were tested to improve spectrum quality for partial least squares (PLS) and principle component regression (PCR) modeling. Two spectrum ranges, i.e., the large range (695-1535 cm-1) and small range (760-885 cm-1 and 1075-1110 cm-1), were tested. The best models were validated with two recycled PP samples with CaCO3 contents of 0% and 18%, respectively. The best PCR model was obtained with the small spectral range selection, slope baseline correction, and MSC normalization. It had an R2 of 0.9830 and a cross-validation SEP (CVSEP) of 2.410. The prediction results of the recycled PP samples were 1.0 ± 0.4% and 21.8 ± 1.2%, respectively. The best PLS model was found with the same spectral range selection and pretreatment. It produced an R2 of 0.9940 and a CVSEP of 2.185. This model's prediction results were -1.7 ± 5.9% and 21.2 ± 2.5% for the two recycled PP samples, respectively. The PCR model had better prediction results for the recycled PP. This work would help properly sort recycled PP and assure the quality of recycled PP materials.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Poster

Development of Dual-Air Purifying Respirators Using Wet-Laid Activated Carbon Fiber Sorbent: Fabrication and Testing.

David McMahan, University of Alabama at Birmingham; Jonghwa Oh, University of Alabama at Birmingham; Claudiu Lungu, University of Alabama at Birmingham .

Section I (Biological Sciences) Papers: Thursday AM

Thousands of workers in the U.S. are required to wear respiratory protection for exposure to hazardous vapors and aerosols1. Exposure to volatile organic compounds (VOCs) and particulate matter (PM) can cause adverse health effects such as pneumoconiosis-like symptoms, acute toxicity, and carcinogenesis1-2. This research aimed to develop and test sorbent material based on non-woven activated carbon fiber (ACF) to be used in a filtering facepiece respirator (FFR) N95-style. This media would be capable of dual-protection against PM and VOCs. The first phase of this research tested filtration efficiency (FE) of non-modified (NM) commercial ACF1800, chosen based on high surface area (1541 m2/g), and tested in our laboratory, indicating a FE of >95% when using 4-layers3. The same ACF was modified for FFR custom development and tested.

ACF mats were produced using the wet-laid method (WL), a paper-making process where fiber orientation/length is controlled for better mechanical properties. Filtration experiments tested 4-layers within a dynamic test chamber challenged with aerosolized salt solution. Pressure drop (PD), initial penetration (IP), and FE were measured using a manometer, and aerosol monitor.

The average IP, PD, and FE for WL-ACF were 13.82 ± 5.4%, 0.39 ± 0.06 mmH2O, and 86.17 ± 5.4%, respectively. Similarly, averages for NM-ACF were 15.33 ± 7.4%, 0.55 ± 0.2 mmH2O, and 84.67 ± 7.38%, respectively.

In conclusion, WL-ACF had lower IP, PD, and 2% higher FE than NM-ACF . The pilot data collected in the present work successfully sets the stage for future developments toward a combined particulate-vapor FFR using WL-ACF.

Citations

1. Centers for Disease Control and Prevention. (2020, January 8). 100 years of respirators. Centers for Disease Control and Prevention. Retrieved January 15, 2023, from https://www.cdc.gov/niosh/newsroom/feature/100yearsrespirators.html

2. Kogevinas, M., Zock, J. P., Jarvis, D., Kromhout, H., Lillienberg, L., Plana, E., ... & Antó, J. M. (2007). Exposure to substances in the workplace and new-onset asthma: an international prospective population-based study (ECRHS-II). The Lancet, 370(9584), 336-341.

3. Summers, M. C. (2022). The fibrous disposition of Acf has been studied and shows the ability to filtrate particulates and VOCs6. (dissertation).

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Poster

Upcycled Polyvinyl Chloride (PVC) Electrospun Nanofibers from Waste PVC Pipe for Water Treatment.

ATTA UR RAZZAQ, University of Alabama; DJ McEachern, University of Alabama (Department of Chemistry & Biochemistry) .

Section VIII (Environmental and Earth Science) Posters: Thursday PM

In recent decades, the increased use of polyvinyl chloride (PVC) in industries and households has led to a surge in PVC waste pollution. We report upcycling of PVC-based products as waste material to a high-value-added product of membranes by electrospinning technique. Waste PVC pipe and waste PVC pool float were selected as the two common PVC products and were upcycled to electrospun membranes for water treatment. The properties such as membrane morphology, fiber diameters, composition, functional groups, hydrophobicity/hydrophilicity, surface charge, maximum bearable stress, etc. of upcycled membranes were compared to the upcycled membranes fabricated from research grade (RG) PVC. In addition, the effect of additives such as calcium carbonate in PVC waste products on the physicochemical properties of upcycled membranes were evaluated. The results showed that upcycled waste PVC electrospun membranes had superior properties such as mechanical stability and more negative surface charge. The upcycled membranes from waste PVC pipe and pool float outperformed the RG PVC membranes in the removal of dye (methylene blue (MB)) from water by showing more than 97% removal efficiency.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Poster

A Prospective Study of Hand-Arm Vibration (HAV) Exposure among Groundskeepers in Alabama.

