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I. BIOLOGICAL SCIENCES

A Paper Presentation

Transgenic model for Stochastic Expression in C. elegans Neurons. Jean-Pierre Arditi, Ryan Littlefield

Department of Biology, University of South Alabama, College of Arts and Sciences

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.

I. BIOLOGICAL SCIENCES

A Paper Presentation

Utilizing an Embryo Growth Model to Predict the Sex Ratio of Kemps Ridley, Lepidochelys kempii, Nests. Forrest Collins, University of Alabama at Birmingham; Thane Wibbels, UAB; Ken Marion, UAB University of Alabama at Birmingham.

The Kemp's Ridley, Lepidochelys kempii, is a critically endangered species of sea turtle that primarily nests on beaches throughout Mexico's Gulf Coast. Being a primitive reptile, the Kemp's Ridley does not have genetic sex determination but have temperature-dependent sex determination (TSD). TSD is found in certain reptile species in which the sex of hatchlings is determined by the temperatures the eggs are incubated at. To evaluate the sex ratios of hatchling Kemps Ridley, nest temperatures were monitored at a major satellite nesting beach in Mexico. During the 2023 nesting season, two egg corrals, Tepehaujes and Osteones, had data loggers placed at mid-nest depth for select Kemps Ridley nests to record the nest temperature (in-situ nests). Utilizing an embryo growth model, the sex ratios were predicted using the nest temperatures recorded. From the Tepejaujes (n = 10) and Osteones (n = 11) nests, both nesting sites were predicted to have a predominantly large female bias. An increase of females without an increase of males can result in a smaller number of mating pairs. This female bias mirrors estimated global climate changes being warmer and is indicative to future Kemps Ridley generations that will continue the population in the Gulf of Mexico.

I. BIOLOGICAL SCIENCES

A Paper Presentation

Impacts of Tank Space and Stocking Density on Growth and Energy Allocation in the Sea Urchin Lytechinus variegatus. Raven Edwards, University of Alabama at Birmingham; Jami de Jesus, UAB; Jeri Brandom, UAB; Michael Williams, UAB; Victoria Gibbs, UAB; Stephen Watts, UAB .

Widespread use of sea urchins as biomedical models comes with widespread protocols, which necessitates standardization and will require the optimization of husbandry practices for lab-scale culture. Propagation should be efficient to maximize use of limited space, often comprised of small tanks in recirculating aquaculture systems. It is important to quantify the impacts of tank environment on growth and reproductive outcomes. We evaluated the impacts of tank size (estimated by available surface area) and stocking density on somatic weight gain and gonad development in urchins fed a formulated diet over a nine-week period. Eighty adult Lytechinus variegatus (ca. 34-g , 40-mm diameter) were collected from St. Joseph Bay in T.H. Stone Memorial Park. Statistic tests performed were ANCOVAs in RStudio. Increased tank surface area was correlated with more efficient dry matter production ($p < 0.01$), but preferential resource allocation among the test, lantern, gut, or gonad was not observed. Increased stocking densities resulted in decreased dry matter production ($p < 0.01$), with resource allocation shifting away from gonad ($p < 0.01$) in favor of increasing somatic skeleton mass, specifically increasing dry mass of the test ($p < 0.01$). As stocking density increased, allocation to gonad production decreased and increased variance in feed conversion ratio and production efficiency increased, possibly due to competition. This study showed that limited space and increased organismal interactions potentially act as environmental stressors and can impact growth outcomes at laboratory scale culture.

I. BIOLOGICAL SCIENCES

A Paper Presentation

Interaction study of the developmental effects of sodium fluoride and sodium selenate on Ambystoma maculatum embryos. Shelby Wolfram, Jacksonville State University; James Rayburn, Jacksonville State University; Grover Brown, Jacksonville State University; Micheal Burns, Jacksonville State University.

Amphibians play critical roles in the environment. Fluoride (F) exists widely within the environment. It is commonly known for being added to drinking water and as a topical dose on teeth. Selenium (Se) can be found in organic and inorganic forms in nature. It is commonly used as a fertilizer. Ambystoma are a native species that could be used to assess effects on native species compare model species. The objective in this study is to determine the interactions effects on developmental toxicity of sodium fluoride, sodium selenate, and a mixture combination on native amphibian embryos. Various concentrations of sodium fluoride, sodium selenate, and a mixture were exposed to populations salamander embryos. The assay lasts 12-day holding 10 embryos in large, deep petri dishes per replicate. Mortalities were counted for each day. Water changes were performed every other day. Mortalities and malformations were counted on the last day of the assay and embryo length were measured. Means, standard error, probit analysis (LC50 and EC50(malformation)), ANOVA and Bonferroni's post hoc test were calculated using Systat. Isobole diagrams were used to determine if the chemicals showed synergism, antagonism, response addition, or concentration response. The overall LC50, EC50 for F and Se was 540.39, 862.26 and 53.06, 69.21 mg/L respectively. The mixture showed response addition. Malformations such as stunted growth, edemas, loose gut, hemorrhages, bent notochords, and kinked tails were seen in both selenate, fluoride, and mixture. Overall, these assays show the usefulness of the Ambystoma embryos as a model species for native amphibians.

I. BIOLOGICAL SCIENCES

A Paper Presentation

Ecology and Seasonal Movements of Eastern Chicken Turtles in Southern Alabama. Andrew Coleman, Talladega College; Scott Rush, Mississippi State University.

The Eastern Chicken Turtle (Deirochelys reticularia reticularia) is a historically understudied species, and no published study has been conducted in Alabama. Most information about eastern chicken turtle ecology and movements have been obtained from populations in South Carolina. The present study utilized acoustic telemetry to examine the seasonal habitat use of a population in the Conecuh National Forest in southern Alabama. Chicken turtles are known to use a variety of lentic systems, including seasonally ephemeral ponds as well as longer-sustained waterbodies. Because their favored aquatic habitats will regularly lose water during warmer months, chicken turtles will leave ephemeral ponds to aestivate in terrestrial refugia, sometimes, for extended periods. To-date, nine turtles (four females and five males) from the same pond have been fitted with an acoustic tag. Of the nine, three were still transmitting in the pond in early January, while most had appeared to leave the pond in October 2023. These data are expanding the knowledge base on this unique aquatic turtle as well as provide managers important information about seasonal movements that can help them plan prescribed burns,as well as other forest management activities ensuring minimal impact on these turtles.

I. BIOLOGICAL SCIENCES

A Paper Presentation

Translation Deregulation in Mutant p53 Cancer. Le Su, Jacksonville State University; Jessica Arriaga-Aguilar, Jacksonville State University.

The p53 tumor suppressor is the most commonly mutated gene in human cancer. Mutant p53 proteins not only lose their anti-cancer activity, but also gain novel oncogenic function through interaction with other proteins. At present, how mutant p53 function can be rectified with existing anti-cancer drugs remains largely unclear, nor has any therapeutic target been discovered in mutant p53 protein complexes. Using mass spectrometry-based proteomics, we identify the ribosome as a mutant p53 cofactor in patient-derived pediatric sarcoma cells. This novel interaction physically occurs in the cytoplasm and functionally stimulates aberrant translation of the c-Met proto-oncogene promoting cancer cell survival. To extend our findings beyond sarcoma biology, we have further confirmed mutant p53 interaction with the ribosome as well as elevated c-Met protein expression in many types of cancer (including breast cancer, lung cancer, ovarian cancer and pancreatic cancer). Notably, we have also used both genetic and pharmacologic approaches to blocking c-Met kinase activity and found significant efficacy of c-Met inhibition for mutant p53 cancers. Taken together, our studies pinpoint a previously unknown but biologically important connection between mutant p53 and translational control of the cancer-causing c-Met gene, and provide exciting evidence for using clinical c-Met inhibitors as an effective treatment option for cancer patients with p53 mutation.

I. BIOLOGICAL SCIENCES

A Paper Presentation

Studying the Transfer of Antibiotic Resistance Genes within the Microbiome. Isabella Parkhurst, University of Alabama at Birmingham; Anuradha Goswami, University of Alabama at Birmingham; J. Jeffrey Morris, University of Alabama at Birmingham.

The World Health Organization estimated that antibiotic-resistant bacteria may cause up to 10 million deaths each year by 2050. It is more imperative than ever to intervene in dissemination of antibiotic-resistant genes (ARGs). Metagenomics identify the functional gene composition of microbial communities yet high complexities in environmental samples could lead to false-positive results. Moreover, understanding ARGs dissemination in metagenome is still challenging. We aim to reduce noise e.g. free environmental DNA contamination by developing a laboratory protocol that identifies mobile ARGs present in the environment. We tap into conjugative plasmid present in the environment which is capable of horizontal gene transfer (conjugation). The transconjugants of E. coli from leachate samples (contaminated environmental samples) was obtained by membrane bound conjugation experiment facilitating Horizontal Gene Transfer (HGT). The plasmid from leachate was transferred to non-resistant E. coli by a mere contact between the membrane. The pore size of the membrane was sufficient for pilus formation which is necessary for conjugation. This protocol has been validated through trials that have been completed, with the transconjugants of these trials having been categorized and studied. The transconjugants exhibited resistance to Kanamycin and will be utilized to study mobile ARG-carrying conjugative plasmids contributing to ARG dissemination in the environment.

Keywords: Antibiotic Resistance Genes, Horizontal Gene Transfer, Conjugative Plasmid

I. BIOLOGICAL SCIENCES

A Poster Presentation

A Comparative Study of a Non-Small Cell Lung Cancer-associated EGFR Missense Variant of Uncertain Significance. Vanessa Mejia, Jacksonville State University; Logan Pitts; Zainub Kaleem, Taylor Cockrell, Ashley Turner, Ph.D.

Non-small cell lung cancer (NSCLC) is a form of lung cancer driven by the heightened activity of epidermal growth factor receptor (EGFR). Genetic variants in EGFR have been identified that lead to abnormal cell growth and tumorigenesis. The objective of this study is to explore and provide insight on the evolutionary conservation of the EGFR gene across species, identifying conserved missense variants of uncertain significance (VUS) loci associated with NSCLC. In C. elegans, the gene ortholog is let-23. Through ClinVar, the EGFR VUS, EGFR c.845G>C(p.Gly282Ala) was identified in a conserved loci through multiple sequence alignments via Benchling. The application of bioinformatics tools was conducted through the analysis of amino acid chemical properties and PolyPhen-2. PolyPhen-2 predicts the VUS to be probably damaging to the encoded protein (HumDiv = 0.999). In addition, protein models were designed to examine potential structural changes between the mutant and wildtype encoded human and nematode proteins. Further investigation will examine the VUS in vivo through C. elegans let-23 ortholog. DNA primers were designed and optimized through PCR, amplifying the EGFR VUS loci in nematode let-23. To target let-23, a CRISPR RNA guide was designed. The RNA guide will be used for future molecular genetic experimentation where the CRISPR-Cas9 reagents will be microinjected to generate the VUS-let-23 C. elegans strain. This study aims to provide a comprehensive evaluation of a NSCLC-associated VUS, elucidating its clinical significance on the implication for cancer and human health

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I. BIOLOGICAL SCIENCES

A Poster Presentation

Exploring the pathogenicity of a type 2 diabetes mellitus associated INSR missense variant of uncertain significance through daf-2 in the C. elegans model. Brittany White, Jacksonville State University; Ashley Turner, Jacksonville State University; Trinity Elston, Jacksonville State University.

Type 2 diabetes mellitus is hallmarked by insulin resistance, with the INSR gene identified as a key player in this condition. This gene is known to harbor genetic variants with a wide range of clinical significance from pathogenic to variants of uncertain significance (VUS). This project investigates a VUS identified through ClinVar. The missense VUS was located at INSR c.1628C>T (p.Thr543Met). PolyPhen-2 predicted this variant to be probably damaging, assigning a HumVar score of 0.954. The ortholog VUS loci was identified in the C. elegans at daf-2 c.2084C>T (p.Thr698Met). Evolutionary conservation of the VUS loci was confirmed through multiple sequence alignment in Benchling. The mutation induces a class change from the polar, hydrophilic amino acid threonine to the nonpolar, hydrophobic amino acid methionine. Utilizing SWISS-MODEL, homology-based protein models were generated for both wildtype and VUS mutant proteins. Subsequent bioinformatic analysis in PyMOL revealed an RMSD value of 0.001. The affected amino acid resides in the extracellular alpha subunit, which may contribute to its potential pathogenicity. To understand the in vivo implications of this structural alteration, we will observe phenotypic differences between a wildtype N2 C. elegans strain and a CRISPR-Cas9 engineered variant strain carrying the daf-2 mutation. Expected phenotypic variations encompass dauer formation, enhanced stress resistance, and increased lifespan. This research aims to elucidate the functional changes of the INSR variant and provide valuable insight into its role in the context of insulin resistance and type 2 diabetes mellitus.

I. BIOLOGICAL SCIENCES

A Poster Presentation

Exploring the Functional Significance of a YAP1 Missense Variant of Uncertain Significance (VUS) in Caenorhabditis elegans. Nathan Jones, Jacksonville State University; Ashley Turner, Jacksonville State University.

Polycystic ovary syndrome (PCOS) is a complex disorder with various implications, such as polycystic ovaries, visceral obesity, and increased risk of cancer. YAP1 was recently identified as a gene of interest in the development of PCOS. Researchers have established that single nucleotide variants (SNVs) in YAP1 are likely to play a role in PCOS development. This study aims to provide insight into the potential impact of a YAP1 variant of uncertain clinical significance (VUS). Studies in C. elegans have established yap-1 as a nematode ortholog. A YAP1 VUS was identified through ClinVar, YAP1 c.1015A>G (p.Asn339Asp). Evolutionary conservation of the VUS loci was confirmed using multiple sequence alignments in Benchling. Bioinformatics analysis was carried out using amino acid chemical properties and PolyPhen-2. PolyPhen-2 predicts this variant to be likely pathogenic (HumDiv score of 0.982). These findings supported further investigation and we sought out to examine the VUS in vivo through the C. elegans yap-1 ortholog and model. DNA primers were designed and optimized using PCR to amplify the YAP1 VUS loci in nematode yap-1. A CRISPR RNA guide was designed and obtained to target yap-1. Future bioinformatic experimentation will include protein modeling to examine potential structural changes between encoded wildtype and mutant proteins. Future molecular genetic experimentation will include microinjection of CRISPR-Cas9 reagents to generate the VUS-yap-1 C. elegans strain and screening and phenotyping of the identified mutant VUS animals. This study aims to provide an assessment of the YAP1 VUS shedding light on its clinical significance.

I. BIOLOGICAL SCIENCES

A Poster Presentation

Effects of Vitis vinifera Seed Extract on Short-term Memory of Amyloid-beta-mediated neurodegeneration in Transgenic Caenorhabditis elegans. Elise Patrick, Jacksonville State University; Ashley Turner, Jacksonville State University.

Alzheimer's disease (AD) is a neurodegenerative condition that is a common cause of dementia and a growing concern worldwide with no effective treatment or cure. Two AD hallmarks include a buildup of amyloid beta (Aβ) plaques and neurofibrillary tangles in the brain. Recent attention has turned to exploring natural chemicals and compounds for AD symptom relief and treatment. Vitis vinifera grape seed extract (GSE) contains many beneficial substances. GSE has been tested in several animal models and shown to improve memory and is even currently being examined as a treatment in an AD human clinical trial. In this study, we aim to examine the potential neuroprotective effects of V. vinifera GSE on Aβ-mediate neurodegeneration in transgenic Caenorhabditis elegans. We will explore the potential preventative and treatment benefits of GSE. We propose to utilize a C. elegans AD strain human Aβ1-42 expression in glutamatergic neurons that displays progressive, age-dependent neurodegeneration. Behavior and memory will be measured in both preventative and treatment experiments utilizing a short-term memory 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 3 concentrations of GSE or vehicle control. This study proposes to gain more insight into the preventative and treatment benefits of GSE on Aβ-mediated neurodegeneration and memory in a C. elegans AD model. It is important to begin to unravel and understand the potential positive impacts of natural chemicals and compounds on complex neurological disorders.

I. BIOLOGICAL SCIENCES

A Poster Presentation

Streptococcus agalactiae Effect on Breast Cancer Resistance Protein in Brain-Like Endothelial Cells.
Alexandra Meyer, University of Alabama; Brandon Kim, University of Alabama.

The blood-brain barrier (BBB) is a collection of blood vessels that are composed of highly specialized brain endothelial cells (BECs). These blood vessels sustain homeostasis in the central nervous system (CNS) by maintaining separation between the blood and the CNS, regulating what is able to enter and exit the brain. The BBB keeps tight control over the nutrients, electrolytes, and oxygen allowed into the CNS while keeping toxins, bacteria, and other pathogens at bay. BECs carry out these functions through a collection of tight-junction proteins, efflux transporters, and nutrient transporters. Breast Cancer Resistance Protein (BCRP) is an efflux transporter found at the BBB that is able to efflux a large variety of substrates out of the CNS and into the bloodstream. Streptococcus agalactiae, or Group B Streptococcus (GBS), is a bacterium that can bypass the BBB's defenses and invade the CNS, causing bacterial meningitis. Bacterial meningitis is an infection of the CNS that occurs when bacteria disrupt the BBB and cause inflammation in the CNS. Since GBS is the leading cause of neonatal meningitis, it is extremely pertinent to understand its mechanism of invasion. However, many of the exact mechanisms that enable GBS to breach the BBB remain unknown, which establishes the foundation for this project. This study will investigate the interaction between GBS and BCRP, determining if GBS infection is able to alter BCRP function.

I. BIOLOGICAL SCIENCES

A Poster Presentation

The Effect of Genetics, Sex, and a Methionine Restricted Diet on the Oxidative Stress Response in D. melanogaster. Joshua Smith, University of Alabama at Birmingham; Steven Austad, UAB.

Increased life expectancy in the 21st century is producing a rapidly aging population that will have a unique societal impact on how we view and address health and socioeconomic problems of aging. Many researchers seek to address these problems by understanding and developing methods to intervene in the aging process to lengthen the number of healthy years individuals can expect to live. Restriction of the essential amino acid, methionine, has been shown to significantly extend the lifespan of common laboratory model organisms including Saccharomyces cerevisiae, Mus musculus, and Drosophila melanogaster. Recent studies suggest that methionine restriction may partially alter the aging process through a reduction in organismal oxidative stress, leading to improved lifespan as well as a reduction in debilitating aging-associated pathologies. However, a number of questions remain as to how and to what extent MR influences the oxidative stress response and its relation to longevity across sexes and genetic backgrounds. This study aims to characterize the response of the oxidative stress response to a methionine restricted diet by utilizing a selection of short and long-lived strains from the Drosophila Genetic Reference Panel (DGRP). Our results suggest that methionine restriction can extend lifespan independently of an enhanced oxidative stress response.

I. BIOLOGICAL SCIENCES

A Poster Presentation

Depakote-Induced Pancreatitis in a 12-Year-Old Male with Complex Psychiatric Comorbidities. Neil Vuppala, Alabama College of Osteopathic Medicine; Kamran Ather, Alabama College of Osteopathic Medicine; Soumya Sidana, Alabama College of Osteopathic Medicine.

Introduction:

This case delves into the complex medical history of a 12-year-old male marked by a diverse range of psychiatric conditions, including bipolar disorder with psychosis, autism spectrum disorder, ADHD, and generalized anxiety disorder. Central to this case is the unforeseen and severe reaction to Depakote, a medication widely used to manage psychiatric illnesses, culminating in acute pancreatitis.

Depakote, or valproate, is a medication crucial for treating various psychiatric disorders, including bipolar disorder and mood-related symptoms associated with autism spectrum disorder. However, this essential treatment is not without its potential pitfalls. This case report highlights the intricate interplay between psychiatric conditions, medication management, and unforeseen medical complications and underscores the importance of identifying and addressing adverse drug reactions. Specifically, it sheds light on the risks of Depakote therapy, such as its propensity to induce pancreatitis.

Case Presentation:

The patient was urgently admitted to the ICU as his disposition was characterized by labored breathing, heightened blood pressure, erratic heart rate, and profound alterations in mental status. The patient's Depakote levels were measured at an alarming 180 mcg/mL in addition to a conspicuous elevation in pancreatic enzyme levels. The patient's condition continued to deteriorate throughout his hospitalization, culminating in a manic episode that harmed hospital staff. In response, all medications were discontinued, and he was relocated to the Pediatric ICU. Zyprexa was restarted on the second day of hospitalization. However, the patient remained predominantly non-verbal, with minimal interaction, and exhibited a steadfast aversion to nourishment. By the ninth day, his pancreatic enzyme levels improved, and by the fifteenth day, he showed significant progress, leading to discharge.