Nathan Chen, University of Alabama at Birmingham; Seunghyeon Yang, Department of Environmental Health Sciences, University of Alabama at Birmingham, Birmingham, AL, USA; Jonghwa Oh, Department of Environmental Health Sciences, University of Alabama at Birmingham, Birmingham, AL, USA .

Section VIII (Environmental and Earth Science) Papers: Thursday PM

Hand-Arm Vibration Syndrome (HAVS) is a complex of vascular, neurological, and musculoskeletal disorders induced by long-term, excessive exposure to hand-arm vibration (HAV). Groundskeepers use powered hand tools regularly and make up a large working population in Alabama (i.e., more than 10,000 workers, according to the Alabama Department of Labor). However, relevant exposure assessment studies on HAV, especially for groundskeepers, are limited. This study aimed to evaluate HAV exposure experienced by the groundskeepers in Alabama.

A one-month prospective study was conducted to evaluate the exposure to HAV (IRB approval obtained). Ten groundskeepers employed at the University of Alabama at Birmingham were recruited. Six workdays (i.e., three days within one week at the beginning of the study and three other days in the following month) were monitored for each groundskeeper during an entire work shift. Vibration total value (ahv) was collected by vibration dosimeters (SV103, Svantek SP. Z O. O., Warszawa, Poland). 8-hour time energy equivalent ahv (A (8)) was then calculated according to ISO 5349-1 as follows:

$$A(8)=ahv \sqrt{(T/T0)}$$

where T is the daily exposure duration, and T0 is the reference 8-hour exposure duration. The 1/3 octave-band analysis from 0.8 to 1250 Hz center frequency was also performed.

The average A (8) of 10 groundskeepers was 3.0 m/s^2, with 7.6% exceeding the ACGIH daily exposure limit value of 5 m/s^2. The highest acceleration peak appeared at 160 Hz on the z-axis. More investigations are needed to better understand the power tool users' exposure status and the burden of HAVS in the U.S.

X. BIOETHICS, HISTORY, PHILOSOPHY OF SCIENCE

A Paper

Philosophy versus Science: Does Knowing Philosophy Make a Scientist a Better Scientist or Does Knowing Science Make a Philosopher a Better Philosopher?. Dennis Sansom, Samford University .

Section X (Bioethics and History & Philosophy of Science) Papers: Thursday PM

In this presentation I contrast two ways philosophy and science can relate and influence each other. On one side, I present René Descartes' metaphysical defense and justification for 17th century science. On the other side, I present the contemporary philosopher John Heil's claim that metaphysics must be based on the latest scientific finding about the nature of reality. I argue for the second claim, not because science is a superior intellectual pursuit but because of the importance and role of "experience" in both scientific and philosophical inquiry.

X. BIOETHICS, HISTORY, PHILOSOPHY OF SCIENCE

A Paper

Pad Mounted Transformer as Engineered Product.

Carter Schatt, Auburn University; Kendal Sandusky, Auburn University NA.

Section I (Biological Sciences) Papers: Thursday AM

My group, team 3B was assigned to choose and write about an engineered object, so I thought it was well fit to describe a pad mounted transformer. When I think of an engineered object, I think of something that was built to make day to day tasks easier and has no aesthetic presence. Some of you may be familiar with those metal green boxes outside your house or somewhere in a nearby neighborhood. These electrical boxes represent an important part of delivering power to your home, while having no intention of being appealing to the eye. The box's sole purpose is to satisfy a need, to keep the lights and bare some of the important necessities of life. Like the left hemisphere of the brain, both work logistically, and plan in an orderly fashion to complete any need in the most efficient way possible. The left hemisphere of the brain handles most of the learning functions, such as, reading, writing, and most importantly calculations. When someone was creating the pad mounted transformer, they had to put all their left-brain characteristics to use. They had to make sure that all these functioning processes could be tucked away into a little green box that goes so unnoticed all the time. The box lacks design because it was made with a linear thinking goal of serving its purpose. That is why I believe a pad mounted transformer makes for the perfect engineered object for the assignment.

A Paper

Quay Sunglasses A Designed Product. Kevin Jones, Auburn University; Emma Kimball, Auburn University .