Discussion:

This case report emphasizes the need for vigilant monitoring to address unanticipated medical complications during the care of pediatric patients grappling with intricate psychiatric disorders. It further characterizes the significance of promptly addressing medication-induced adverse effects and

accentuates the risks of Depakote therapy, specifically its potential to induce pancreatitis. It highlights the importance of diligent monitoring, astute management, and swift intervention when facing unforeseen medical complications.

I. BIOLOGICAL SCIENCES

A Poster Presentation

A Mechanism for Doxycycline Resistance in a Probiotic. Brad Bennett, Samford University; Sarah Frances Little, Samford University; Ansley Applestone, Samford University; Kwadwo Antwi-Fordjour, Samford University; Drew Hataway, Samford University.

Probiotics, live microbes in certain foods such as yogurts, interact in a mutualistic way with humans. 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 (0.1X MIC) of doxycycline. Compared to controls, L. plantarum exposed to sub-lethal antibiotic levels showed an increase (~4-fold) in the inhibitory concentration, suggesting modest doxycycline resistance emerged over time. When the selection pressure was removed (no doxycycline), resistance was lost rapidly, in ~100 generations, with the inhibition profile 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 being investigated by whole genome sequencing (WGS). We found that column-based purification during genomic DNA extraction from L. plantarum samples produced purity necessary for WGS. Analysis of the single nucleotide variants (SNVs) identified in the WGS of the generation 1000 doxycycline-treated cultures reveal 7 distinct variants. Two of these variants are in the rpsJ gene, which encodes ribosomal protein s10, a component of the 30S ribosomal subunit. This gene has been previously reported to harbor mutations associated with tetracycline resistance. Importantly, these variants are not observed in the generation 1200 sequences.

I. BIOLOGICAL SCIENCES

A Poster Presentation

2-oxphytodieonic Acid Primes Induced Systemic Resistance in Cottons. Sang-Wook Park, Auburn University; Ashna Adhikari, Auburn University; Simrandeep Kaur, Auburn University .

In plants, trade-offs between growth & 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 broad-spectrum disease resistances without the usually accompanied growth penalty. Here, we i) Screened and isolated the ISR-inducible PGPR strains, Bacillus subtilis and Pseudomonas oryzahabitans. 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 Protein (PR) 1 and 5, 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 Presentation

Cathepsin L Inhibitor Enhances Sorafenib's Efficacy on Hepatocellular Carcinoma. Olamide Crown, University of Alabama in Huntsville; Bosede Kolawole, Jackson State University, Jackson MS; Olawale Adeyinka, ; Victor Ogungbe, .

Hepatocellular Carcinoma (HCC) is a highly lethal form of liver cancer with a poor prognosis, especially in advanced cases. Despite the approval of newer treatments over the past decade, issues related to efficacy, toxicity, and drug resistance persist. Hence, there is a crucial need to develop novel and effective chemotherapeutic agents for HCC. In this work, the antiproliferative actions of two cathepsin L inhibitors and a combination of one of the cathepsin L inhibitors with Sorafenib (SOR), a kinase inhibitor, were studied using in vitro assays and xenograft assays in mouse models. In addition, the ability of the compounds to inhibit cathepsin B and generate ROS in HCC cell lines was investigated. The results revealed that the inhibitors have antiproliferative effects on HCC cell lines, Hep G2 and Hep 3B, with low micromolar IC50 values. Combining Sorafenib with one of the inhibitors produced additive antiproliferative effects on in vitro cell culture assays. In addition, one of the inhibitors preferentially inhibited recombinant and endogenous cathepsin L over cathepsin B in a time-dependent manner. In mice, the cathepsin L inhibitor and the combination with SOR significantly reduced subcutaneous tumor sizes without gross toxicity, leading to improved survival. Transcriptomics analysis using RNA-Seq unveiled a time- and dose-dependent enrichment of the cell migration pathway, along with overexpression of genes linked to apoptosis and cell structural organization in cells treated with the cathepsin L inhibitor. Overall, combining the cathepsin L inhibitor with Sorafenib warrants further investigation as a potential chemotherapy against HCC.

I. BIOLOGICAL SCIENCES

A Poster Presentation

Significant new population of Florida Willow (Salix floridana Chapman) discovered in Pike County, Alabama. Alvin Diamond, Troy University.

Florida Willow is a native deciduous tree in the Willow family (Salicaceae). It is ranked as an S1 species in Alabama, and globally as a G2 species. Prior to this discovery it was known from three counties in southern Alabama (Butler, Covington, and Houston), 4 counties in Georgia, and 14 counties in Florida. The habitat of this species is restricted to seeps and forested wetlands along spring runs. This new population was discovered on April 11, 2022. Later surveys of the population documented over 150 individuals of both sexes and various sizes from mature flowering trees to saplings. This population extends for approximately 1,500 feet along both sides of a small sand-bottomed spring run, making it the largest known population in Alabama. Currently, there are 35 extant populations of Florida Willow with most located in the central portion of the Florida peninsula. This species is threatened by habitat destruction due to impoundment, stream channelization, sedimentation, and clearcutting for conversion to pine plantations. Additional threats include herbicide use (in forestry and to maintain powerline and road right-of-way's) and browsing by deer and domestic livestock.

I. BIOLOGICAL SCIENCES

A Poster Presentation

A leatherback sea turtle (Dermochelyidae) from the Lower Oligocene (Rupelian) Byram Formation of Alabama, USA. Andrew Douglas Gentry, University of Alabama at Birmingham; Kimberly Gregson, Alabama School of Math and ScienceAlabama School of Math and Science.

The family of leatherback sea turtles (Dermochelyidae) has only one extant representative (Dermochelys coriacea) but leatherback species richness was considerably higher during the Paleogene with seven recognized genera and at least three distinct lineages. Attempts to resolve the phylogeny of Dermochelyidae are routinely impeded by low specimen counts for fossil taxa, largely incomplete fossil specimens, and the resulting lack of phylogenetically informative characteristics that can be derived from the available fossil material. Here we report a nearly complete dermochelyid carapace recently recovered from the Lower Oligocene (Rupelian) Glendon Limestone Member of the Byram Formation in Monroe County, AL. This specimen represents the first Oligocene dermochelyid described from Alabama and one of the most complete fossil leatherbacks currently known. The preserved carapace is nearly 1.5 meters in length and consists of the typical mosaic of bony ossicles characteristic of dermochelyids. This specimen provides an opportunity to test the validity of diagnostic character suites proposed for historically described species of fossil leatherback and enables more in-depth analyses of dermochelyid osteology and phylogeny than have previously been possible.

I. BIOLOGICAL SCIENCES

A Poster Presentation

A basilosaurid whale from the Lower Oligocene (Rupelian) of Alabama, USA. Andrew Douglas Gentry, University of Alabama at Birmingham; Lindsey Stallworth, Alabama School of Math and ScienceAlabama School of Math and Science.

Cetaceans belonging to the family Basilosauridae are well-known members of the Eocene marine fauna of both the Gulf Coastal Plain and Atlantic Coastal Plain. Numerous cladistic studies of these animals have demonstrated their evolutionary significance by placing them as not only the first fully aquatic cetaceans but also as the direct ancestors of modern Mysticeti and Odontoceti. Although numerous Eocene occurrences of basilosaurids have been reported from the southeastern United States, there are almost no post-Eocene records for this clade outside of the southern Atlantic Coast. Additionally, of the three currently recognized North American basilosaurids, only one has been thoroughly described (Basilosaurus cetoides). Here we report the first Oligocene occurrence of a basilosaurid cetacean from the Gulf Coastal Plain. The fossil was recovered from the lowermost marl of the Red Bluff Formation just above the underlying contact with the Upper Eocene Shubuta Clay Member of the Yazoo Formation, constraining the maximum age of the specimen to roughly 33.9 Ma. Although not yet fully excavated, we tentatively refer this specimen (ASMS-1201) to Zygorhiza sp. based on the length of the left mandibular ramus, the presence of a moderately high coronoid process of the mandible, and the size of the posterior accessory denticles of premolar 3 (Pm3) relative to the primary cusp. This specimen helps fill a temporal gap in the record of North American basilosaurids and may reveal new anatomical insights into this poorly described cetacean.

I. BIOLOGICAL SCIENCES

A Poster Presentation

A Comprehensive Overview of Research Methodologies for determining the association between water quality and freshwater fish health: A global perspective. Maya Seesholtz, Jacksonville State University; Lori Tolley-Jordan, Jacksonville State university.

Although there are documented relationships between poor water quality and freshwater fish health, the scientific approaches utilized to establish these links are poorly understood. We gathered peer-reviewed scientific articles with the keywords water quality and freshwater fish. We evaluated research methodologies (surveys, field empirical studies, and loratory hypothesis testing) to determine the most common method and study outcome (positive, negative, or mixed results). We found 35 scholarly publications published between 1996 and 2023, with the majority of studies taking place in Europe and Asia. The majority of studies (65.7%) utilized a deductive lab study design, followed by fieldwork (20%) and empirical lab (5.7%). The percentages of the major factors from the studies were as follows, heavy metals (37.2%), microplastics (25.6%), pesticides and fertilizers (11.6%). The characteristics that defined health rates were mortality (45.8%), behavior and physical abnormalities (10.4%), and bioaccumulation (33.3%). Regardless of the study design or water quality measure, the majority of studies found a negative relationship between deterioration in water quality and fish health. This synthesis concluded that more research on water quality deterioration and fish health is needed in North America, as well as the establishment of a global standard value for each water quality indicator to assess the degree of water quality degradation across regions. Understanding the relationship between the quality of water as well as freshwater fish health is critical for the successful preservation and administration of freshwater systems globally.

I. BIOLOGICAL SCIENCES

A Poster Presentation

A comparison of the distribution and concentration of antibiotics in two streams in Jefferson County, Alabama. MacKinzie McCravy, Samford University; Sadie Wright, Samford University; Kate Morgan, Samford University; Brad Bennett, Samford University; Drew Hataway, Samford University.

Antibiotic resistance remains a global threat to human health and the ability to combat infectious disease, and the even low antibiotic concentrations within surface water can threaten the ecosystem and cause the rise and spread of antibiotic-resistance genes. Sources of antibiotics within waterways include effluents of hospitals, wastewater treatment plants, and agricultural runoff, and there are often regional differences in waterway antibiotic concentrations. Often, regional differences translate to differences in antibiotic concentrations in different socioeconomic areas, magnifying the health disparities experienced by those disadvantaged populations. The present study quantified the amounts of seven common antibiotics in two different waterways in Jefferson County, Alabama: Five Mile Creek and Shades Creek. Samples from Five Mile Creek were taken both upstream and downstream of Five Mile Creek Wastewater Treatment Plant and were from an area of greater socioeconomic disadvantage. Samples from Shades Creek were from an area of lesser socioeconomic disadvantage. Compounds were isolated using solid phase extraction prior to liquid chromatography-mass spectrometry analysis and were compared to control standards in DI water. Of the seven antibiotics that were screened for, five were detected in stream surface water of both waterways: Azithromycin, Amoxicillin, Doxycycline, Cephalexin, and Sulfamethoxazole from 0.5 ng/mL to 200 ng/mL. There was an increase in concentrations downstream of the wastewater treatment plant point source.

I. BIOLOGICAL SCIENCES

A Poster Presentation

Molecular genetic analysis of congenital stationary night blindness associated TRPM1 genetic variants of uncertain significance in humans and horses utilizing Caenorhabditis elegans. Victoria Moses, Jacksonville State University; Gabrielle Davis, Auburn University; Sara Morris, Jacksonville State University; Ashley Turner, Jacksonville State University

Congenital stationary night blindness (CSNB) is a collection of genetic diseases affecting the eyes and vision in humans and horses. In horses, genetic mutations in TRPM1 also result in a leopard-spotted coat pattern. Studies of Caenorhabditis elegans have revealed the nematode ortholog gon-2. If a TRPM1 missense variant has been associated with CSNB in humans and horses, then the genetic variant could result in gon-2 dysfunction and a phenotype in the mutant nematode. Identification of conserved variants of uncertain significance (VUS) within the TRPM1 were identified in both humans and horses. The human and horse TRPM1 genes, along with the nematode gon-2 gene were used to identify I875V VUS at the human TRPM1 location. Future experiments include generating a CRISPR-Cas9-engineered C. elegans model containing the TRPM1 missense VUS in the nematode loci of gon-2 for in vivo assessment. Primers were designed and used to amplify the I875V VUS region in C. elegans using polymerase chain reaction (PCR), gradient PCR, and gel electrophoresis. Gradient PCR was carried out to identify the optimal annealing temperature for a single band PCR product and a large PCR reaction was generated for an in vitro CRISPR-Cas9 experiment followed by microinjection. Ultimately, we plan to analyze phenotypic differences present in the mutant nematode strain when the gon-2 gene is edited with the TRPM1 VUS; focusing on the impact of gonadal and vulva development. This study will provide in vivo assessment of this CSNB-associated VUS shedding light on its clinical significance for humans and horses.

I. BIOLOGICAL SCIENCES

A Poster Presentation

Global Scale Effects of Pollution and Parasitism on Freshwater Fish Health: A Review.. Lori Tolley-Jordan, Jacksonville State University; Kathleen Madden, Jacksonville State University; Tori Tolley-Jordan, Jacksonville State University.

The negative effects of pollution on declines in diversity and impaired health are well described in freshwater systems worldwide. However, the interaction between anthropogenic stressors and parasites on fish health is less well studied. We conducted a survey of published literature to determine the number of studies, approaches, and the interaction between parasite infection and pollution on freshwater fish health. By using search terms including metals, pollution, freshwater, parasites, fishes, and physiology in literature search engines, we compiled a collection of scientific studies. Studies were classified into years published, location by global region, study design (field surveys, laboratory studies), pollutant type (metals, microplastics, or chemicals), and fish health response (physiology or immune). For this review, all parasite types were combined. The most widely used study approach was survey based and most focused on the combined effect of parasites and pollution on fish physiology and immune responses. More research is needed in other regions of the world and laboratory studies to test the results found in the field studies. Also, other measures of fish health are needed to understand the relationships of pollution and parasitism. Finally, as fishes are parasitized by a wide variety of organisms from bacteria to different types of worms, the negative effects of parasitism on health may not be equal across all parasites. Literature surveys such as this uncover data gaps in the science of this topic and promote continued research to fully understand the combined effects of pollution and parasitism on the health of freshwater fishes.

I. BIOLOGICAL SCIENCES

A Poster Presentation

Genetic Assessment of Familial Hemiplegic Migraine Type 1 Associated CACNA1A Variants of Uncertain Significance in Caenorhabditis elegans. JoAnna LaPoint, Jacksonville State University; Kritika Marharjan, JSU; Ashley Turner, JSU.

General migraine disorder represents a set of complex neurological disorders affecting 15% of the world's population. In this study, the focus will be a genetic investigation of familial hemiplegic migraine type 1 (FHM1). The potential pathogenicity of variants of uncertain significance (VUS) identified in FHM1 patients in the human gene CACNA1A will be examined. CACNA1A codes for voltage gated calcium channels (VGCC). In Caenorhabditis elegans, only a single gene (unc-2) encodes for a single VGCC subunit called UNC-2/CaV2α. Specifically, this study examines a missense VUS that we discovered to be conserved from human (CACNA1A) to C. elegans (unc-2). Preliminary genetic and evolutionary conservation analyses suggest structural impact for this VUS, warranting further in silico and in vivo investigation. Protein modeling will be carried out to examine the potential structural impact of the CACNA1A VUS on the mutant protein compared to the wildtype protein. Additionally, a CRISPR-Cas9-engineered C. elegans model containing the CACNA1A missense VUS in the nematode loci of unc-2 is being proposed. Two sets of DNA primers have been designed and are being tested to amplify the VUS region in unc-2 using polymerase chain reaction (PCR) and gel electrophoresis. CRISPR RNA guides will be designed to target unc-2 and will be used in future microinjection experiments. A PCR assay will be optimized to be utilized for downstream screening and genotyping to identify the unc-2 VUS C. elegans strain. This mutant strain will allow for further in vivo investigation of the missense VUS in the C. elegans model.

I. BIOLOGICAL SCIENCES

A Poster Presentation

The State of the Science: Wetland degradation worldwide and its effect on Herpetofauna biodiversity.

Jalen Scott, Jacksonville State University; Lori Tolley-Jordan, Jacksonville State University.

Wetlands are an important part of aquatic systems due to their natural filtration systems, Carbon sequestration, and their ability to provide habitat for thousands of species, including amphibians. Currently, only 50% of wetlands remain globally and are contributing to the globally unprecedented extinctions of amphibian populations, which are dwindling by 3.79% each year. In order for advancements in further conservation efforts, it is critical to compile a summary of existing information in relation to the link between wetlands and amphibian diversity. This will aid the identification of necessary studies to propel the field forward. Therefore, I evaluated research approaches in published, peer-reviewed papers to summarize the state of the science at a global scale. The methods included using keywords such as 'wetland restoration', 'wetland biodiversity', and 'amphibian biodiversity' to select papers that were subsequently compiled into categories. Wetlands were categorized by wetland type, size, health, and conservation, while amphibians were categorized by diversity indices, population size, and recruiting averages. First, I recorded dates of publication and large-scale geographical region, based on the scientific approaches used (survey, empirical-field, field-hypothesis testing, lab hypothesis-testing and modeling. I later found that most papers included information on wetland type, size, health, and conservation management with respect to wildlife diversity, including amphibians, due to them being excellent indicator species.

I. BIOLOGICAL SCIENCES

A Poster Presentation

A review of freshwater quantity and quality challenges and effects on the conservation and regulatory needs in Small Island Developing States. Christian Strachan, Jacksonville State University; Dr. Lori Tolley-Jordan, Jacksonville State University.

The common characteristic of small island developing nations (SIDS) is their socioeconomic and environmental susceptibility to natural catastrophes and climate change. They frequently lack the resources necessary to provide freshwater supply services. Many islands have no surface water resources and rely on limited groundwater resources in the form of thin freshwater lenses. Their groundwater is vulnerable to saltwater intrusion since it is surrounded by ocean. Peer reviewed articles along with various reports were evaluated with varying research methodologies

surveys, field empirical studies, and laboratory hypothesis testing) with keyword being water quality, water demand and water scarcity.

The purpose of this research is to provide light on this diminishing resource, examine the numerous variables that contribute to its depletion, and determine what must be done to assure a sustainable supply of water.

I. BIOLOGICAL SCIENCES

A Poster Presentation

Using 18S rDNA metagenomic sequencing to identify the animal components of tree bark microecosystems. Madison Hardegree, Samford University; David Johnson, Samford University.

In a class project, 18S rDNA metagenomic sequencing was performed on three lichen- and moss-covered tree bark samples. DNA was extracted from the samples and a DNA segment was PCR-amplified using universal 18S primers. Amplicons were sent for metagenomic sequencing to CD Genomics. The animal components of these three communities included insects, nematodes, tardigrades, rotifers, and vertebrates (possibly from fertilizer). The possible roles of these animals in the three communities were discussed.

I. BIOLOGICAL SCIENCES

A Poster Presentation

Using 18S rDNA metagenomic sequencing to identify potential lichen components of tree bark microecosystems. Karis Williamson, Samford University; David Johnson, Samford University.

In a class project, 18S rDNA metagenomic sequencing was performed on three lichen- and moss-covered tree bark samples. DNA was extracted from the samples and a DNA segment was PCR-amplified using universal 18S primers. Amplicons were sent for metagenomic sequencing to CD Genomics. From the sequence results, it was found that ascomycete and basidiomycete fungi and chlorophyte algae made up a significant percentage of the total sequences. BLAST searches of the specific fungal and algal sequences revealed the specific organisms present. Literature searches of these sequences were used to identify which possible lichens (which fungus and algae combinations) might be present in the samples. These were compared with photographs of the sample lichens to identify possible lichens present.

I. BIOLOGICAL SCIENCES

A Poster Presentation

Using 18S rDNA metagenomic sequencing to elucidate tree bark microecosystems: A class molecular biological ecology exercise. Isaac Hennessey, Samford University; David Johnson, Samford University.

The first step in understanding an ecosystem is a complete identification of the components of that ecosystem. In an attempt to gain a thorough knowledge of the eukaryotic-community components of microecosystems, 18S rDNA metagenomic sequencing was used to identify as many OTUs of three lichen- and moss-covered tree bark samples as possible. DNA was extracted from each sample and a DNA segment was PCR-amplified using universal 18S primers. Amplicons were sent for metagenomic sequencing to CD Genomics. Geneious Prime software (Amplicon Metagenomics Tutorial), the EukRibo database, and Numbers speadsheet software were used to create graphical summaries of the organisms present. The ecological dynamics of these the three microecosystems were discussed and compared.