Section X (Bioethics and History & Philosophy of Science) Papers: Thursday PM

My group, 6B, was instructed to bring in and describe a designed object. In my mind, a designed object is known for being a function/useful product that achieves its created purpose, while being aesthetically pleasing to the consumer. I brought to class a pair of Quay Sunglasses that are inside a clear case. These sunglasses are considered a perfect example of a designed object because they achieve their original purpose of protecting my eyes from the sun's harsh rays. The lens of the sunglasses is dark enough to shield the sun in an effective way without hindering my vision. However, these Quay sunglasses include a certain design, style, and color that appeal to me as a consumer. The colors are grey and pink with a cat-eye frame, making them fun and easy to style with any clothes. The shape and style of the frames compliment my face, causing the product to go beyond being just practical. Also, the clear case of the product is protective towards the glasses, allowing them to fit nicely inside without risk of breaking or scratching, The case would be considered designed object because it intentionally allows customer to see product in a pleasing way while protecting glasses. The practicality, usefulness, and creative design of the sunglasses and the case makes me believe it is a function of the Corpus Callosum part of the brain. My product connects the rational and artistic sides of the brain with their useful function and the beauty of the design. These contrasting ideas in one product is what these Quay Sunglasses a perfect example of a designed object.

X. BIOETHICS, HISTORY, PHILOSOPHY OF SCIENCE

A Paper

Longtermism: Watch Out For This Philosophy. Jim Bradley, Auburn University .

Section X (Bioethics and History & Philosophy of Science) Papers: Thursday PM

Longtermism is a recent outgrowth of the moral philosophies of Consequentialism and Utilitarianism. Consequentialism holds that the rightness and wrongness of actions are judged solely on their consequences, with good outcomes being the objective. Utilitarianism is a form of Consequentialism that prioritizes creation of pleasure or prevention of pain for the greatest number of sentient beings as good outcomes. Sentient beings are not just humans but all beings capable of feeling pain. Longtermism is a philosophy and active, world-wide project that emphasizes our responsibilities for the happiness of thousands of future generations of humans and/or their sentient AI creations. A major spokesperson for Longtermism, William MacAskill, argues that the well-being of our unborn/uncreated descendants millions or billions of years hence trumps the well-being of existing persons by virtue of their sheer numbers. Strong Longtermism demands that we strive to prevent global catastrophes such as a nuclear holocaust, an asteroid impact, and extinction-level climate change in order that our far off descendants be born and have the chance to populate across the universe. Longtermism minimizes our responsibilities for social and environmental justice today in favor of working to insure that we have descendants millions of years from now. For a consequentialist concerned about present sentient beings and our planetary life-support system, Longtermism has more cons than pros.

X. BIOETHICS, HISTORY, PHILOSOPHY OF SCIENCE

A Paper

Obelisks: 4500-Year-Old Symbol of Mythology and Science. Clark Lundell, Auburn University .

Section X (Bioethics and History & Philosophy of Science) Papers: Thursday PM

In Egyptian mythology the world was created atop a primordial mound of earth which manifested itself as slender vertical shafts of stone symbolizing rays of light from the sun god creator. These stones grew to enormous dimensions and challenged the science of their builders to create, transport and place. Their symbolic meaning activated the mythology of the environments within which they were placed. The sunlight cast upon them depicted the passing of the day allowing scientific measure of time and location of place.

X. BIOETHICS, HISTORY, PHILOSOPHY OF SCIENCE

A Poster

Ethical Issues Involved in Organ Transplantation. Shuntele Burns, Alabama State University .

Section X (Bioethics and History & Philosophy of Science) Posters: Thursday PM

Organ transplantation, one of the most significant scientific and medical achievements of the past century, raises ethical issues that are complex and that often intersect with other ethical concerns. One issue involves the methods by which organs are allocated, specifically, the fair and just distribution of organs. Geographic, racial, and other disparities continue to exist and are exacerbated by the gap between organ supply and demand. Developing ethical means of obtaining more organs also presents a challenge. In some parts of the world, organs are bought and sold, and the poor are often exploited for their organs. What is the best way to ensure free and informed consent, both for living donors and for those who wish to authorize postmortem organ donation? Another problem is the absence of oversight and accountability concerning organ procurement organizations (OPOs), which, studies have shown, often fail to take the steps necessary to salvage usable organs. The removal of cadaveric organs also raises questions surrounding the definition of life and the definition and diagnosis of death, which are still being debated. Animal-to-human transplantation, while offering promise, also involves ethical dilemmas, including the possibility of cross-species transmissions that may affect not only recipients but the general population. Other issues involve the conditions under which animals are raised for transplantation. Both human-to-human transplantation and animal-to-human transplantation present a number of ethical problems that deserve the attention of scientists, healthcare providers, government agencies, and the public.