II. CHEMISTRY

A Paper Presentation

Investigation of Non-Structural Protein 2 (nsP2) Inhibitors as Therapeutics for Encephalitis and Chikungunya Viral Infections. Victor Ogungbe, University of Alabama in Huntsville; Olawale Adeyinka, The University of Alabama in Huntsville; Damilohun Metibemu, The University of Alabama in Huntsville; Olamide Crown, The University of Alabama in Huntsville; John Falode, The University of Alabama in HuntsvilleThe University of Alabama in Huntsville.

Emerging infectious diseases like those caused by arboviruses such as Venezuelan equine encephalitis virus (VEEV) and Chikungunya virus (CHIKV) pose a severe threat to public health. Therefore, the development of therapeutics and vaccines against emerging infectious diseases is of utmost importance. In this work, inhibitors of the cysteine protease domain of VEEV's non-structural protein 2 (nsP2) were investigated as promising starting scaffolds against VEEV and CHIKV. The initial compounds in the series were found to have potent inhibitory activity against nsP2 and block the replication of VEEV and CHIKV in infected cells in vitro. In addition, the compounds were found to have promising but suboptimal ADME properties. Analogs of the initial hits were synthesized and evaluated against both viruses and found to be significantly more potent against CHIKV, have similar activity against VEEV, and have optimal in vitro ADME properties. Our current results provide structural insights into a new class of potent non-peptidic covalent inhibitors of nsP2 cysteine protease with validated antiviral activities. These results may facilitate the evolution of the compounds into selective and broad-spectrum anti-alphaviral drug leads.

II. CHEMISTRY

A Poster Presentation

Investigation of Non-Structural Protease 2 as Therapeutic Targets in Alphaviruses. Jane-Frances Ojobor, University of Alabama in Huntsville; Olawale Adeyinka, University of Alabama in Huntsville; John Falode, University of Alabama in Huntsville; Victor Ogungbe, University of Alabama in Huntsville.

Alphaviruses, transmitted through mosquito bites, are a prominent class of emerging infectious agents with pandemic potential. Viruses in the alphavirus genus are either arthritogenic or encephalitic in humans, leading to considerable morbidity and mortality. Currently, there are no approved antiviral therapeutics for human use against the viruses. Our current work is focused on biochemical characterization of the nsP2 protease from arthritogenic alphaviruses, including

Barmah Forest virus (BFV), Ross River virus (RRV), Sindbis virus (SINV), Semliki Forest virus (SFV), and Highlands J virus (HJV) which is endemic to North and South America and investigating their potential drug as targets for small molecule inhibitors. The proteases are recombinantly expressed in E. coli and purified using a combination of affinity, ion exchange, and size exclusion chromatography. Protein gel electrophoresis is used to verify the purity of the nsp2 proteases. The purified protein will be used for in vitro screening assays to identify inhibitors of the proteases using an existing library of Chikungunya nsP2 inhibitors in our laboratory. Active hits will be selected for antiviral and cytotoxicity assays. Active and selective inhibitors from the screening assays will serve as starting points for a comprehensive hit-to-lead investigation against the arthritogenic alphaviruses.

II. CHEMISTRY

A Poster Presentation

A Comparison of Active-Site Interactions for LDH Between Wild-type and Two Mutants. Donna Perygin, Jacksonville State University; Ziyad Tariq, Jacksonville State University; Demetrice Marable, Jacksonville State University; Macee Glick, Jacksonville State University; Sharifah Albraiki, Jacksonville State University.

Lactate Dehydrogenase (LDH) is an enzyme that catalyzes the reversible conversion of pyruvate to lactate. For this in-silico study we used the human LDH crystal structure 4OKN which was co-crystallized with NADH and the substrate analog oxalate. We developed a model from this crystal structure using the MOE software suite and studied interactions in the active site of the minimized complexes for the wild-type and two mutants. In addition to the oxalate analog, our active site complexes included NADH/pyruvate and NAD+/Lactate for both wild-type and the mutants K224A and K265R. Neither mutation exists in proximity to the active site, but both have been proposed to affect the thermal stability and therefore the conformation of the enzyme, which should lead to a decrease in overall activity. Our results demonstrate no significant difference in interaction distance between the WT and mutant complexes. We did, however observe weaker interactions in the NAD+/Lactate complexes relative to the NADH/pyruvate complexes for all systems. Our in-silico predictions therefore indicate that these mutations will not result in a significant decrease in enzyme activity.

II. CHEMISTRY

A Poster Presentation

Energy harvesting using defect rich Ni-MoSe2 counter electrode-based dye-sensitized solar cells. John Bailey, University of North Alabama; Humayun Kabir, University of North Alabama.

Dye-sensitized solar cells (DSSCs) are currently emerging as a promising technology for efficient and economical conversion of solar-to-electricity conversion efficiency. 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 (Ni-MoSe2) 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 Ni-MoSe2 and Ni-MoSe2–Poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate)(PEDOT:PSS) conductive polymer (NiMoSe2-PEDOT:PSS) 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 and Raman spectroscopies, and scanning electron microscopy (SEM), were used to analyze electrode materials and photoelectrochemical performances of the cell.

II. CHEMISTRY

A Poster Presentation

Electrochemical Detection of Metal Ions Using Metal-Organic Frameworks-Based Sensing. Sarah Clouse, University of North Alabama; Md Abu Shohag, Univ. of North Alabama; Cameron Gren, Univ. of North Alabama; Aubrey Clay, Univ. of North Alabama; Md Humayun Kabir, Univ. of North Alabama.

The increasing demand for precise monitoring and control of environmental pollution necessitates the development of novel sensing techniques characterized by high sensitivity, selectivity, and reliability. Metal−organic frameworks (MOFs) have emerged as promising candidates for detecting various environmental contaminants, including anions, heavy metal ions, volatile organic compounds, and toxic gases. This is attributed to their exceptional properties exhibiting high surface area, porosity, large pore volumes, tunable structures, and open metal sites. However, the challenge lies in the inherent low stability of MOFs, hindering their seamless integration into chemical sensing devices. In this study, we addressed this challenge by synthesizing polymer-functionalized (Cu-BTC) MOF-2D carbon nanocomposites and assessing their potential for detecting metal ions in aqueous environments. The synthesized (Cu-BTC) MOF-2D carbon nanocomposite underwent thorough characterization using FT-IR spectroscopy, scanning electron microscopy/Energy dispersive X-ray spectroscopy, and voltammetry. The outcomes of the investigation on the detection of heavy metal ions will be presented during the upcoming meeting.

II. CHEMISTRY

A Poster Presentation

Detection of Heavy Metals in Water Using Sensitive Metal-Organic Frameworks. Aubrey Clay, University of North Alabama; Elizabeth Ford, Duke University; Cameron Gren, University of North Alabama; Md Humayun Kabir, University of North Alabama.

Environmental contamination poses a significant global challenge for humanity. The escalating attention towards water pollution, specifically the presence of heavy metal ions originating from industrial discharges, has intensified in recent decades due to its detrimental impact on human health. Heavy metals, characterized by their non-biodegradable nature, tend to accumulate in the human body through inhalation of polluted air. The accurate determination of these pollutants is imperative for enhancing safety, given their toxic nature even at trace concentrations. Metal−organic frameworks (MOFs) have garnered substantial interest owing to their remarkable attributes such as high surface area, porosity, large pore volumes, tunable structures, and open metal sites. These distinctive features make MOFs highly desirable for applications in adsorption, separation, sensing, and catalysis. This study presents the development of cost-effective and sensitive electrochemical sensors for in situ sensing, demonstrating a broad linear range. In particular, MOF-808(Zr) and a MOF-808(Zr)-graphene composite were synthesized and evaluated for their electrochemical sensing capabilities concerning Cu2+, Cd2+, Pb2+, As3+, and Hg3+. The electrochemical oxidation or reduction of the targeted metal ions was measured using I-V curves and Differential Pulse Stripping Voltammetry (DPSV). Furthermore, the MOFs sensing materials were characterized using FT-IR spectroscopy, scanning electron microscopy/energy dispersive spectroscopy (SEM/EDX), and atomic emission spectroscopy.

II. CHEMISTRY

A Poster Presentation

Synthesizing and Characterizing Fatty Acid Methyl Ester Biodiesel Fuels Derived from Acorn Biowaste.
Ryley Gilley, University of North Alabama; Cameron Gren, UNA; Humayun Kabir, UNA; Frank Diaz, UNA; Sarah Clouse, UNA.

Addressing the pressing challenge of energy demand is crucial in society. Our reliance on fuel combustion to sustain modern living has heightened the need for alternative energy sources due to increased energy demand and the environmental consequences associated with fossil fuels. Over the past decades, biofuels have emerged as a promising alternative. This study focuses on utilizing acorn nuts as a triacylglycerol source for synthesizing biodiesel fuels, exploring transesterification reactions with methanol under base-catalyzed, acid-catalyzed, and metal-organic framework conditions. The resultant acorn kernel oil fatty acid methyl ester products underwent thorough characterization through FTIR spectroscopy, NMR spectroscopy, iodine value, acid value, cloud point, and viscosity analyses. A comparative analysis between biodiesel derived from vegetable oils and biodiesel produced from acorn kernel oil is presented, shedding light on crucial fuel properties. This work unveils the yields of biodiesel fuels and their respective fuel characteristics, offering valuable insights into the potential of biodiesel derived from acorn kernel oil in addressing energy challenges.

II. CHEMISTRY

A Poster Presentation

The Effects on Thermal Stabilities of Barracuda LDH-A Proteins by Site Directed Mutagenesis. Sharifah Albraiki, Jacksonville State University; Elizabeth Cortez, Jacksonville State University; Dr. Sharifah Albraiki, Jacksonville State University.

Lactate dehydrogenase (LDH) is an enzyme that catalyzes the conversion of Pyruvate to Lactate and vice versa. LDH from different organisms have different thermal stability. This provides an answer as to why organisms like fish can thrive in disparate thermal conditions compare to human LDH. Previous studies have suggested that amino acid substitution in the non-conserved regions of a protein may have a more favorable effect than substitutions at highly conserved regions. According to research, substitutions at highly conserved regions will alter the activity of the protein, generally causing it to become inactive, whereas substitutions at non-conserved protein regions causes the protein to act more like a rheostat, with moderated functionality.

To investigate the effects that thermal stability has on the function of LDH, the non-conserved regions of the protein LDH-A will be targeted through amino acid substitution. LDH amino acids sequences from two species (Human and Barracuda) will be aligned and examined. Both species have shown different adaptation to different thermal conditions. A site-directed mutagenesis will be performed on Barracuda LDH-A to substitute a lysine residue to an aspartic acid, to mimic the sequence of Human LDH-A at position # 217. It is theorized that a substitution in the βJ-α 1G Loop of the LDH-A protein will inspire LDH-A to function like a rheostat instead of a “toggle switch”. The mutant and wild-type LDH enzymes will be isolated and purified and enzyme kinetics will be calculated.

II. CHEMISTRY

A Poster Presentation

Inorganic Synthesis of Cobaloxime Variants and Investigation as Possible Electrocatalysts in Photo-Driven Processes. Nicholas Covalsen, Jacksonville State University; Anusree Mukherjee.

The energy crisis in today's world is one of the most prevalent, if not the most prevalent issue on everyone's mind. The need for clean, renewable energy is at its highest it has ever been, which is why scientists from all over the world have been investigating various photo driven processes and how to make them efficient enough to stand against fossil fuels as an energy alternative. One such compound that can play a big role in these methods is Cobaloxime, because of its ability to catalyze proton reduction. This begs the question of how many other compounds are there like Cobaloxime that can do this same job and can any of them do work as an electrocatalyst more efficiently. At JSU under the supervision of Dr. Anusree Mukherjee, I worked on answering this question, specifically for copper complexes. This poster goes through the inorganic synthesis as well as solubility tests of several variations on the compound and looks at their potential as a major player in photo driven processes.

II. CHEMISTRY

A Poster Presentation

Next-Generation Biodegradable Lipid-Like Nanoparticles. Mary Helene Marmande, University of South Alabama; Bailey Baxter, ; Mary Helene Marmande, ; David Forbes, ; Richard Honkanen.

Next-generation Lipid-Like Nanoparticles (LLNPs) represent a cutting-edge advancement in drug delivery systems. These innovative nanocarriers, inspired by natural lipids, offer enhanced biocompatibility and stability. As part of our special topics CH 490-H experience, next-generation nanoparticles will be explored. The methodology centers upon the Curtius rearrangement and yields a series of carboxylic acid derivatives. Presented will be our findings from the experiments.

II. CHEMISTRY

A Poster Presentation

Exploring Analgesic Possibilities: 3-nButyl & 3-Methyl Homoepibatidine. Evan Hester, Jacksonville State University; Reagan Pruitt, Jacksonville State UniversityJacksonville State University.

Addiction is a continuing problem throughout the world and especially in the state of Alabama. Analgesics that can provide relief without binding to the opioid receptors can help to curve opioid addiction. Epibatidine is a analgesic found on the epidermal layer of the Ecuadorian poison frog Epipedobates tricolor. This compound has been observed to bind to the nicotinic receptors but not opioid receptors. The major concern with Epibatidine and its derivatives is its observed adverse effects in the GI tract. This research focuses on manipulation of the 3-carbon position of the homoepibatidine scaffold with the addition of a methyl and n-butyl group to determine its effectiveness in binding to nicotinic receptors and adverse effects. Dihydropyridine intermediates were formed through Grignard reactions, and the intermediates underwent a Diels-Alder reaction to form the homoepibatidine scaffold. The desired products were characterized by high-temperature NMR.

II. CHEMISTRY

A Poster Presentation

Polypropylene Face Mask Recycling. Martin Bouldo, Troy University; Mojtaba Enayati, Troy University.

Surgical face masks are made of polypropylene (PP) micro/nano fibers that can be effectively recycled and used to reinforce resin in a composite material after being chemically treated. We show that common PP facemasks can be discolored, disinfect, and chemically functionalized after 4h treatment with a 6.0 M HCl + 1.0 wt% KMnO4 solution from a blue hydrophobic polymer to a white polymer with increased hydrophilic properties. The properties of untreated and treated PP facemasks was assessed by ATR-FTIR, TGA, DSC as well as microscopy. These treated fibers were then shredded and incorporated into a polyester resin at variable wt% in order to assess the structural properties of the new composite material. The mechanical properties were tested using an INSTRON machine to obtain each sample's maximum force, maximum tensile stress, tensile strain (displacement) at maximum tensile stress, energy at maximum tensile stress, and Young's modulus. INSTRON testing showed that 0.5-1.0 wt% of the fiber produces the mechanical properties and beings to diminish after 2 wt%. With these results we demonstrate that common polypropylene face masks can be discolored and treated to be more hydrophilic in order to create a new polyester composite material. This treated facemask waste has the potential to be recycled and upcycled into new materials to reduce the environmental burden of single-use PPE equipment.

III. PHYSICS AND MATHEMATICS

A Paper Presentation

A Modified Czochralski Method for Growth of Cesium Hexachlorohafnate Scintillator Crystals. Elijah Adedeji, Alabama A&M University; Angel Reader, Alabama A&M University; Stephen Babalola, Alabama A&M University.

We report the pioneering attempt to grow a Cesium Hafnium Chloride (CHC) scintillator using a modified Czochralski (CZ) method and a novel ampoule. CHC is a novel scintillator, originally discovered as a luminescent material and re-invented as an attractive scintillator for gamma-ray detection. The scintillator has a cubic crystal structure and is almost non-hygroscopic, with highly proportional scintillation better than thallium-activated sodium iodide, NaI (Tl), and comparable to lanthanum bromide. Unlike many other scintillator crystals, it requires no doping to achieve a high light yield and high energy resolution.

The employed ampoule incorporates a rotatable borosilicate stir rod for the controlled descent and introduction of the seed crystal into the crystal-melt. An O-ring maintains a controlled atmosphere for the hygroscopic starter materials and the melt, producing 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 and a seed crystal of CHC are characterized using photoluminescence spectroscopy for comparative study.

III. PHYSICS AND MATHEMATICS

A Paper Presentation

Optical studies of tellurium oxide-based glasses embedded with Silver and Samarium. Kevin Bennett, Alabama A&M University; Rami Bommareddi, Alabama A&M University.

Studies will be conducted on the effects of silver nanoparticles on rare-earth luminescence in inorganic oxide glasses with specific focus on tellurium oxide-based glasses. Whenever rare-earth ions are doped into glasses the crystal field effects are smaller than the spin-orbit interaction effects. As a result, the centers of gravity of dopant ionic levels are not changed or influenced drastically.

Sodium tellurite glasses are brittle, so strength is increased by the addition of yttrium oxide and to increase transparency, we added boron oxide. The composition included: Na2O (26.12%), Y2O3 (10.42%), TeO2 (38.52%), B2O3 (22.84%), Sm2O3 (2.1%). In the second sample Ag (2.13%) was added. We recorded the absorption spectrum of the sample using a Cary 3E spectrophotometer. The absorption spectrum revealed two broad peaks at 250 – 350 nm and 370 – 520 nm.

When these samples were exposed to 375 nm and 405 nm respectively, the lasers revealed a yellow color emission. However, a spectral recording revealed an emission spectrum from 430nm to 800 nm. A broad emission indicates that the emission is at a superposition due to the silver particles and molecular aggregates of silver. We made another sample that includes silver and samarium compounds. The resulting glass was heat treated. Silver particles impacted the intensity of rare-earth ions. We are pursuing interaction mechanisms between Ag particles and Sm3+ rare-earth ions. We have measured decay times for unambiguous identification of the spectral peaks and their interactions with metallic particles. Further work is in progress for a detailed understanding.

III. PHYSICS AND MATHEMATICS

A Paper Presentation

AAMU Chapter of the Society of Physics Students: History, Activities and Projections. Stephen Babalola, Alabama A&M University; Angela Davis, Alabama A&M University.

The Society of Physics students at Alabama A&M University embark on a captivating journey, educating students and the community about the frontiers of physics while unraveling the mysteries of physics and their everyday lives. Our society is dedicated to helping students become contributing members of the professional community by teaching the students effective communication and personal interaction skills, providing leadership experience, establishing a network of contacts, presenting scholarly work in professional meetings and journals, and research experiences, while creating an awareness of Physics through outreach services to the campus and local communities.

Through community service, participation in fairs and conferences, and collaborative discussions, the AAMU Chapter of the Society of Physics students aims to inspire and educate non-STEM students and the community of Physics. We aim to cultivate a passion for physics that transcends the boundaries of the classroom and the college.

Furthermore, we are dedicated participants in physics conferences, where our members can interact with experts, present research findings, and stay abreast of the latest developments in the field. By bridging the gap between academia and the community, the University Physics Society plays a pivotal role in promoting the importance of physics education and encouraging a lifelong interest in science. Our history, recent activities, successes, weaknesses and opportunities are presented.

III. PHYSICS AND MATHEMATICS

A Paper Presentation

Dynamic Spacetime and Cosmic Dark Energy Mystery. Tianxi Zhang, Alabama A&M University.

Two of the most critical observations of the universe made in the last century are: 1) the distance-proportional redshift of light from galaxies and 2) the extra redshift of light from supernovae. Conventionally, the first is interpreted as expansion of the universe with the Big Bang origin, while the second is explained as acceleration of the universe driven by the mysterious dark energy. To provide an alternative, self-consistent interpretation of the observations, the author has recently upgraded spacetime from Einstein's relative spacetime to dynamic one. Spacetime is said to be absolute if independent of matter, to be relative if affected by matter, and to be dynamic if mutually interacting with matter. Mach's principle is the base for spacetime to be dynamic. In this presentation, the author will explain why the spacetime should be dynamic, describe how the mutual interaction between matter and spacetime is theorized, demonstrate how the redshift-distance relation in dynamic spacetime is derived, and illustrate how the observations of redshifts of light from galaxies, supernovae, and gamma-ray bursts are self-consistently explained. This study potentially revolutionizes the model of cosmology because dynamic spacetime does not mandate the universe to be expanding and accelerating and hence does not need the universe to be initiated from the Big Bang and driven out by the mysterious dark energy. To fully understand how matter and spacetime mutually interact, quantum spacetime will be investigated in future. This work is partially supported by the IBM-HUCU Quantum Center.

III. PHYSICS AND MATHEMATICS

A Paper Presentation

Quantum Unruh Effect on Singularity and Radiation of Black Holes. Tianxi Zhang, Alabama A&M University; Brian Papandrea, Alabama A&M University; Jason Papandrea, Alabama A&M University; Maria Dudley, Alabama A&M University.

With Mach's principle, quantum Unruh effect shows that an observer in a gravitational field can detect a thermal radiation with temperature proportional to the gravitational acceleration. The total Unruh radiation energy surrounding a gravitational object is obtained and the result indicates that a gravitational object can emit Unruh radiation when the object gains mass or shrinks radius. For a black hole, it radiates when it reduces its mass. It is generally believed that matter inside or once entering a black hole will gravitationally fall into the center and form a size-less singularity, where the density goes to infinity and spacetime breaks down with infinite curvature. In accordance to quantum Unruh effect, however, Zhang has recently found that a size-less singularity cannot be actually formed because it violates the law of energy conservation. The radius of the singularity sphere cannot be zero, unless the mass also approaches zero. Quantum Unruh effect excludes a black hole to form a size-less singularity, which has a finite mass but infinite density, curvature, and Unruh radiation energy. A size-less singularity can only be massless and naked. The Unruh radiation power of a black hole can be determined by the rate of change of the total Unruh radiation energy, which gives a result completely different from that obtained by Hawking. As the Unruh temperature at the surface of a black is not the luminous one, substituting the Unruh temperature into Stefan-Boltzmann's law does not give the radiation power of the black hole. Our study provides a new insight and conceptual correction to the singularity and radiation of black holes. This work is partially supported by the IBM-HBCU Quantum Center.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Strain Engineering of Nano-crystalline CaTiO3 and LiNbO3 in PVDF Matrix for Efficient Smart Material.
Angela Davis, Alabama A&M University; Angela Davis, Alabama A&M University; Clyde Varner, Alabama A&M University; Padmaja Guggilla, Alabama A&M University; Ashok K. Batra, Alabama A&M University.

Demand for thin films of various functional nano-crystalline 2D

functional materials is increasing due to the miniaturization of

electronic devices to nanometer scales. Nano-thin films can be defined as a thin layer of material where the thickness spans from a fraction of a nanometer to several micrometers in thickness in at least one dimension. Based on the material's specific characteristics, they are categorized as SMART materials. As the material gets to the size of a

nanometer, the characteristics will behave entirely differently from the bulk in terms of their electrical and optical properties. Polyvinylidene fluoride (PVDF) is a flexible, stretchable, piezoelectric polymer. When a semi-conductive nano-crystalline dopant is introduced into the PVDF matrix, the properties of the resulting material can be enhanced. The study will determine the ideal concentration of CaTiO3 or LiNbO3, semiconductive

nanocrystals embedded in a PVDF matrix that exhibit

enhanced conductivity and optical properties under strain. Under the current investigation, PVDF thin films are fabricated with various LiNbO3 and CaTiO3 concentrations and characterized for their electrical, optical, and physical properties as smart materials.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Optical Investigations of Samarium Doped Barium Borate Glass. Aaron Johnson, Alabama A&M University; Ja'Heim Goodwin, Alabama A&M University; Rami Bommareddi, Alabama A&M University.

Optical investigations of Samarium doped Barium borate glass

Ja'Heim Goodwin, Aaron Johnson and B. Rami Reddy

Alabama A&M University, Normal, AL 35762

Abstract

Barium borate glass was made by the melt quenching technique. For this purpose, we mixed appropriate amounts of barium carbonate, boron oxide Samarium oxide and/or silver compound for an hour and poured into a crucible. The crucible was introduced into a tube furnace and heated above the melting point for an hour, in ambient air. The resulting melt was poured into an aluminum mold allowed to cool to room temperature naturally. We made three such glasses with or without any dopants. The resulting glass was clear. Absorption spectrum of the sample was recorded using Cary 3E spectrophotometer. Absorption spectrum revealed several peaks corresponding to Sm3+ energy levels, in the uv-visible spectral region. We induced emission from the samples by exposing them to a 405 nm cw laser beam, which excites 6P3/2 level of Sm3+. The excited ions relax nonradiatively to lower levels causing 4G5/2 level to emit. The sample revealed intense emission peaks at 570 (4G5/2—6H5/2), 600 (4G5/2—6H7/2), 650 (4G5/2—6H9/2) and 710 nm (4G5/2—6H11/2). We measured the lifetimes of the emission peaks which confirmed that they all emanated from the same upper level. Further work is in progress.

This research was supported by DoD grant W911NF2310157 and NSF grant 2331969.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

A Comparative Study of Virgin and Recycled Metal Powder in Additive Manufacturing. Ajibike Joan Farounbi, Alabama A&M University; PADMAJA GuGGILLA, Alabama A&M University; JUDITH SCHNEIDER, University of Alabama Huntsville; Ajibike Joan Farounbi, Alabama A&M University.

Additive manufacturing (AM) has emerged as a transformative technology, offering unparalleled flexibility and efficiency in producing complex metal components. The study examines the impact of powder origin on the final properties of components made from virgin and recycled powders. The experiments utilizing laser powder bed fusion (LPBF) analyze tensile strength, hardness, microstructural properties and overall print quality. The findings highlight the need for better understanding of powder characteristics for sustainable additive manufacturing practices.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Quantum Chromodynamics for Quark Pair-Production and Lepton Disintegration. Brian Papandrea, Alabama A&M University; Jason Papandrea, Alabama A&M University; Tianxi Zhang, Alabama A&M University.

Lepton formation has been proposed as emerging from quark-antiquark annihilation of two types. Quark-antiquark annihilation of only color charges results in structureless, colorless, electrically charged leptons (such as electrons, muons, and tauons), and their annihilation of both electric and color charges forms structureless, colorless, electrically neutral leptons (such as electron, muon, and tauon neutrinos). These annihilations between first generation quarks and antiquarks, those of up and down flavors, with quantum excitations for each, allows for the prediction of a fourth-generation lepton sector, namely, the lambda particle and its corresponding neutrino. The first generation of leptons can be produced by the beta decay of a neutron and the positron emission of a proton. Conversely, a lepton particle or neutrino can be disintegrated into a quark-antiquark pair, upon collision, which can also explain neutrino oscillations. Herein are developed Feynman rules for the quark level diagrams and Lie group representations of particle symmetries utilizing conserved Noether currents, providing a mathematical framework for Zhang's scheme of four generations of leptons and quark-antiquark pairs.

Acknowledgments

This work is partially supported by the IBM-HBCU Quantum Center.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Unruh-DeWitt Particle Detectors in QED for Testing Stochastic Signatures of the Unruh Effect. Jason Papandrea, Alabama A&M University; Brian Papandrea, Alabama A&M University; Tianxi Zhang, Alabama A&M University.

Local spatial and temporal information is extracted from quantum fields via Unruh-DeWitt detectors, first quantized excitations (particles) of the second quantized field. We consider Unruh-DeWitt detectors coupled to fermion fields, in order to test an accelerating electron's Brownian motion in the inertial frame being sourced in the thermal excitation of the Unruh effect in the accelerating frame. Specifically, Unruh demonstrated that a blackbody thermal emission is measured by an accelerating observer in the Minkowski vacuum. Although the Unruh radiation is a phenomenon only in the accelerating frame, we will show that the corresponding heat in the body of the particle in the accelerating frame could even survive in the inertial frame with thermal Brownian motions. Previous stochastic analysis, without the Unruh-DeWitt detector, has been performed for a Klein-Gordon real scalar field with the Higgs-type potential on the de Sitter space. Here, we develop a scalar-vector-spinor model in

two-dimensional Minkowski space . The detector couples directly to the fermion (spinor) field through its monopole moment. A Klein-Gordon complex scalar field with Bogoliubov coefficients accounts for the Unruh thermal radiation. Spontaneous symmetry breaking, which is restored by the Unruh thermal bath, is addressed by a Yukawa-type coupling term incorporated in the quantum electrodynamic total interaction Lagrangian.

Acknowledgments

This work is partially supported by the IBM-HBCU Quantum Center.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Exploring the synergy of light and matter interactions: Multiferroic photonic crystals for novel photonics applications. Dimitar Dimitrov, Tuskegee University; Elijah Taylor - Harris, Tuskegee UniversityTuskegee University.

This research aims to make a substantial contribution to the field of photonics by synergistically exploring the utilization of innovative multiferroic materials while pushing the boundaries of photonic device design. Drawing upon a robust foundation of preliminary data from prior modeling endeavors, this research seeks to realize a practical optical switch through the intricate interplay between multiferroic materials and both electric and magnetic fields. The proposed Anisotropic Photonic Crystal Slab promises to achieve complete photonic band gaps across all polarizations, unlocking a realm of extraordinary phenomena including self-collimation, negative refraction, and zero-index refraction.

The architecture of the photonic device is designed using the OmniSim numerical simulation suite, which empowers calculations employing the 3D Finite-Difference Time-Domain (FDTD) method across both spatial and frequency domains, alongside the Plane Wave Expansion method. Advanced equipment such as the Direct Laser Writer and E-Beam Lithography will be employed to manufacture prototypes.

The current phase of the investigation has yielded several promising photonic structures, with a select few demonstrating favorable attributes. In collaboration with students from the Department of Material Science and Engineering, various types of multiferroic nanoparticles suitable for this project have been fabricated. Presently, ongoing efforts involve the exploration of the alteration of dielectric constants within diverse polymer-multiferroic nanoparticle blends under the influence of electromagnetic fields.

The proposed research stands poised to drive substantial progress in the realm of Photonics, delivering noteworthy contributions to the evolution of pioneering devices for optical computing while potentially extending its sphere of influence to other scientific domains. These include the advancement of sophisticated photonic solar sails and biosensors.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Partial Fraction Decomposition by Synthetic Division. Youngsoo Kim, Tuskegee University; Byunghoon Lee.

We present a way to find partial fraction decomposition of a rational function when the denominator is a product of two highly powered linear factors. The method utilizes repeated synthetic division, which is easily performed both by hands and by machines.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Sufficient Conditions for Explosive and Collisional Fragmentations of Spacecraft in Orbit. Arjun Tan, Alabama A&M University.

Since 1961, hundreds of artificial satellites including upper stage rockets have fragmented in orbit due to two basic causes: explosion and collision. Still, the causes of several satellite breakups in orbit remain unknown. It is of strategic interest to determine if these are due to anti-satellite tests conducted by adversarial powers. There are fundamental differences between the fragments generated by explosion and collision which cannot be determined from ground-based radars. However, breakup causes can sometimes be ascertained if the fragments dispersion exhibit special characteristics which belong to either explosion or collision. These include explosions in the 'clam model' of fragmentation in explosion; and formation of 'ricochet fragments' or the 'butterfly pattern' in collision. The fragments pattern in the Nimbus 6 rocket explosion exhibits the classic clam model, whereas the Cosmos 1408 breakup displays both ricochet fragments and the butterfly pattern.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Lifespans of the Greatest Mathematician-Physicists of the Modern Era in Europe. Arjun Tan, Alabama A&M University.

In much of human history, the average life expectancy was low. Even during the early modern period, the average life expectancy was flat and under 30 years. The life expectancy started to climb dramatically in the late modern period led by Europe and continued in the contemporary era. The life expectancy in Europe depended significantly on occupation, being the highest for the teaching profession. This study investigates the lifespans of the greatest mathematician-cum-physicists of Europe in the modern era. Curiously, the average lifespan was more than double the world life expectancy for most of this period. However, the lifespan was flat with no rise at the end of the period, due most probably to the two world wars occurring there. There was a great variance in this lifespan having a standard deviation of 13.868 years.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

System of Radiation Detection. Sarah Olocha, Alabama A&M University.

Radioactive materials are physically imperceptible from nonradioactive metals and ionizing radiation is not detectable by one's senses. These materials can not be seen, heard, sniffed, etc. So for these reasons, a simple visual inspection is inadequate to identify radioactive materials/sources and can be impossible to recognize without proper equipment. In this case, I will introduce Radiation detection, which detects the illicit transport of radioactive materials by indicating elevated radiation levels. The basic radiation detector system has a sensor that sensor senses Radiation, activates its alarm, and sends a low-voltage signal to all the other detectors in the vicinity. This low voltage signal activates the individual relays in the other Radiation detectors causing them to emit a tone that alerts residents, that one of the Radiation detectors senses Radiation.

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III. PHYSICS AND MATHEMATICS

A Poster Presentation

Photoluminescence Spectroscopy Study of Cesium Hafnide Chloride (CHC) Crystal. Ibrahim Bello, Alabama A&M University; Elijah Adedeji, Alabama A&M University; Nehemiiah Ibi-Eletta, Alabama A&M University; Claudiu Muntele, Alabama A&M University; Stephen Babalola, Alabama A&M University; Marius Schamschula, Alabama A&M University .

This report details a photoluminescence study on Cesium Hafnium Chloride (CHC) grown using a modified Czochralski method via a Cary Eclipse Fluorescence Spectrophotometer with an excitation wavelength of 200nm. The modified Czochralski is a technique in which the crystal is melted and maintained at a temperature slightly above the melting point, and a pulling rod containing the seed crystal is lowered to touch the melt. The crystal is pulled slowly while the seed crystal is rotated to keep the crystal uniform and cylindrical. The investigation focuses on the first-grown CHC crystal and its seed crystal. Through a comparative systematic analysis, the photoluminescence properties of these crystals are explored, shedding light on their optical characteristics and potential applications.

The study explores the crystals' emission characteristics and spectral features under the specified excitation conditions. This research also aims to use our findings to determine the crystal's purity through a comprehensive analysis of the photoluminescence spectra.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Design and Fabrication of Precision Linear Motion Stage for Bridgman Crystal Growth Setup. Success Oluwole, Alabama A&M University; Elijah Adedeji, Alabama A&M University; Nehemiah Ibi - eletta, Alabama A&M University; De'Angelo Bailey, Alabama A&M University; Claudiu Muntele, Alabama A&M University; Stephen Babalola, Alabama A&M University; Marius Schamschula, Alabama A&M University.

The design and construction of a customized precision linear motion stage made specifically for the Bridgman crystal growth setup are described in this abstract. The purpose of the linear motion stage, which is essential to the growth of crystals, is to enable regulated movement inside the Bridgman apparatus. The stage facilitates the smooth transition of the substance from a higher temperature region to a lower temperature region by acting as a precise lowering mechanism for the ampoule containing the molten material. This optimizes the conditions for crystal nucleation.

Customization of this linear motion stage guarantees that it will work with the special needs of the Bridgman crystal growth configuration. Extensive testing has proven that the stage effectively accomplishes its intended goal. It is also significantly more affordable than commercially available alternatives, saving ninety percent. By offering a precise, economical, and effective instrument, this work advances the field of crystal growth technologies by meeting the unique requirements of the Bridgman setup.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Applying Multilayer Perceptron's to DFT. Cornelius Salonis, Alabama A&M University; Matija Medvidović, Flatiron Institute.

Embarking from first principles, this study delves into neural network training, focusing on precise reproduction of quantum parameters—total Exc with future work focused on Vxc, and Fxc—for diverse organic and inorganic molecules. Incorporating Multilayer Perceptrons (MLPs) into Density Functional Theory (DFT), the research explores the synergy between machine learning and quantum mechanics, aiming to enhance the accuracy and efficiency of simulations for molecules where normally DFT might be less accurate. This integration of MLPs into DFT presents a promising avenue for advancing computational methodologies in understanding complex molecular behaviors.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Josephson Junction and Superconducting Qubit. De'Angelo Bailey, Alabama A&M University; Tianxi Zhang, Alabama A&M University.

Josephson Junction and Superconducting Qubit

De'Angelo Bailey and Tianxi Zhang

Department of Physics, Chemistry, and Mathematics, Alabama A&M University, Normal, AL 35762

Josephson junction is a device and can be used to construct quantum bit (qubit), which plays an essential role in the development of a superconducting quantum computer. It is formed with two superconductors separated by a thin insulating barrier. Super-electrons in superconductors can quantum-mechanically tunnel through the barrier and generate an electric current through the junction or an electric voltage across the junction. The current or voltage is usually direct, but can be alternative when an external influence is applied. Superconducting circuits with Josephson junctions can construct superconducting qubits, which can be categorized into three different types, called the charge, flux, and phase qubits, respectively. In this quantum information and science study, we will investigate how superconducting qubits work and are controlled and how their performances are improved. We will analytically explore and numerically calculate the electric charge and magnetic flux, capacitance and induction, and frequency and energy of superconducting qubits. We will also investigate how perturbations of the superconductors generate superconducting pulses in Josephson junctions. The results obtained from this study about Josephson junctions and superconducting qubits will be presented. The work is supported by the IBM-HBCU Quantum Center awarded project.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Machine Learning Application for Antineutrino Event Selection with PROSPECT. Pablo Ruiz-Crespo, Alabama A&M University; Diego Venegas-Vargas, University of Tennessee, Knoxville; Andrea Delgado, Oak Ridge National Laboratory.

The Precision Reactor Oscillation and Spectrum Experiment (PROSPECT) is a reactor antineutrino experiment consisting of a 4-ton liquid scintillator antineutrino detector divided into an 11x14 array of optically separated segments. The detector was designed to probe the existence of sterile neutrino oscillations and precisely measure the antineutrino spectrum resulting from 235U fission. Data was taken in 2018 and 2019 with a first-generation detector called PROSPECT-I located on the Earth's surface roughly 7 m from the 85 MW, compact, highly-enriched High Flux Isotope Reactor (HFIR) at Oak Ridge National Laboratory. With almost no overburden from the HFIR building, the PROSPECT detector is subjected to many sources of background. This makes precise background characterization essential for antineutrino detection. This poster presents the results from a study using machine learning techniques to distinguish between background and signal events. We trained several classifier methods such as Boosted Decision Trees (BDT) and Multilayer Perceptrons (MLPs) on the reconstructed inverse beta decay interactions from PROSPECT's data. We benchmark the classifier's performance on the reconstructed antineutrino energy spectrum from U-235.

This work is supported by the US DOE Office of High Energy Physics, the Heising-Simons Foundation, CFREF and NSERC of Canada, and internal investments at all institutions. This work is supported by the U.S. Department of Energy, Office of Science, Office of High Energy Physics, as part of the RENEW program at Oak Ridge National Laboratory under FWP ERKAP89.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Investigating the Impact of Cold Plasma Jet on Ferroelectric Polymer Thin Films and Nanofiber Membranes. Amari Williams, Alabama A&M University.

There are many different Electro Active Polymers namely, polylactide aniline pentamer copolymer, poly (lactic-co-glycolic acid), and poly (vinylidene fluoride) (PVDF). Amongst them, PVDF exhibit the best electroactive properties, such as piezo, pyro and ferro electricity and optoelectronic. It is known to have good flexibility, exceptional chemical resistance, high mechanical strength, easy processing and low cost, and when doped with perovskite materials exhibits good Optoelectrical properties. Perovskites are cubic crystal structured materials with chemical formula ABX 3 where A and B represents “Cations” and X represents an “Anion” that bonds to both, same as that of Calcium Titanate (CaTiO 3) and this is applied to the class of compounds which share the same crystal structure as that of CT. As a result, PVDF polymer doped with perovskites are of choice for the increasing number of possible microelectronics applications, such as electro-optic transducers and sensors, energy harvesting, biomimetic robotics etc. This research emphases focusing on developing a perovskite polymer nanocomposite thin films using Solution Casting technique and characterize their electrical, optical properties and analyze their ability to work as efficient sensors.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Raman scattering studies of Silbond H-5. Ja'Heim Goodwin, Alabama A&M University; Amari Williams, Alabama A&M University; B. Rami Reddy, Alabama A&M University.

Raman scattering studies Silbond H-5

Ja'Heim Goodwin, Amari Williams and B. Rami Reddy

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Abstract

Glasses are made by the melt quenching method as well as sol-gel method. The former involves high temperatures, and the latter is a low temperature method. We are using such a low temperature method. We mixed appropriate amounts of Silbond H-5, water and Tetraethoxysilane in a plastic cuvette and successfully condensed the mixture into a solid. Such organic molecules have large vibrational frequencies. We recorded the absorption spectrum of the samples using a Cary 3E spectrophotometer. The absorption spectrum revealed small peaks at 357, 367, 462, 558, 684, and 737 nm superimposed on a broad background. However, when the sample in the cuvette was exposed to a 405 nm laser beam, we detected several intense peaks in the emission spectrum at 467, 543, 548, 597, 604, 610, 618 and 661 nm. The sample color is white along the beam path. Whenever the laser wavelength was changed the wavelengths of the scattered signals or emission wavelengths also shifted. The sample glow is very bright along the beam path. Further work is in progress.

This research was supported by DoD grant W911NF2310157 and NSF grant 2331969.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Optical investigation of samarium doped Barium carbonate. Ja'Heim Goodwin, Alabama A&M University; Aaron Johnson, Alabama A&M University; B. Rami Reddy, Alabama A&M University.

Optical investigations of Samarium doped Barium borate glass

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Alabama A&M University, Normal, AL 35762

Abstract

Barium borate glass was made by the melt quenching technique. For this purpose, we mixed appropriate amounts of barium carbonate, boron oxide Samarium oxide and/or silver compound for an hour and poured into a crucible. The crucible was introduced into a tube furnace and heated above the melting point for an hour, in ambient air. The resulting melt was poured into an aluminum mold allowed to cool to room temperature naturally. We made three such glasses with or without any dopants. The resulting glass was clear. Absorption spectrum of the sample was recorded using Cary 3E spectrophotometer. Absorption spectrum revealed several peaks corresponding to Sm 3+ energy levels, in the uv-visible spectral region. We induced emission from the samples by exposing them to a 405 nm cw laser beam, which excites 6 P 3/2 level of Sm 3+ . The excited ions relax nonradiatively to lower levels causing 4 G 5/2 level to emit. The sample revealed intense emission peaks at 570 (4 G 5/2 — 6 H 5/2), 600 (4 G 5/2 — 6 H 7/2), 650 (4 G 5/2 — 6 H 9/2) and 710 nm (4 G 5/2 — 6 H 11/2). We measured the lifetimes of the emission peaks which confirmed that they all emanated from the same upper level. Further work is in progress.

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III. PHYSICS AND MATHEMATICS

A Poster Presentation

Josephson Junction and Superconducting Qubit. De'Angelo Bailey, Alabama A&M University; Tianxi Zhang, Alabama A&M University. Josephson Junction and Superconducting Qubit De'Angelo Bailey and Tianxi Zhang. Department of Physics, Chemistry, and Mathematics, Alabama A&M University, Normal, AL 35762.

Josephson junction is a device and can be used to construct quantum bit (qubit), which plays an essential role in the development of a superconducting quantum computer. It is formed with two superconductors separated by a thin insulating barrier. Super-electrons in superconductors can quantum-mechanically tunnel through the barrier and generate an electric current through the junction or an electric voltage across the junction. The current or voltage is usually direct, but can be alternative when an external influence is applied. Superconducting circuits with Josephson junctions can construct superconducting qubits, which can be categorized into three different types, called the charge, flux, and phase qubits, respectively. In this quantum information and science study, we will investigate how superconducting qubits work and are controlled and how their performances are improved. We will analytically explore and numerically calculate the electric charge and magnetic flux, capacitance and induction, and frequency and energy of superconducting qubits. We will also investigate how perturbations of the superconductors generate superconducting pulses in Josephson junctions. The results obtained from this study about Josephson junctions and superconducting qubits will be presented. The work is supported by the IBM-HBCU Quantum Center awarded project.

III. PHYSICS AND MATHEMATICS

A Poster Presentation

Electronic Authentication for Secure Identification. Isaac Anokye, Alabama A&M University; Mohan Aggarwal, Alabama A&M University; Marius Schamschula, Alabama A&M University.

Electronic authentication refers to the process of verifying the identity of a user who is accessing an electronic system or service. It ensures that only authorized individuals can access sensitive or confidential information or perform specific actions within an electronic system. Electronic authentication is crucial to modern digital systems, enabling secure identification and access control in an increasingly interconnected world. This abstract provides a concise overview of electronic authentication methods' critical aspects and challenges, highlighting their significance in ensuring data security and user privacy. In recent years, electronic authentication has witnessed remarkable advancements, driven by the proliferation of online services, e-commerce, and the digitization of sensitive information. This paper reviews the various electronic authentication techniques and technologies, including but not limited to biometrics, smart cards, one-time passwords, and multi-factor authentication. It explores their strengths, weaknesses, and applicability in different contexts, shedding light on the trade-offs between security and user convenience. Electronic authentication has yet to be widely used; there is little published research on its effects on various end-users. We still do not know enough about gender, age, and experience level. However, there has been a significant amount of research on e-authentication in recent years, focusing on developing new authentication methods and improving the security and usability of existing methods.

IV. ENGINEERING AND COMPUTER SCIENCE

A Paper Presentation

Patient-specific mechanical analysis of PCL periodontal membrane: Modeling and simulation. Rakesh Pemmada, University of Alabama at Birmingham.

This research fills a knowledge gap in bone tissue engineering by examining the mechanical characteristics of scaffolds at bone-tissue interfaces utilizing a cutting-edge technique involving the creation of 3D scaffolds from Polycaprolactone (PCL). The work employs Finite element analysis to measure the scaffolds' maximum principal and Von Mises stresses and strains. CT scans of the Maxilla and Mandible were used to apply load conditions to 3D models of the upper central incisor. In the derived computational model, four different load situations considered were: the masticatory load (70–100 N at 45°), two parafunctional habits (100–130 N) and 500–550 N at the incisal edge, both at 45°), and a trauma case (800–850 N applied perpendicularly from the inwards direction at 90°). The findings revealed that the central tooth region experiences the highest stress concentration, while the Maxilla and Mandible regions show the least stress. These results provide critical insights into the mechanical behavior of scaffolds at bone-tissue interfaces, suggesting a research direction for developing scaffolds that closely mimic real bone characteristics. The results of this study are particularly significant for using bone replacement materials, providing an approach to more effective healing options for bone traumas and degenerative bone disorders.

IV. ENGINEERING AND COMPUTER SCIENCE

A Paper Presentation

Engineered Hydrogels For Contact Guidance Of Fibroblasts. Vineeth Viijayan, Alabama State University; Amrita Natarajan, Alabama State University; Sunate Kim, Wyss Institute For Biologically Inspired Engineering, Harvard University; Gerardo Hernandez, Southern Research; Derrick Dean, Alabama State University; Christopher Chen, Wyss Institute For Biologically Inspired Engineering, Harvard University .

Hydrogels with topographical modifications can guide the growth of the cells via a contact guidance mechanism. The guided growth of cells through contact guidance mechanism can play a major role in different cellular processes including growth, proliferation, and differentiation. Hence, it is very important to engineer new hydrogel-based materials with contact guidance potential for biomedical applications. In the present work, we report the development of Hyaluronic acid hydrogels with 3D surface patterning which can impact the growth of the cells via contact guidance mechanism. The surface patterning was generated on the surface of the hydrogels via a 3D printing process. We have systematically characterized the surface patterns using various characterization methods such as Scanning Electron Microscopy, 3D Confocal laser scanning microscopy and Contact Angle Goniometer. Subsequently, to test the capability of the patterned hydrogels, dermal fibroblasts were used as a model cell line. Very interestingly, the confocal fluorescent imaging on the hydrogels have shown both spatial confinement and alignment of the fibroblasts on patterned surfaces. This observed topography-driven contact guidance mechanism on dermal fibroblast may find utility for several biomedical applications including skin tissue engineering and wound healing applications.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster Presentation

Plasma/ Ozone Induced Graft Polymerization Of Peek Scaffolds For Bio- Integrated Orthopaedic Implants. Chandrima Karthik, University Of Alabama At Birmingham; Vinoy Thomas, University Of Alabama At Birminghamuniversity Of Alabama At Birmingham.

The success of any implant material in biomedical applications is greatly influenced by the bulk and surface characteristics of the material. The biological response is determined by the surface chemistry 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 and results in the development of an inflammatory response, a type of biological reaction that may result in cell necrosis and apoptosis. In this work, plasma and ozone treatments has been utilized to surface activate PEEK and graft ionic bioactive polymer Poly NaSS (Poly Sodium Styrene Sulfonate) successfully grafted on the surface to promote cellular attachment and biomineralization. The main goal of our research has been to find a stable surface modification for PEEK that will boost surface energy and ideal for orthopedic applications. The future of this work lies in grafting various functionalities on to the surface of the implant using plasma technology for enhanced bio interactions.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster Presentation

A Phenomenological Model for the Crushing Failure Mechanism in Lattice Structures. Matthew Wise, University of North Alabama; Md Abu Sayeed Shohag.

Lattice structures are promising candidates for high energy-absorption applications but are expensive to create and test experimentally. This paper investigates a phenomenological model designed to predict the failure mechanisms of various energy-absorbing lattice structures, with a primary objective of enhancing its predictive accuracy. The study explores the avenue of improvement through the application of physics-informed neural networks, presenting a novel approach to refining the understanding and performance of these structures.

IV. ENGINEERING AND COMPUTER SCIENCE

A Poster Presentation

Prototyping A Spatial Atomic Layer Deposition (Ald) System Using A Gear Drive System And Programmable Logic Controller (Plc). Emmanuel SOEREN KOUM NGANDO, University of North Alabama; Tegra Kabue Mubikayi, University of North Alabama; Dongqing Pan, University of North Alabama.

Layer Deposition or (ALD) is operated by alternately injecting two or more chemical precursors into a chamber to enable material deposition layer by layer. However, ALD is a very slow process restricted by the fashion of depositing materials layer by layer at atomic level. To solve this issue, the faculty-student team has been devoted to developing a faster spatial ALD system reactor. In this poster, the team presents the work of implementing two improvements to the current metallic prototype. The mechanical improvement is to replace the belt-pulley driven system with a more compact gear-box system. The new power transmission system increases the speed of the driving system and reduces the lag issue of the belt system. The electrical improvement is to use a Programmable Logic Controller (PLC) to control multiple components in the project. The major benefit of using PLC is its expandability with more inputs and outputs as required by the system. The team researched the different types of PLC controllers, and a controlling diagram and program was developed to integrate the different components of the spatial ALD system, and testing has been implemented.

IX. HEALTH SCIENCES

A Paper Presentation

The Evolution Of An Interactive "Edissection" Manual To Enhance The Laboratory Experience Of Health The Evolution Of An Interactive "eDissection" Manual To Enhance The Laboratory Experience Of Health Science Learners Learners. James Martin, University of Alabama at Birmingham; Christopher Cesiro, University of Alabama at Birmingham; Michael Herr, University of Alabama at Birmingham.

Anatomical donor dissection remains a critical component of health science education. Educator shortages and increased enrollment necessitate the evolution of teaching methods. Learner use of dissection videos has historically shown mixed outcomes. Moreover, recently reported video creation methods are unwieldy, expensive, and inefficient. We propose a time- and cost-efficient way to increase student engagement and discuss the outcomes, pearls, and pitfalls of creating an "eDissection" manual. A GoPro camera was mounted to a microphone stand providing an affordable method of creating 42 short donor dissection videos (length range: 0:34 – 3:02 [MM:SS]). Rise 360 web-app was used to generate unique modules exported and securely disseminated to learners. Students engaged with content before and during sessions to guide dissection and view interactive structure checklist. Embedded GIF images guided technique; quizzes provided practice and feedback to learners. Qualtrics evaluation surveys gathered feedback and improvement suggestions. Responses (n=52) indicated that learners found the modules helpful to guide dissection (8.8/10 ± 1.3) and understand content (8.6/10 ± 1.5). The modules were easier to follow than traditional manuals and preferred because they alleviated anxiety and depicted expectations. Suggestions for improvement included more videos and implementation of more quiz questions. The use of a novel "eDissection" manual is preferred by students over traditional manuals. The creation process was time- and cost-efficient and easy to replicate. Interactive features of the manual are preferred by learners. These improvements to outdated laboratory pedagogy are an example of healthcare education evolving to meet the needs of learners.

IX. HEALTH SCIENCES

A Paper Presentation

Cadaver Anomalies in graduate student cadaver dissection. Mark Caulkins, Samford University; Nicholas Washmuth, Samford University; Will Scogin, Samford University .

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 Presentation

Distance horizontal fusional facility (DFF): A new diagnostic vergence test for the acquired brain injury (ABI) population. John Shelley-Tremblay, University of South Alabama; Barry Tannen, EyeCare Professionals, Inc.; Emma Karlin, Dr. Shalu Pal and Associates; Kenneth Ciuffreda, SUNY/College of Optometry; Noah Tannen, EyeCare Professionals, Inc.

To report the retrospectively-based, clinical diagnostic findings for the horizontal, distance, fusional facility (DFF) test in the non-TBI (traumatic brain inury), ABI (acquired brain injury) population.

Methods

The DFF test (4 pd base-out/2 pd base-in) was assessed and compared retrospectively in the first author's optometric practice in three clinical populations: (1) post-mTBI, visually-symptomatic (n = 52), (2) post-ABI, non-mTBI, visually-symptomatic (n = 34), and (3) visually-normal, visually asymptomatic (n = 44).

Results

The DFF values in each group were significantly different from each other ($p < 0.05$). The mean non-TBI, ABI group value was significantly lower than found in the mTBI group, and both were significantly lower than the mean found in the normal cohort ($p < 0.05$). There was a significant reduction in DFF with increased age ($p < 0.001$). ROC values for the AUC ranged from excellent to acceptable (0.94–0.74).

Conclusion

The DFF test is a new and useful way to assess horizontal, distance, dynamic, fusional facility in those with presumed non-mTBI, ABI neurological conditions to assist in its diagnosis.

IX. HEALTH SCIENCES

A Paper Presentation

Stereotactic Breast Biopsy. Donna Cleveland, University of South Alabama; Donna Cleveland, University of South Alabama.

Donna Cleveland, M. Ed, RT (R)(M); RDMS (AB/BR/OB/GYN); FAAS. Director Diagnostic Medical Ultrasound Program. Department of Radiologic Sciences. University of South Alabama. (251)445-9357dcleveland@southalabama.edu

Stereotactic Breast Biopsy Defined

Stereotactic breast biopsy uses mammography – a specific type of breast imaging that uses low-dose x-rays — to help locate a breast abnormality and remove a tissue sample for examination under a microscope. It's less invasive than surgical biopsy, leaves little to no scarring and can be an excellent way to evaluate calcium deposits or tiny masses that are not visible on ultrasound.

Doctors use breast biopsy to remove a small amount of tissue from a suspicious area for lab analysis. The doctor may perform a biopsy surgically. More commonly, a radiologist will use a less invasive procedure that involves a hollow needle and image-guidance. Image-guided needle biopsy does not remove the entire lesion. Instead, it obtains a small sample of the abnormality for further analysis.

Image-guided biopsy uses ultrasound, MRI, or mammography imaging guidance to take samples of an abnormality.

In stereotactic breast biopsy, a special mammography machine uses x-rays to help guide the radiologist's biopsy equipment to the site of the imaging abnormality.

Why the Procedure is ordered

A stereotactic breast biopsy may be performed when a mammogram shows a breast abnormality such as:

- a suspicious mass
- tiny clusters of small calcium deposits (microcalcifications)
- a distortion in the structure of the breast tissue
- an area of abnormal tissue changes
- a new mass or area of calcium deposits in a previous surgery site.

Stereotactic breast biopsy is performed as a non-surgical method of assessing a breast abnormality. If the results show cancer cells, the surgeon can use this information for planning treatment.

Equipment Operation

Cartesian and Polar Coordinate systems are explained.

Imaging Procedure and Core Biopsy workflow

Image-guided, minimally invasive procedures such as stereotactic breast biopsy are most often performed by a specially trained radiologist.

Breast biopsies are usually done on an outpatient basis.

In most cases, the patient will lie face down on a moveable exam table. The mammographer will position the affected breast into an opening in the table.

The table is raised and the procedure is then performed beneath it. If the machine is an upright system, you may be seated in front of the stereotactic mammography unit.

The breast is compressed and held in position throughout the procedure.

Preliminary stereotactic mammogram images are taken and reviewed by the radiologist. Once the radiologist identifies the abnormality on imaging, the computer will generate coordinate information and send it to the biopsy device.

The doctor will inject a local anesthetic into the skin and more deeply into the breast to numb it.

The doctor will make a very small nick in the skin at the site where they will insert the biopsy needle.

The radiologist then inserts the needle and advances it to the location of the abnormality using the mammogram and computer-generated coordinates. Mammogram images are again obtained to confirm that the needle is within the lesion prior to sampling.

Tissue samples are then removed, generally using a vacuum-assisted device. Typically, three to twelve samples are obtained, depending on the device used.

If calcium deposits (calcifications) are being sampled, an x-ray of the removed tissue will be obtained to document enough deposits were obtained for analysis under a microscope. Additional sampling may be needed if not enough calcifications are identified initially.

After the sampling is complete, the needle will be removed from the breast.

A final set of images will be taken.

The doctor may place a small marker at the biopsy site so they can locate it in the future if necessary.

Once the biopsy is complete, the doctor or nurse will apply pressure to stop any bleeding. They will cover the opening in the skin with a dressing. No sutures are needed.

The doctor may use mammography to confirm that the marker is in the proper position.

This procedure is usually completed within an hour.

Interpretation of results

A pathologist examines the removed specimen and makes a final diagnosis. Depending on the facility, the radiologist or the referring physician will share the results with the patient. The radiologist will also evaluate the results of the biopsy to make sure that the pathology and image findings explain one another. In some instances, even if cancer is not diagnosed, surgical removal of the entire biopsy site and imaging abnormality may be recommended if the pathology does not match the imaging findings.

What are the benefits vs. the risks?

Benefits

The procedure is less invasive than surgical biopsy, leaves little or no scarring, and can be performed in less than an hour.

Stereotactic breast biopsy is an excellent way to evaluate calcium deposits or masses that are not visible on ultrasound.

Stereotactic core needle biopsy is a simple procedure that may be performed in an outpatient imaging center.

Compared with open surgical biopsy, the procedure is about one-third the cost.

Very little recovery time is required.

Generally, the procedure is not very painful.

No breast defect remains and, unlike surgery, stereotactic needle biopsy does not distort the breast tissue or make it difficult to read future mammograms.

Recovery time is brief and patients can soon resume their usual activities.

No radiation stays in your body after an x-ray exam.

X-rays usually have no side effects in the typical diagnostic range for this exam.

Risks

There is a risk of bleeding and forming a hematoma, or a collection of blood at the biopsy site. The risk, however, appears to be less than one percent of patients.

An occasional patient has significant discomfort, which can be readily controlled by non-prescription pain medication.

Any procedure where the skin is penetrated carries a risk of infection. The chance of infection requiring antibiotic treatment appears to be less than one in 1,000.

Depending on the type of biopsy or the design of the biopsy machine, a biopsy of tissue located deep within the breast carries a slight risk that the needle will pass through the chest wall. This could allow air around the lung and cause the lung to collapse. This is extremely rare.

There is a small chance that this procedure will not provide the final answer to explain the imaging abnormality.

There is always a slight chance of cancer from excessive exposure to radiation. However, given the small amount of radiation used in medical imaging, the benefit of an accurate diagnosis far outweighs the associated risk.

Women should always tell their doctor and x-ray technologist if they are pregnant.

Patient Positioning and Alternative Positioning

Limitations of Stereotactic Breast Biopsy

There are some instances in which stereotactic biopsy may not be possible, including if:

The target abnormality is located near the chest wall or directly behind the nipple.

The mammogram shows only a vague change in tissue density but no definite mass or nodule. The finding may be too subtle to identify at time of biopsy.

The breast is too thin.

The target is composed of diffuse calcium deposits scattered throughout the breast, which on occasion are difficult to target.

Breast biopsy procedures will occasionally miss a lesion or underestimate the extent of disease present. If the diagnosis remains uncertain after a technically successful procedure, surgical biopsy will usually be necessary.

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IX. HEALTH SCIENCES

A Poster Presentation

Forearm Muscle Anomalies in Student Dissected Cadavers. Anna-Blake Lowe; Samford University; Miranda Rein, Samford University; Will Scogin, Samford University; Nicholas Washmuth, Samford University; Mark Caulkins, Samford University.

Preferred Presentation Time: 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 upper extremity muscles and tendons of cadavers dissected by graduate students in the Samford University Cadaver Lab.

IX. HEALTH SCIENCES

A Poster Presentation

Bilateral Absence of Semimembranosus Muscles in Student Dissected Cadaver. Karly Grace Holt, Samford University; Emma Bishop, Samford University; Alyssa Brown, Samford University; Caroline Overstreet, Samford University; Ryan Tomlinson, Samford University; Will Scogin, Samford University; Nicholas Washmuth, Samford University; Mark Caulkins, Samford University.

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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 cadaver with bilateral congenital absence of semimembranosus muscles detected during graduate student dissection in the Samford University Cadaver Lab.

IX. HEALTH SCIENCES

A Poster Presentation

Social Vulnerability related to Mental Health During the 2020 COVID-19 Pandemic in Alabama, Georgia, and Florida. Alejandro Arroyo Rodriguez, Alabama College of Osteopathic Medicine; Cassie Odahowski, University of South Carolina; Joy Taazieh, Alabama College of Osteopathic Medicine; Stephanie Gonzalez, Alabama College of Osteopathic Medicine.

Introduction:

The fall of mental health during the 2020 COVID-19 pandemic has been a well-documented change. Our paper aims to understand the relationship between the socioeconomic and sociodemographic factors that were protective and harmful to mental health during this time in the Tri-state area of Alabama, Florida, and Georgia.

Methods:

We examined socioeconomic and sociodemographic characteristics by means of the Social Vulnerability Index, self-rated mental health from the BRFSS, and urban vs rural classifications. We used a t-test for unequal variances to examine differences in mean self-rated mental health status in the tri-state area. ArcGIS visually displayed a bivariate (rural self-rated mental health) map of rural vs. urban counties and county average “poor mental health days.” SAS 9.4 was used to conduct a linear regression with backwards selection to examine county Social Vulnerability (SoVI) metrics and Medically Underserved Areas (MUA) related to self-rated mental health.

Results:

Our statistical analyses showed that Alabama had the highest frequency of individuals reporting poor mental health, while Florida had the lowest frequency. The use of the Social Vulnerability Index highlighted socioeconomic and sociodemographic protective factors and risk factors based off each state and urban vs rural counties. SOVI predictors of poor mental health in Alabama and Georgia explained the variation observed when comparing county-level averages by urban and rural counties.

Conclusion:

During the 2020 COVID-19 Pandemic there was a dip in mental health, and the effects of been long lasting. Approaches to prevent and treat poor mental health may need to be tailored by geographic regions. Future research should examine individual-level data to ensure the observed associations hold true in an analytic observational study design.

IX. HEALTH SCIENCES

A Poster Presentation

TeamSTEPPS®: A Framework to Foster Teamwork and Collaboration Among Interprofessional Students. Donna Copeland-Streeter, University of South Alabama; Margaret Nadler, Moore.

Introduction: Teamwork among healthcare professionals is necessary for providing high-quality, team-based care. Nevertheless, individual members of healthcare teams are rarely trained together. Health-related students are no exception, and they do not innately know how to work collaboratively within an interprofessional team.

Background: Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) was developed by the Department of Defense to reduce errors in aviation, and it was quickly adopted by other industries, including healthcare to reduce harm from potential medical errors. While TeamSTEPPS addresses the interprofessionl education competencies, methods for delivering TeamSTEPPS training in healthcare education vary, including interviews, simulation, and online training. Likewise, Team-based learning (TBL) is a structured form of small-group learning that supports the Interprofessional Education Collaborative (IPEC) core competencies by enhancing communication and teamwork among student learners. However, little is written about using a TBL pedagogy for implementing TeamSTEPPS training among an interprofessional group of health-related students.

Objectives: A foundation for interprofessional teamwork starts with clinicians and faculty through a cross-disciplinary, health-related curricula exposing students to real-life experiences of interprofessional collaboration within an authentic setting. Therefore, an IRB approved mixed method research design was conducted among a convenience sample of health-related students enrolled in an interprofessional education course to a) determine the feasibility of utilizing a team-based learning (TBL) approach for teaching TeamSTEPPS competencies to a group of health-related students and b) examine whether TeamSTEPPS training would improve student's capacity for interprofessional teamwork and collaboration.

Methods: A pretest-posttest survey design was used to measure changes in students' perceptions of interprofessional collaboration. Qualitative data were obtained through student reflections of their interprofessional education experience.

Results: Descriptive statistics were used for data analysis. The findings revealed an overall increase in the mean scores for interprofessional collaboration: pretest scores 4.13 (SD=0.904); posttest scores 4.20 (SD=0.823). Students' reflections indicated that the TeamSTEPPS training positively influenced their knowledge, skills, and attitudes in team-based collaborative practice.

Conclusion: A TBL format was found to be complementary in delivering the TeamSTEPPS training to a group of health-related students. Both quantitative and qualitative findings suggest that TeamSTEPPS training improved students' capacity for interprofessional teamwork and collaboration.

IX. HEALTH SCIENCES

A Poster Presentation

Assessment of Gut Microbial Diversity among Sexual and Gender Minority Young Adults. Ashley Guy, University of Alabama at Birmingham; Taylor Miller, UAB; Lauren Picken, UAB; Christine Loyd, UAB.

Evidence supports that people identifying as a sexual or gender minority (SGMs) experience minority-related stress resulting from discrimination or expectations of prejudice, and that this is associated with increased mental and physical health problems compared to cisgender heterosexuals. However, the biological mechanisms driving minority-related stress impacts remain unknown, including the role of the gut microbiome. Thus, the aim of this study is to investigate the impact of SGM status on health of the gut microbiome among young adults attending a 4-year university. Self-identified SGMs (N=22) and cisgender-heterosexuals (CIS-HET, N=43) were enrolled in the study during fall and spring semesters of 2021-22. In-person interviews were conducted to collect demographics and mental health data. Biological samples (nail and saliva for cortisol, stool for microbiota) were collected within 48 hours of interview. We did not observe a significant difference in perceived stress, anxiety, depression, or cortisol levels between groups. Yet, assessment of the gut microbiota identified that the SGM group had higher abundance of microbes in phylum Bacteroidetes and lower abundance of microbes in phyla Firmicutes, Actinobacteria, and Proteobacteria compared to the CIS-HET group. This was accompanied by a significant reduction in alpha diversity among the SGM group compared to the CIS-HET group, even when adjusting for mental health outcomes. Overall, the findings suggest that SGM young adults have reduced diversity of the gut microbiota, which could be contributing to negative health effects in this population.

IX. HEALTH SCIENCES

A Poster Presentation

: Changes in Multimorbidity Among Hospitalized Adults in the US. Richelle Sanders, University of Alabama at Birmingham; Christine Loyd, University of Alabama at Birmingham; Lauren Picken, University of Alabama at Birmingham; Briahna Ballay, University of Alabama at Birmingham; Yue Zhang, University of Alabama at Birmingham; Richard E. Kennedy, University of Alabama at Birmingham; Cynthia J. Brown, Louisiana State University Health.

Background: Having multiple chronic health conditions, or multimorbidity, is common among adult inpatients and is associated with risk of death, disability, and reduced quality of life. This investigation examines prevalence trends of multimorbidity over time among inpatients based on age, sex, and race and disease-related hospitalization rates over time.

Methods: Retrospective cross-sectional analysis of 2012-2018 US National Inpatient Sample datasets was completed. Participants were hospitalized patients ≥55y from community hospitals. ICD-9 and 10 codes for admitting diagnoses were used to calculate disease burden using the Charlson Comorbidity Index (CCI) and Elixhauser Comorbidity Index (ECI). Unweighted mean index scores and admission rates for diseases were compared.

Results: The mean comorbidity scores increased across the sample over the 7-year period: mean CCI increased from 1.69 to 1.97 and mean ECI increased from 3.66 to 4.14. Increases in comorbidity over time were greater in older age groups until age 80-84 (for CCI) and age 85-89 (for ECI) and increased similarly among males and females. Black and Native American inpatients had the largest increase in both mean CCI and ECI scores overtime. Hospitalization rates associated with specific primary or secondary discharge diagnoses changed overtime including for complicated hypertension (+17%), complicated diabetes (+14%), dementia (+6%), congestive heart failure (+5%), obesity (+5%), and renal disease/failure (+5%).

Conclusions: Growing multimorbidity among inpatients supports the continued need for community-based programs aiming to prevent and treat chronic diseases especially among populations experiencing health inequities including the older adult, Black, and Native American communities.

IX. HEALTH SCIENCES

A Poster Presentation

Changes in Multimorbidity Among Hospitalized Adults in the US. Richelle Sanders, University of Alabama at Birmingham; Christine Loyd, Department of Clinical and Diagnostic Sciences, University of Alabama at Birmingham; Lauren Picken, Department of Clinical and Diagnostic Sciences, University of Alabama at Birmingham; Yue Zhang, Department of Medicine, Division of Gerontology, Geriatrics, and Palliative Care, University of Alabama at Birmingham; Richard E. Kennedy, Department of Medicine, Division of Gerontology, Geriatrics, and Palliative Care, University of Alabama at Birmingham ; Cynthia J. Brown, Department of Medicine, Louisiana State University Health Sciences Center.

Background: Having multiple chronic health conditions, or multimorbidity, is common among adult inpatients and is associated with risk of death, disability, and reduced quality of life. This investigation examines prevalence trends of multimorbidity over time among inpatients based on age, sex, and race and disease-related hospitalization rates over time.

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Conclusions: Growing multimorbidity among inpatients supports the continued need for community-based programs aiming to prevent and treat chronic diseases especially among populations experiencing health inequities including the older adult, Black, and Native American communities.

Special 1. Alabama Honors Scholars

A Paper Presentation

The evolution of Artificial Intelligence (AI) and evolving ramifications. Brian Officer Jr., Miles College .

The history of artificial intelligence (AI) spans over centuries, marked by significant milestones in human ingenuity. The roots of AI can be traced back to ancient myths and automata, reflecting humanity's fascination with creating intelligent, lifelike entities. However, it wasn't until the mid-20th century that AI emerged as a formal field of study. Pioneering figures like Alan Turing laid the groundwork for computational thinking and posed fundamental questions about machine intelligence. The Dartmouth Conference in 1956 is often considered the birth of AI as a discipline, with early optimism about creating machines that could mimic human intelligence. Over the decades, AI experienced cycles of enthusiasm and skepticism, with breakthroughs in areas like expert systems, neural networks, and machine learning. Recent years have witnessed unprecedented advancements, driven by the integration of big data, powerful computing, and innovative algorithms, propelling AI into various aspects of daily life.

Special 1. Alabama Honors Scholars

A Paper Presentation

Calling For Innovative Approach to addressing Deviant Behaviors of Adolescents. Kaleigh Burden, Miles College; Jessica Harris, Miles College.

Addressing deviant behavior, particularly among adolescents and individuals prone to criminality, requires a multifaceted approach that integrates various strategies for socialization and rehabilitation. One effective method involves providing comprehensive support systems that address underlying factors contributing to deviant behavior, such as socioeconomic disparities, lack of education, and limited access to resources. Programs that offer educational opportunities, vocational training, and mental health services can empower individuals to develop essential skills and make positive life choices. Additionally, mentoring and counseling initiatives can provide crucial guidance and support, helping individuals navigate challenges and build healthier relationships within their communities. This paper argues that interventions aimed at correcting deviant behavior should prioritize rehabilitation and reintegration rather than punitive measures alone. Restorative justice approaches that focus on repairing harm, fostering accountability, and promoting empathy can facilitate meaningful transformation and reduce recidivism ra

Special 1. Alabama Honors Scholars

A Paper Presentation

Harlem Renaissance: how a single neighborhood created modern African American culture. Jessica Harris, Miles College; Kaleigh Burden, Miles College.

The Harlem Renaissance, a pivotal cultural and artistic movement in the 1920s, unfolded as a transformative force within the confines of the Harlem neighborhood in New York City. This migration of a substantial African American population to Harlem became a crucible for the emergence of modern Black culture. Inspired by the intellectual contributions of visionaries like W. E. B. Du Bois, the denizens of Harlem laid the groundwork for a renaissance that resonated far beyond its geographical boundaries. As the Great Migration brought thousands to the urban enclave, Harlem became a haven where African Americans sought to redefine their identity and challenge societal norms. Within this vibrant community, a flourishing of literature, music, visual arts, and intellectual discourse unfolded. The cultural efflorescence can be attributed to the convergence of diverse talents, ignited by a shared desire for self-expression and social progress. The Harlem Renaissance was not merely a geographical phenomenon; it was a crucible of creativity that birthed luminaries like Langston Hughes, Zora Neale Hurston, and Duke Ellington. Through their works, they not only illuminated the richness of Black experience but also reshaped the broader American cultural landscape. This paper explores the dynamic interplay of social, intellectual, and artistic forces that coalesced in Harlem, illuminating how a single neighborhood catalyzed the creation of a modern African American culture that resonates with enduring significance.

Special 1. Alabama Honors Scholars

A Paper Presentation

Making Space For all of our Voices: Student-led Action UAB-style. Lina Jabr, University of Alabama at Birmingham; Rachael George, University of Alabama at Birmingham; Nikhita Mudium, University of Alabama at Birmingham.

Diversity, equity, and inclusion (DEI) and the connection to social justice are important considerations in various contexts, including workplaces, communities, and educational institutions. Alabama, like many other places, has faced significant historical challenges and difficulties, but there has also been a variety of efforts to push forward initiatives to promote DEI as well as social justice across all communities. Student-led DEI initiatives have become increasingly valuable as universities face opposition, and also give students the opportunity to design and lead new and innovative endeavors. Having initiatives like this on campus is a key responsibility that universities have to protect freedom of speech in the face of external pressure, as well as academic growth. One way students have led DEI initiatives on the University of Alabama at Birmingham's (UAB) campus is through the Organized Radical Collegiate Activism (ORCA) conference. ORCA accepts presentation proposals from all students around Alabama who are involved in social justice efforts at their university or in their community. Examples of issues discussed can range from racial/cultural tolerance, issues, environmentalism, veteran advocacy, mental health, or any issues students deem to be significant. Such conferences are opportunities for students who may not see social justice as a space for them to learn from their peers about socially prevalent issues that are impacting communities across the state and nation and get involved in small ways. We will discuss the steps involved in organizing a successful social justice conference, its impact on UAB's campus, as well as how to implement the infrastructure of the conference at other universities. Student-led DEI initiatives can play a crucial role in fostering a more inclusive campus community. They provide students with opportunities to develop leadership skills, engage in meaningful dialogue, and contribute to positive change within their educational institutions.

Special 1. Alabama Honors Scholars

A Paper Presentation

A Look into Second Amendment Jurisprudence: Analyzing United States v. Rahimi. Anthony Venezia, University of Alabama at Birmingham; Liberty Wigen, UAB.

This term, the Supreme Court has heard oral arguments in United States v. Rahimi, a case in which they will decide the constitutionality of disarming individuals subject to domestic-violence restraining orders. This panel will explore the arguments on both sides, ranging from the government's interests in safety and the respondent's interest in due process. This discussion will also cover the scope of 2nd Amendment protections in a post-Bruen world as the Court seeks to affirm only historically supported restrictions on firearm possession and use. Finally, this panel hopes to utilize the voting records of the sitting justices to predict how this case will be resolved in the coming months and what impact such a decision might have on the Court's jurisprudence moving forward.

Special 1. Alabama Honors Scholars

A Paper Presentation

Parental Obligations in Educating their Children. Liberty Wigen, University of Alabama at Birmingham.

Parental rights and obligations are surprisingly difficult topics to nail down. It is unclear where they come from, what they should be, and how they should be applied. It is unclear why there would be a right to create a person, and from that why a parent could make sweeping decisions that will influence their child's life. One theory states obligations are born out of the procreation of a child. Another theory says that there are social obligations to caring for a child. Theories of parental obligation attempt to deal with the questions posed about raising a child. The main question being addressed is: What are the parental obligations regarding a child's education? The theories of parental obligation previously mentioned will be blended and applied to education. These theories of parental obligation engender a need for some kind of liberal education that will expose children to a variety of viewpoints.

Special 1. Alabama Honors Scholars

A Paper Presentation

An Analysis of Religious Experience during Hindu and Muslim Prayer. Priya Mantraratnam, University of Alabama at Birmingham.

The questions that will be addressed are: 1) to what extent are the religious experiences of prayer in Hinduism and Islam similar or different? 2) What modes of prayer are used in these two major religions? and 3) how egalitarian are the two religions when it comes to involving different genders in prayer? Although using science to study religious experiences may seem counterintuitive or even controversial, the experience of prayer or the feeling of closeness to God can be studied scientifically as indicated by the emerging field of neurotheology. Neurotheology is defined as the study of the connections between the brain, religious experience, forms of prayer, and the well-being of different groups who pray. Experimental studies in neurotheology have found that subjective religious/spiritual experiences measured by psychological methodologies (self-reports, ratings, questionnaires, etc) can be linked to brain activity measured by functional brain imaging techniques. My study will use a scientific lens to explore the differences and commonalities in prayer as practiced by Hindus and Muslims. Peer-reviewed journal articles and scholarly analyses of sacred texts will be used to explore the nature and modes of prayer in the two religions. Existing findings in the neurotheology literature will be used to assess the extent to which there are commonalities and differences in the subjective experiences of prayer of Hindus and Muslims. Though Hinduism and Islam are anchored in very different sacred texts and followers engage in quite different modes of worship using various modes of prayer in order to induce feelings of closeness to God, it is quite likely that Hindus and Muslims likely experience prayer in a similar way, given the extant literature in neurotheology. A particular focus of the research will be the roles played by different genders in prayer.

Special 1. Alabama Honors Scholars

A Poster Presentation

Patient Safety: Orthotic Thermoplastics Demonstrate a Similar Contamination Potential to Bacillus Bacteria Recovered from Thermoplastic Radiation Therapy Masks. Dev Mehta, University of South Alabama; Terrence Ravine, University of South Alabama; Catherine Brock, University of South Alabama.

Having previously studied infectious bacteria attractions to patient radiation therapy thermoplastic head/neck immobilization masks, there was question as to whether these results were relevant to other thermoplastic medical devices. Orthotic splints are made of similar thermoplastics and applied to patients with burns and surgical wounds to support affected areas. Splints are also prone to bacterial contamination. Nine different Bacillus species were previously recovered from radiation therapy masks. Bacillus is a gram-positive, spore-forming bacterium. B. cereus and B. megaterium mask isolates were utilized to assess attachment to thermoplastic sheets from North Coast Medical (NC Beige) and Klarity Medical (Klarity) used to construct orthoses. The hydrophobicity of the thermoplastic surface promotes the attraction of certain bacteria like Bacillus. Water contact angles (WCA) revealed a difference in hydrophobicity between NC Beige and Klarity sheets. Prepared suspensions of B. cereus or B. megaterium were separately applied to target squares on both sheets, subsequently sampled, and the number of recovered bacteria determined. No significant difference was seen in the number of either bacteria recovered at any sampling interval, which ranged from 1 hour to 8 weeks. However, trends were noted in the number of either Bacillus species recovered from NC Beige and Klarity material over time. Klarity demonstrated a weekly downward trend over the 8-week sampling period. Contrarily, NC Beige revealed an upward trend over the same period. These results suggest that there is stronger Bacillus adhesion to the Klarity material as opposed to NC Beige. Additional studies are planned using antibiotic resistant bacteria.

Special 1. Alabama Honors Scholars

A Poster Presentation

Data Analysis of Gene Expression in Pancreatic Cancer Tumor Tissue. Brianna Leahr, Miles College.

Data Analysis of Gene Expression in Pancreatic Cancer Tumor Tissue

Pancreatic cancer is projected to be responsible for 3% of all cancers in the United States and ~7% of all cancer deaths in the United States, as reported by the American Cancer Society. In terms of incidence rate between men and women– men are slightly more prone to be diagnosed. with pancreatic cancer than women. Pancreatic cancer has higher incidence and mortality rates. among African American patients than white patients. The goals of this study are to 1) analyze. gene expression in patients with pancreatic tumors in comparison to non-tumor controls, 2) make. connections with transcripts of interest and pathways that could potentially be related to pancreatic cancer, and 3) identify transcripts of interest and pathways that can further be studied. in relation to pancreatic cancer. An RNA-Seq dataset was obtained from Gene Expression Omnibus to conduct statistical analysis in Excel. Then, an over-representation analysis was. conducted using Web Gestalt. Gene Mania was then utilized to expand transcripts in connection to transcripts of interest previously identified. Following the expansion, Gephi 0.10.0 was used to create a visualization. The data analysis yielded the results of transcripts and pathways of interest. that could be further studied in relation to pancreatic cancer. The JAK-STAT signaling pathway, the transcript for platelet-derived growth factor receptor beta (PDGFRB), the transcript for platelet-derived growth factor receptor alpha (PDGFRA), and platelet-derived growth factor subunit A (PDGFA) demonstrated the most significant alteration in pancreatic tumor tissue. These results suggest that the JAK-STAT pathway and PDGFRB may have significant roles in the development of pancreatic cancer.

Special 1. Alabama Honors Scholars

A Poster Presentation

The Prevalence and Effect of Misinformation About Birth Control on TikTok. Kaitlyn Riggins, University of South Alabama; Jung Choi, University of South Alabama.

Social media is a crucial part of everyday life. People use social media for various reasons, such as entertainment, connections, and obtaining information. TikTok is one of the biggest social media platforms, and many use TikTok to investigate different topics. Prevalent topics on TikTok are women's health care and contraceptives. Many videos containing information related to birth control on TikTok contain misinformation, which could potentially lead women to make decisions to avoid contraceptives or health care. This study used content analysis and a survey to discover which topics of misinformation about birth control were more prevalent on TikTok and if posts influence women's healthcare decisions.

Special 1. Alabama Honors Scholars

A Poster Presentation

Investigating the effect of WNK lysine deficient protein kinase inhibition in breast cancer. Suhas Patil, University of South Alabama; Suman Prabhat, University of South Alabama; Kakkat Sooraj, University of South Alabama; Turbat-Herrera Elba, University of South Alabama; Singh Seema, University of South Alabama; Sarkar Chandrani, University of South Alabama; Chakroborty Debanjan, University of South Alabama.

Breast Cancer (BCa) is the second leading cause of cancer-associated death in women in the United States and a significant health concern. Over the years, the progress made in screening, diagnosis and management of BCa have improved the clinical outcomes in patients. Nevertheless, the disease remains a significant threat to the wellness of women as almost all patients with advanced metastatic forms of the disease ultimately succumb to the disease . Thus, there is a critical need to identify new and novel signaling pathways and therapeutic strategies targeting those pathways to treat metastatic BCa. In this study we identified the role of with-no- lysine protein kinase 1 (WNK1), a serine threonine kinase primarily involved with blood pressure regulation, in BCa progression. WNK1, which is highly expressed in BCa, shows a strong association with overall survival of BCa patients. However, its exact role in BCa is not clearly understood. Using and analyzing publicly available datasets and conducting IHC and Western Blot analyses, we observed strong WNK1 expression in BCa cells and fibroblasts, the most abundant cell types in the BCa microenvironment. Using murine BCa cells and mouse embryonic fibroblasts, we determined that inhibition of WNK1 using WNK1 inhibitors significantly inhibits the growth of cancer cells and fibroblasts. These results lead us to believe that WNK1 could be a potential therapeutic target in the treatment of BCa. Our findings are currently being confirmed in vivo where we are investigating the effects of WNK1 inhibition on tumor growth and progression.

Special 1. Alabama Honors Scholars

A Poster Presentation

Student contributions to a campus tree inventory. Muhammad Shalan, University of Alabama at Birmingham; Yeachan Park, University of Alabama at Birmingham; Sakshyat Chhetry, University of Alabama at Birmingham.

The University of Alabama at Birmingham (UAB) is an urban university, whose campus spreads over 430 acres located on the edge of downtown Birmingham. UAB is committed to prioritizing green spaces, preserving tree growth, planting new trees, and minimizing the loss of trees in new construction projects and generally having a healthy tree population. The university has been named a Tree Campus USA by the National Arbor Day Foundation since 2015 and has also been designated a U.S. Department of Education Green Ribbon School. Understanding an urban forest's structure, function and value can promote management decisions that will improve human health and environmental quality. An assessment of the vegetation structure, function, and value of the UAB Tree Inventory urban forest was previously conducted during 2018 in which over 4,000 on-campus trees were analyzed using the i-Tree Eco model developed by the U.S. Forest Service, Northern Research Station. Our University Honors Program (UHP) partnered with UAB Facilities personnel to conduct an updated tree inventory. As part of our nine credit-hour interdisciplinary course on 'Sustainability,' twenty-three groups, each consisting of three students, received hands-on training on assessing various parameters for each tree (e.g., diameter, height, crown width, % of canopy missing and % dieback, as well % of impervious surface under the canopy, and type of ground cover). Groups were assigned a sector of campus containing from 153 to 234 trees. Students used a dedicated field-map smart-phone App to register the GPS location of each tree, entered all data, and upload a picture. A total of 3,408 trees were assessed (about 81% of all trees on campus). The data will form the basis of a new campus Tree Inventory report using the i-Tree Eco model that will assess the environmental impact of the tree canopy on the UAB campus.

Special 1. Alabama Honors Scholars

A Poster Presentation

Alterations in prefrontal cortex dendritic spine morphology accompany behavior abnormalities in progranulin haploinsufficient mice. Juliana Eberhardt, University of Alabama at Birmingham.

Loss-of-function mutations in the progranulin (GRN) gene are an autosomal dominant cause of Frontotemporal Dementia (FTD). These mutations typically result in haploinsufficiency of the progranulin protein. Grn+/– mice provide a model for progranulin haploinsufficiency and develop FTD-like behavioral abnormalities by 9–10 months of age. In previous work, we demonstrated that Grn+/– mice develop a low dominance phenotype in the tube test that is associated with reduced dendritic arborization of layer II/III pyramidal neurons in the prelimbic region of the medial prefrontal cortex (mPFC), a region key for social dominance behavior in the tube test assay. In this study, we investigated whether progranulin haploinsufficiency induced changes in dendritic spine density and morphology. Individual layer II/III pyramidal neurons in the prelimbic mPFC of 9–10 month old wild-type or Grn+/– mice were targeted for iontophoretic microinjection of fluorescent dye, followed by high-resolution confocal microscopy and 3D reconstruction for morphometry analysis. Dendritic spine density in Grn+/– mice was comparable to wild-type littermates, but the apical dendrites in Grn+/– mice had a shift in the proportion of spine types, with fewer stubby spines and more thin spines. Additionally, thin spines on apical dendrites of Grn+/– mice were longer and exhibited smaller head diameter in comparison to wild-type littermates. These changes in thin spine morphology may contribute to altered circuit-level activity and social dominance deficits in Grn+/– mice.

Special 1. Alabama Honors Scholars

A Poster Presentation

Inter-group Contact, Beliefs About Gender, and Anti-Trans Prejudice. Samantha Oyler, University of South Alabama; Samantha Oyler, University of South Alabama; Erica Ahlich, University of South Alabama.

Gordon Allport first proposed the Inter-group Contact Theory in 1954. According to his theory, contact between ingroup and outgroup members, under certain conditions, would lead to positive effects, specifically the reduction of prejudice. Since then, this theory has been applied to other majority/minority groups. Research suggests inter-group contact has positive effects for reduction of anti-trans prejudice. It remains unclear whether inter-group contact might also promote the acquisition of more nuanced sociocultural understanding about gender. This study tested the hypothesis that imagined inter-group contact would be associated with more positive attitudes toward trans individuals, greater endorsement of social gender theory beliefs, and more positive behavioral intentions towards trans individuals. The study utilized an experimental design. Participants were randomly assigned to a control prompt (imagine an outdoor scene) or are asked to imagine interacting with a trans individual. Subsequently, participants completed questionnaires related to gender beliefs and attitudes and behavioral intentions towards transgender individuals. Data collection is underway. Currently 136 participants have completed the study. So far, no significant differences were found between groups based on attitudes toward transgender individuals, social gender theory beliefs, negative, positive, or public behavioral intentions. However, self-reported quantity and quality of contact with trans individuals in one's personal life were both positively correlated with a positive attitudes, positive behavioral intentions, public behavioral intentions, and social gender theory endorsement. Mixed support for the inter-group contact theory was found in this sample. Limitations (e.g., imaginal exercise vs real world contact) and future directions will be discussed.

V. SOCIAL SCIENCES

A Poster Presentation

The Relationship Between Guilt, Shame, and the Dark Tetrad. Heidi Dempsey, Jacksonville State University; Kayleigh Forehand, Jacksonville State University; Rachel Powell, Jacksonville State University; Haley Helms, Jacksonville State University; Katherine Robles, Jacksonville State University; Harley Fields, Jacksonville State University; Richard Sheffield, Jacksonville State University.

Guilt is primarily an interpersonal emotion which facilitates social relationships by making a person feel bad for causing harm to a valued relationship partner (Olthof, Ferguson, Bloemers, & Deij, 2004). Thus, it is more closely tied to empathy. In contrast, shame is an emotion that is more self-focused. An ashamed person feels they have an unwanted identity, that is, they are being seen by others in a way they do not want to be seen (Ferguson, Eyre, & Ashbaker, 2000). Myriad studies have shown that guilt is generally the more adaptive of the two emotions because it is more problem-focused and constructive. In contrast, shame focuses the person inward on their defective qualities which can relate in more internalizing symptoms (such as anxiety and depression) and also externalizing symptoms as the person lashes out against these unwanted identities (Ferguson et al., 2000; Tangney, 1994). However, less research has looked at how guilt and shame are related to the dark traits of Machiavellianism, narcissism, psychopathy, and sadism. Because some research has shown that psychopathy and sadism are related to a dearth of empathy, one would expect that people who are more guilt-prone would be less likely to experience psychopathy and sadism (Marsh, 2014). Narcissism is interesting in terms of predictions regarding shame because on one hand, we would predict that narcissist feel little shame because of their grandiose self-views. However, others have suggested that narcissists are actually more vulnerable because they have self-doubt that they are using narcissism to cover (Altmann, 2017; Schröder-Abé & Fatfouta, 2018). In the current study 182 undergraduate students completed two measures of the dark traits, the Dirty Dozen and SD-4 (Jonason & Webster, 2010; Delroy L. Paulhus, Buckels, Trapnell, & Jones, 2021), the Variety of Sadist Tendencies (D. L. Paulhus, Jones, Klonsky, & Dutton, 2011), and the Gilbert Shame and Guilt Scale (Gilbert, Allan, & Pehl, 1991). The results showed that sadism and psychopathy were moderately negatively correlated with guilt-proneness. Machiavellianism and guilt were negatively correlated in one questionnaire, but unrelated in the other. Narcissism was unrelated to shame or guilt, but the current measures only addressed grandiose forms of narcissism, not vulnerable. These results will be discussed in more detail in the presentation and tied back to previous research.

V. SOCIAL SCIENCES

A Poster Presentation

The Shortage of Psychologists in the Geriatric Workforce. Beverly Myers, Stillman College.

The purpose of this presentation is to examine factors that can potentially have a positive influence on psychology students' willingness to work with an older adult population. In 2015, the American Psychological Association reported that only 3% of licensed psychologists identified as a geriatric psychologist versus 30% of surveyed psychologists identified as a child and adolescent psychologist. This finding is a concern because adults 65 and older will make-up 20% of the United States population by 2030 and out-number children 18 and younger by 2034 (U.S. Census, 2018). Today, the field of psychology remains challenged to attract clinicians, researchers, and educators into the geriatric workforce. Psychologists are needed to address the cognitive and behavioral needs of older adults and needed to understand the impact of age-related illnesses on mental health outcomes. Society as a whole will benefit if more psychologists are willing to work with adults age 65 and older.

V. SOCIAL SCIENCES

A Poster Presentation

Examining the relationship between lighting and crime on a university campus. Michelle Wooten, University of Alabama at Birmingham; Kendal Colley, Jefferson County IB School.

One reason communities use artificial light at night is because, in addition to making pathways visible, lighting may reduce likelihood of crime. We seek to explore the veracity of the assumption that more lighting reduces the likelihood of crime on an Alabama university campus.Using data provided by the university police department, we ask, do outdoor crimes occur more often at night or during the day? And are more lighted areas less prone to crime? Using a chi-square test for independence, we found that in 2022, crime instances at the University of Alabama at Birmingham occurred significantly less often at night compared to the day on a monthly basis. Because exposure to artificial light at night has negative human medical and environmental consequences, we use our study findings to suggest that it may be a faulty assumption to overlight college campuses to reduce the possibility of crime. We recommend that similar analyses be performed at other campuses, in addition to using the Illuminating Engineering Society's recommended practices for exterior lighting (IES RP 43-22) as a guideline for establishing safe and healthy illumination of their nighttime environment.

V. SOCIAL SCIENCES

A Poster Presentation

Discovering the Truth Behind Football Culture: Examining the Effects Football Has On Collegiate Male Athletes. Paige Fandel, University of South Alabama; Caitlyn Hauff, University of South Alabama.

The mental health of athletes has become an increasingly discussed topic ashighly-watched athletes like Simone Biles, Harry Miller, and Michael Phelps have recently shared their personal struggles. Many athletes have voiced there is a critical need to continue evolving the conversation surrounding mental health, and thus, researchers have started focusing on why athletes feel they are unable to discuss their mental health, or their personal barriers that keep them from speaking out or asking for help. As research in this area grows, it has become clear that there is a stigma surrounding athlete mental health, and it is important for researchers and practitioners to address why this stigma exists and how it presents itself across different factors such as sex, sport type, and race. Research has indicated the male athletes are stigmatized for seeking mental health assistance, and therefore, little research exists on male athlete mental health. In order to fill this gap, this research project sought to qualitatively examine male football players at the collegiate level and their experiences regarding mental health. The guiding research question for this project was: “Why do male collegiate football athletes have a hard time discussing and getting assistance for their mental health struggles?” Previous research has examined different specifications as to why they struggle, but in order to answer this overarching question, we considered the following objectives:The experiences collegiate male football players have with mental health; The accessibility of mental health resources for the athletes;The stigma collegiate athletes feel surrounds mental health.

After obtaining IRB approval, we recruited male collegiate football players who met the following criteria: 18 years of age, currently playing collegiate football or have played in the past 3 years, and a self-identified male. Participants (n=11) participated in a Zoom interview where they discussed their experiences as collegiate football players. Some of the interview questions included “Explain your experiences with mental health as a collegiate athlete, How do you feel mental health should be addressed with student athletes, and was there a difficult transition for you going from a high school athlete to a collegiate athlete?”. Completed interviews were transcribed verbatim and interview transcripts were coded to determine emerging themes. Four higher order themes were identified, with some themes containing subthemes: 1) Presence of mental health issues (subthemes: anxiety, depression); 2) Transitions (subthemes: COVID-19, injury); 3) Stigma; and 4) Team dynamics (subthemes: support system, coach interactions). The first major theme was the Presence of mental health issues, with depression and anxiety being the most common struggles these collegiate athletes faced. Participants stated many mental health struggles emerged during their time as a collegiate athlete, oftentimes as a result of their intense schedules. The next theme, Transitions, exemplified transitioning from a high school athlete to a collegiate. The subthemes of COVID-19 and injury were also prevalent, with many participants stating that restrictions added to the stress of transitions. The third theme, Stigma, stemmed from the participants expressing that they could not speak of their mental health struggles because they were an athlete. The final theme, Team dynamics, focused on interactions with their support systems and coaches. While many of these participants expressed positive interactions with their fellow teammates and found someone they are comfortable talking to about their issues, many of these athletes would not go to their coaches with their problems, creating a barrier to engaging

in help-seeking behavior. This population of student-athletes is understudied and it is important to examine what personal barriers they might face regarding their mental health. Often, many student-athletes undergo their battles silently, ultimately suppressing their emotions only make them worse. Because of this, their mental health exacerbates, and it only furthers the stigma of help seeking. This research is important in order to continue helping collegiate athletes through their silent battles. People find it hard to discuss their mental health, and these athletes need to learn how to use their voices to advocate for help. Future research in this area will aim at implementing mental health resources for athletes to ensure better mental health.

V. SOCIAL SCIENCES

A Poster Presentation

The Relationship Between Age, Emerging Adulthood, Empathy, Moral Reasoning, and Dark Traits.

Harley Fields, Haley Helms, Katherine Robles, Kayleigh Forehand, Richard Sheffield,

Rachel Powell, and Heidi Dempsey, Jacksonville State University, AL

The relationship between age and dark personality traits has only very recently begun to appear as a topic in personality research and the preliminary findings suggest that morality and empathy tend to increase with age (Abramson et al., 2022). Interestingly, at the same time, research has found an increase in Machiavellianism, narcissism, psychopathy, and sadism (dark traits) in adolescence with a peak in emerging adulthood (Klimstra et al., 2020). Further, Barlett and Barlett (2015) pointed out that the key characteristics of emerging adulthood could actually be better indications of presence of socially aversive traits than just using age itself. In the current study, we are examining the relationship between age, empathy, moral reasoning, dark traits, and indicators of participants' perceived transition into adulthood. Empathy will be assessed using the Questionnaire of Cognitive and Affective Empathy (Reniers et al., 2011) and moral reasoning will be assessed using a modified Kolhbergian framework (Brugman et al., 2023). The dark traits will be assessed using the SD-4 (Paulhus et al., 2021) and Dirty Dozen (Jonason & Webster, 2010). A short version of the Inventory of Dimensions of Emerging Adulthood questionnaire will be used to measure transitions into adulthood (Baggio et al., 2015). We hypothesize that the youngest college participants, and those lowest on dimensions of emerging adulthood, will score higher on dark personality characteristics and show lower levels of empathy and moral judgment than our oldest participants and those higher on emerging adulthood.

V. SOCIAL SCIENCES

A Poster Presentation

Psychopathy, Machiavellianism, Aggression, and Moral Taboos. Katherine Robles, Jacksonville State University; Kayleigh Forehand, Jacksonville State University; Richard Sheffield, Jacksonville State University; Rachel Powell, Jacksonville State University; Haley Helms, Jacksonville State University ; Harley Fields, Jacksonville State University; Heidi Dempsey, Jacksonville State University.

In the past decade there has been an increased interest in the dark personality traits of psychopathy, Machiavellianism, narcissism, and sadism and how they relate to personality disorders and psychological dysfunction (Curtis et al., 2022; Muris et al., 2017). Researchers have found that those who are higher on these traits are more likely to have related personality disorders (e.g., anti-social personality disorder and narcissistic personality disorder) and struggle with interpersonal relationships and moral decision making (Glenn et al., 2009; Graham & Haidt, 2012; Kiehl, 2008). In the current study we collected data from over 150 undergraduate college students to examine the correlational relationship between two of the dark traits, psychopathy and Machiavellianism using the Dirty Dozen and SD-4 measures of dark traits (Jonason & Webster, 2010; Paulhus et al., 2021), and self-reports of physical, verbal, and indirect aggression using the Buss-Perry Aggression Questionnaire (Buss & Perry, 1992) along with decisions about how much money it would take to violate a variety of moral taboos using the Sacredness Scale (Graham et al., 2009). We hypothesize that college-aged students higher in Machiavellianism will require less money to violate moral taboos and students higher in psychopathy will self-report more aggressive behaviors across the three domains. OBJ

V. SOCIAL SCIENCES

A Poster Presentation

The Connection Between Schadenfreude, Dark Traits, and Counterproductive Workplace Behaviors.
Rachel Powell, Jacksonville State University; Richard Sheffield, Jacksonville State; Harley Fields, Jacksonville State; Haley Helms, Jacksonville State; Kayleigh Forehand, Jacksonville State ; Katherine Robles, Jacksonville State; Heidi Dempsey, Jacksonville State.

Schadenfreude is defined as a positive reaction to someone else's misfortune (Johnson, 2021). In previous research schadenfreude has been found to be positively correlated with measures of the dark personality traits of Machiavellianism, psychopathy, and narcissism (Greenier, 2018; James et al., 2014). Further, all three components of the dark triad have been found to be related to counterproductive workplace behaviors, such as purposefully wasting supplies, skipping work, ignoring people at work, etc. (O'Boyle et al., 2012). The goal of the current study is to further examine and replicate the relationship between schadenfreude, dark traits, and counterproductive workplace behaviors. Over 150 college students participated in a large-scale online survey assessing a variety of constructs related to dark traits. The schadenfreude measure was created by the authors, based on an adaptation of the scenarios developed by Johnson (2021). Workplace behaviors were assessed using the Counterproductive Workplace Behavior Checklist (Spector et al., 2006) and dark traits were assessed using the Dirty Dozen (Jonason & Webster, 2010) and SD-4 (Paulhus et al., 2021). We hypothesize that there will be strong positive correlations between all of the subscales assessed. The discussion will focus on how our results tie back to previous research. OBJ

V. SOCIAL SCIENCES

A Poster Presentation

Does Endorsement of Sex Roles Differentially Predict Sex Guilt, Indirect Aggression, Sadism, and Narcissism? Kayleigh Forehand, Jacksonville State University; Katherine Robles, Jacksonville State University; Rachel Powell, Jacksonville State University; Richard Sheffield, Jacksonville State University; Harley Fields, Jacksonville State University; Haley Helms, Jacksonville State University; Heidi Dempsey, Jacksonville State University.

In past research, men have been found to be higher on dark personality traits (Grijalva et al., 2015; Takikawa & Fukukawa, 2023) and women have been found to be higher on sex guilt and indirect forms of aggression (Archer & Coyne, 2005; Thomson et al., 2019). However, additional studies have suggested that the relationship may be more complex and based not just on sex differences, but also on gender role adoptions (Jonason & Davis, 2018). In the present study, we collected data from over 150 college-aged students to examine whether gender roles moderated the relationship between sex and sex guilt, indirect aggression, sadism, and narcissism. We hypothesized that females who score higher on the masculinity side of the Bem Sex Role Inventory (BSRI) will also score higher on sadism and indirect aggression and have lower sex guilt. In contrast, males who score higher on the femininity side of the BSRI will have lower sadism and indirect aggression scores and higher sex guilt.

V. SOCIAL SCIENCES

A Poster Presentation

The Link Between Psychopathy and Empathy. Haley Helms, Jacksonville State University; Harley Fields, Jacksonville State University; Kayleigh Forehand, Jacksonville State University; Katherine Robles, Jacksonville State University; Rachel Powell, Jacksonville State University ; Richard Sheffield, Jacksonville State University; Heidi Dempsey, Jacksonville State University.

Empathy is defined as a construct that is a result from conjointly operating both cognitive and affective processes and being the center of social awareness. Affective empathy involves the ability to experience the emotions of another while cognitive empathy involves the understanding of another's emotional state (Jolliffe & Farrington, 2006). A lack of empathy is considered a fundamental aspect of the Dark Triad traits (Jonason et al., 2013). While this may be true, the relationship appears to be mainly with the affective component of empathy rather than the cognitive component (Wai & Tilipoulos, 2012). When looking at psychopathy and Machiavellianism, research has found both were correlated with higher levels of difficulty identifying and describing feelings along with external-oriented thinking and low levels of affective empathy (Jonason & Krause, 2013). We hypothesize that individuals who score high in psychopathy will score high in cognitive empathy and low in affective empathy acknowledging that individuals with psychopathic tendencies understand and can recognize empathy but cannot feel empathy introspectively. Over 150 college students participated in an online survey where they completed the Dirty Dozen measure of psychopathy and the Questionnaire of Cognitive and Affective Empathy (QCAE; Reniers et al., 2011). Results and discussion will focus on whether our findings match previous research.

V. SOCIAL SCIENCES

A Poster Presentation

Gender Differences in Sub-categories of Narcissism, Extraversion, Conscientiousness, and Psychopathy. Julianna Mostillo, Jacksonville State University; Heidi Dempsey, Jacksonville State University.

The literature suggests men score higher on measures of narcissism and psychopathy (Grijalva et al., 2015; Muris et al., 2017) and that women score higher on measures of conscientiousness (Schmitt et al., 2008). The literature also shows that women score higher on the warmth, friendliness, and gregariousness facets of extraversion while men score higher in dominance and assertiveness measures of extraversion (Costa et al., 2001; Schmitt et al., 2008). We hypothesize that men will score higher on all facets of narcissism and psychopathy and that women will score higher on all facets of conscientiousness. We also expect that men will score higher on the dominance/assertiveness facets of extraversion while women will score higher on the warmth, friendliness, and gregariousness facets of extraversion. In the current study 160 college students were asked to anonymously fill out the Brief Pathological Narcissism Inventory which measures two aspects of narcissism – grandiose and vulnerable (Schoenleber et al., 2015). This scale has 28 items rated on a 5-point scale. The second measure completed was the Self-Report Psychopathy Scale, version 3 (Paulhus et al., 2015). This scale consists of 64 psychopathy items rated on a 5-point scale. Conscientiousness and Extraversion were both taken from the IPIP-NEO-120 measure of the Big 5 personality traits (Johnson, 2014). Each scale consists of 24 items rated on a 5-point scale. Results and discussion will focus on whether the hypotheses were supported or not and why that might be the case.

VI. ANTHROPOLOGY

A Paper Presentation

"Nobody Knows My Name": Confronting America's Amnesia about the Middle Passage and Resurrecting Collective Memory Through the Ritual of Remembrance" by Chadra Pittman. Chadra Pittman, University of Alabama at Birmingham.

"Nobody Knows My Name": Confronting America's Amnesia about the Middle Passage and Resurrecting Collective Memory Through the Ritual of Remembrance" by Chadra Pittman

For centuries, the history of enslaved Africans was buried under skyscrapers, asphalt, and America's amnesia. Ten to twenty-thousand unnamed skeletal remains of African men, women and mostly children lay in the heart of Wall Street in lower Manhattan while millions of other human beings drowned in the Atlantic Ocean during the massacre on the Middle Passage. While we may never know their names, or what their dreams were, what we do know is that the inhumane terror imposed on Africans during slavery was brutal and its afterlife is still being felt today. As a Former Public Educator for the world-renowned 17th century African Burial Ground to Creator of Sankofa's Remembrance Ceremony in Hampton, VA, Chadra Pittman has spent nearly three decades giving voice to the untold history of Africans across the Diaspora. According to Pittman, "The history of slavery remains incomplete if you do not tell the truth of what transpired at the massacre on the Middle Passage." In this lecture, Pittman will take you on an anthropological, historical journey through time from Hadar, Ethiopia to Hampton, Virginia, from the barracoons to the belly of the ships, exploring the construction of race and our collective memory, the hierarchy of humanity, scientific racism, from a 17th century cemetery to and the erasure of the Middle Passage from the historical annals. Pittman will resurrect the work of Ancestors James Baldwin, Zora Neale Hurston, Audre Lorde, Sterling Stuckey, and Toni Morrison drawing correlations from history to what Sadiya Hartman refers to as "…the afterlife of slavery." Pittman will share the cultural continuity of the Ritual of Remembrance through images from the ceremony over the past thirteen years.

VI. ANTHROPOLOGY

A Paper Presentation

Gender-Affirming Care as an Expression of Agency, and a Right. Macy Sauls, University of Alabama at Birmingham.

The number of transgender individuals choosing to receive gender-affirming care is increasing. Gender-affirming care is a frontier for applying anthropological theory because it explores agency in gender expression. To demonstrate how gender-affirming care is an act of agency, I draw on Butler's concept of gender performativity and Haraway's idea of the breakage of the nature-culture binary. I argue that as opposed to gender-affirming care being viewed as self-mutilation of one's sex, it is the utmost act of agency and self-determination for one's gender. I apply these concepts to the analysis of two films, Blade Runner and RoboCop, which demonstrate that one becomes fully human by manipulating technology in an act of self-determination. In conclusion, I argue that restrictions on gender-affirming care are acts of violence that limit transgender individuals' right to freedom of expression and happiness.

VI. ANTHROPOLOGY

A Paper Presentation

Visualizing Archeology: New research from Viking Age Iceland. Evie Vaughn, Jacksonville State University; Dr. Kathryn A. Catlin, Jacksonville State University.

This presentation describes archeological excavations at Kotið, a small Viking Age dwelling site in North Iceland. The presenter will describe the history of the project, a brief analysis of the buildings excavated at Kotið, the data collected from them and briefly share their experience as a JSU student working on this archeological excavation. The presenter will also share an artistic representation which is a part of an extended project they will present later in the spring at the Society for American Archaeology's 89th Annual meeting. This rendering of the Viking Age turf dwelling at Kotið demonstrates how this structure differs from previously excavated turf dwellings in Viking Age Iceland.

VI. ANTHROPOLOGY

A Paper Presentation

Menstrual Taboos in the United States in the Twenty-First Century. Cam Brand, University of Alabama at Birmingham.

Menstrual taboos are a common widespread cultural feature of many societies. Scholars from multiple fields – including anthropology, medicine, psychology, and public health – have studied these taboos cross-culturally throughout time. Menstrual taboos range from the use of menstrual euphemisms to the complete isolation of the menstruating female. The purpose of this analysis is to understand taboo surrounding menstruation in the United States through cross-cultural analysis that considers the cultural context in which it has developed in the United States within the last hundred years. Data on menstruation in the US was collected through online questionnaires with over a hundred respondents. Findings point towards ongoing stigma surrounding menstruation, passed from mother to daughter, and exacerbated by capitalist expectations of productivity as well as limited education to pre-and-post-menarcheal females. Ortner's (2022) concept of patriarchy will be used to analyze how menstruation can be used to endorse patriarchal structures by excluding females/women from certain spaces. On the other hand, it could disrupt patriarchy as females/women claim traditionally male spheres. The lack of strict menstrual restrictions in North America may be perceived as "freedom". However, it can also be a demonstration on how females/women struggle to again equal status as 'social adults' in a culture that forces them to ignore the multiple challenges that are associated with this biological process. This study seeks to contribute to the knowledge of how menstruation influences and it's influenced by society in the United States in the midst of a sociopolitical regression in gender and reproductive rights. While menstrual taboos are still present in the United States, researchers, healthcare providers, and feminist movements are currently working to improve this perception in order to improve the social and health experiences of menstruating females.

VI. ANTHROPOLOGY

A Paper Presentation

Mixed Martial Arts, Meaning, And Behavioral Peace: Examining Social Relationships In A Diverse Environment. Dana Dawson, The University of Alabama at Birmingham.

This research study investigates mixed martial arts (MMA) gyms, utilizing a behavioral definition of peace to understand the meaning of behaviors and social interactions in diverse gym environments. The concept of behavioral peace is integral to peace ethology—a field that seeks to scientifically explain peace as a process of achieving harmony within a social system. The operational definition of peace provided by peace ethology extends beyond reactions to direct or structural violence, encompassing the preservation of harmony through pursuits including mutual interests, tolerance, helping, sharing, and active avoidance of aggressive confrontation. The research question seeks to understand how peace manifests within the subcultures of MMA gyms, examining the interactions and social relationships in environments characterized by controlled violence and physical vulnerability. This study employs a blend of autoethnography and reflexive ethnography, incorporating the researcher's personal experiences alongside observations and semi-structured interviews with hobbyists, competitors, fighters, and coaches from three mixed martial arts gyms in Alabama. Presenting a qualitative analysis of how culture, environment, and individual and shared motivations influence peace within the dynamic playful and competitive contexts of MMA gyms, themes discussed encompass dichotomies of gym subcultures, including variations within and between "family" gyms and "fight" gyms, Gi and no-Gi, fighting and grappling, gender dynamics, and bonding mechanisms through play and competition within the MMA community. The findings contribute to cultural anthropology and the emerging field of peace ethology, illuminating the inherent behavioral peace processes within MMA communities.

VII. STEM EDUCATION

A Paper Presentation

Using a Biography Science Project to enhance Introductory Biology Students Research Skills through Diversity and Inclusion in STEM fields. Diann Jordan, Alabama State University Alabama State University, Montgomery, AL.

Diversity and inclusion are usually considered a part of the "fabric" of students' lives who attend an HBCU. Many introductory biology courses do not necessarily include diversity and relevancy as an active part of the curriculum. The contributions of scientists of color, gender and sexual orientation can give students a sense of self identity and thus relevancy. Because students often express their fear of failing the course, relevant and active learning assignments can often be a "game changer" for improve self-identity of who is a scientist and to increase their grades. This project sought to enhance students' research skills through writing and presentation, help improve self-identity, introduce students to scientists of color/marginalized groups and help improve overall grades. For 3 semesters, I used a Biography Project in introductory biology to teach students how to research a project and recognize the diversity and inclusion in STEM fields.There were 2-3 list of scientists provided to students each semester with 3 weeks of research time. In the fall semesters, students could research Hispanic, Native American, LGBTQ, or campus scientists celebrating each of these groups national months. In the spring semesters, students could research African American, Asian/Pacific Islander, LGBTQ, or campus scientists celebrating each of these groups national months. Students could also select their own scientist with approval of the instructor. Because the project counted as one test score, most students put a great deal of effort into this project resulting in overall grade improvement and enhanced research and presentation skills.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Paper Presentation

Plasma Surface Engineered ACF Mats for Effective Aerosol-Mediated Heavy Metal Remediation.
RENJITH RAJAN PILLAI, University of Alabama at Birmingham; David McMahan, UAB; Lea Hebert, Grambling State University; Claudiu Lungu, UAB; Vinoy Thomas, UAB.

Surface modification of nano-micro porous fiber surfaces without affecting the bulk properties in a green and scalable way is both desirable and highly challenging. Herein, a green low-temperature plasma-based strategy is reported for achieving improved heavy metal adsorption capacity. This study employed the development of a plasma-engineered activated carbon fiber (ACF) mat to eliminate heavy metals from the air efficiently. This eco-conscious initiative aimed to improve air quality in severely contaminated regions, focusing on the northern area of Birmingham. The central technique employed in this study involved modifying the ACF mat through a process called low-temperature plasma (LTP) treatment. Plasma surface modification is an environmentally friendly approach that preserves the fundamental properties of the material being unaffected. To gauge the effectiveness of these modifications, filtration efficiency experiments were conducted using a custom-built experimental system. Manganese aerosols were generated using a particle generator with MnCl2 solution. Various precursors were employed for the plasma surface modification including air, tetraethyl orthosilicate (TEOS), thiophene (THIO), methyl methacrylate (MMA), tetrahydrofuran (THF), vinyl pyrrolidone (VP), ethylene diamine tetraacetate (EDTA), and 2-mercaptoethanol (MCE). The physicochemical properties of the mat were extensively examined before and after modifications using Scanning Electron Microscopy (SEM), X-ray Photoelectron Spectroscopy (XPS), porosity analysis, and Ultra High-Resolution 3D-Microscopic Imaging. These examinations confirmed the adsorption efficiency of the plasma-treated ACF mat surface and substantiated the observed changes in the morphology of the fibers. Ultimately, these results have demonstrated the potential of this mat as a filter for heavy metals from aerosols.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Paper Presentation

Survey of Molecular Weight Distribution of Post-Consumer Recycled Polypropylene and Polyethylene.
Emily Sustarich, Troy University; Pixiang Wang, Troy University; Shaoyang Liu, Troy University.

Polypropylene (PP) and Polyethylene (PE) are two of the most common thermoplastic polymers due to their good mechanical properties, affordability, and low material densities. PP is widely used in food packaging, storage, and construction, where PE is used primarily in grocery bags, wire and cable insulation, housewares, etc. Their widespread usage makes PP and PE large contributors to plastic pollution. Recycling is an effective way to reduce their environmental impacts. Molecular weight (Mw) is a critical factor in determining polymer properties and should be closely monitored during recycling. The Mw of recycled PP (rPP) and PE (rPE) could be significantly affected by their previous life cycle. In the current work, 25 post-consumer rPP and rPE samples were analyzed with a gel permission chromatograph (GPC) to investigate their Mw distributions. The Mw of the rPP ranged from 115k to 378k g/mol with an average ± standard deviation of 246k ± 78k g/mol. The Mw of the rPP concentrated in the ranges of 200k to 250k g/mol (32%) and 300k to 350k g/mol (20%). The Mw of rPE had a slightly wider range from 28k to 315k g/mol with an average ± standard deviation of 138k ± 66k g/mol. The average Mw of the rPE samples was evidently lower than that of the rPP samples. A majority portion (56%) of the rPE had a Mw in the range of 100k to 150k g/mol. The information will help properly recycle PP and PE and ensure the quality of recycled products.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Paper Presentation

Deconvolution of GPC chromatograms of PP-PE mixtures with multiple-band IR detector. Dayne Long, Troy University; Shaoyang Liu, Troy University; Pixiang Wang, Troy University.

Polypropylene (PP) is a versatile material that has been widely used in the world and accounts for a large portion of today's plastic waste. Polyethylene (PE) is often the dominating contamination in post-consumer recycled PP and needs to be closely monitored to ensure the quality of recycled PP. In the current work, a gel-permeation chromatograph (GPC) was employed to establish a convenient method to analyze the PE content in PP-PE mixtures, as well as determine the PP and PE molecular weights (Mw). The GPC separates polymer molecules based on their sizes, and a multiple-band infrared (IR) detector is equipped to analyze their chemical compositions. PP-PE mixtures with a PE content of up to 14% were investigated. The results suggest that the PE content was proportional to the CH3/1000 C value, which could be used to monitor the PE level in recycled PP materials. The PP and PE molecular weights could be calculated by deconvoluting the chromatograms of the mixtures. The deconvolution was also based on the CH3/1000 C signal. The results indicate that relatively stable deconvoluted PP and PE chromatograms could be obtained when the PE content was more than 4%, and the molecular weights of the PP and PE in the mixture could be determined, respectively.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Poster Presentation

Plasma Surface Engineered ACF Mats for Effective Aerosol-Mediated Heavy Metal Remediation.
RENJITH RAJAN PILLAI, University of Alabama at Birmingham; David McMahan, UAB; Lea Hebert, Grambling State University; Claudiu Lungu, UAB; Vinoy Thomas, UAB.

Surface modification of nano-micro porous fiber surfaces without affecting the bulk properties in a green and scalable way is both desirable and highly challenging. Herein, a green low-temperature plasma-based strategy is reported for achieving improved heavy metal adsorption capacity. This study employed the development of a plasma-engineered activated carbon fiber (ACF) mat to eliminate heavy metals from the air efficiently. This eco-conscious initiative aimed to improve air quality in severely contaminated regions, focusing on the northern area of Birmingham. The central technique employed in this study involved modifying the ACF mat through a process called low-temperature plasma (LTP) treatment. Plasma surface modification is an environmentally friendly approach that preserves the fundamental properties of the material being unaffected. To gauge the effectiveness of these modifications, filtration efficiency experiments were conducted using a custom-built experimental system. Manganese aerosols were generated using a particle generator with MnCl2 solution. Various precursors were employed for the plasma surface modification including air, tetraethyl orthosilicate (TEOS), thiophene (THIO), methyl methacrylate (MMA), tetrahydrofuran (THF), vinyl pyrrolidone (VP), ethylene diamine tetraacetate (EDTA), and 2-mercaptoethanol (MCE). The physicochemical properties of the mat were extensively examined before and after modifications using Scanning Electron Microscopy (SEM), X-ray Photoelectron Spectroscopy (XPS), porosity analysis, and Ultra High-Resolution 3D-Microscopic Imaging. These examinations confirmed the adsorption efficiency of the plasma-treated ACF mat surface and substantiated the observed changes in the morphology of the fibers. Ultimately, these results have demonstrated the potential of this mat as a filter for heavy metals from aerosols.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Poster Presentation

Development of a Dual-Air Purifying Respirator: Analysis of Activated Carbon Fiber's simultaneous Filtration Efficiency and VOC Capture. David McMahan, University of Alabama at Birmingham; David McMahan, University of Alabama at Birmingham.

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Thousands of workers in the U.S. are required to wear respiratory protection for potential exposure to hazardous chemicals and aerosols. Prolonged exposure to volatile organic compounds (VOCs) and particulate matter (PM) can cause adverse health effects such as pneumoconiosis-like symptoms, acute toxicity, and carcinogenesis. The present work aimed to test non-woven activated carbon fiber (ACF1200) as a filtration media capable of dual-protection from both PM and VOCs.

The first phase of this research evaluated filtration efficiency (FE) and VOC retention, using breakthrough times of ACF1200, which was chosen based on high surface area (1246 m2/g) and microporosity by volume (79.4%). Experiments conducted in our laboratory indicated that ACF1200 when compared to other non-woven ACFs (1800 and 2000), had the highest FE (43.25%) and lowest pressure drop (30 mmH2O)3. ACF1200 also showed longer breakthrough times (using 3-4 layers) when compared to commercially available 3M particulate + Nuisance Odor Filters.

Particulate Filtration (NaCl), and VOC breakthrough (Toluene) challenge experiments were conducted using 3-layers of ACF1200 within a dynamic adsorption chamber. Pressure drop, FE, and VOC breakthrough times were measured using a manometer, aerosol monitor, and photoionization detector, respectively; each experiment was performed in triplicate.

The resulting data shows that ACF1200 had a 50% breakthrough concentration at 39.51 minutes against a 500 ppm toluene challenge concentration, while concurrently maintaining a particulate FE of 56.89%, and pressure drop of 43 mmH2O.

In conclusion, the pilot data presented here has successfully set the stage for future developments toward a dual-protection particulate-vapor filter based on ACF1200.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Poster Presentation

Sustainable PET waste recycling: thermolysis of PET water bottle labels provide catalyst for PET waste recycling. Somayeh Mohammadi, Troy University; Mojtaba Enayati, Troy university; Martin G. Bouldo, Troy University.

We present a method utilizing waste PET water bottle labels to produce a catalyst for the chemical recycling of the same PET water bottles. The solid fillers in these labels were obtained through thermolysis in an electrical furnace at temperatures of 600, 800, and 1000 °C, resulting in recovery rates of 13.5%, 12.0%, and 10.4% of solid fillers, respectively. Analysis of the recovered solid residues revealed the presence of commercial fillers such as calcium carbonate, calcium oxide, and titanium dioxide, commonly used in the production of packaging film, including water bottle labels. Subsequently, these solid residues were used as catalysts for PET depolymerization through glycolysis in the presence of excess ethylene glycol at 200 °C. The resulting reaction mixtures underwent analysis to evaluate PET conversion and the yield of bis(2-hydroxyethyl)terephthalate (BHET) monomer, representing the glycolysis efficiency. Our findings indicate that the catalyst prepared at 800 °C (Cat-800) exhibited optimal performance, achieving 100% PET conversion with a BHET yield of 95.8% at a 1.0 wt % loading within 1.5 hours.

VIII. ENVIRONMENTAL AND EARTH SCIENCE

A Poster Presentation

Rheological and mechanical behavior of maleated recycled high-density polyethylene. Deacon Godfrey, Troy University; Aboulfazl Barati, Troy University; Erfan Dashtimoghadam, Troy University.

Plastic production, consumption, and disposal continue to rise unabated, leading to a severe environmental crisis. Projections indicate that global plastic waste generation will soar to 12 billion metric tons by 2050. Both large-scale plastic fragments and microplastics have substantial adverse effects on human health and the ecosystem. In recent years, there has been a significant shift from reusable to single-use containers, accelerating the proliferation of plastic packaging. The outstanding mechanical properties, high chemical resistance, and stability across a broad temperature range (-60 to 100°C) have positioned high-density polyethylene (HDPE) as the material of choice for disposable bottles and food packaging. Despite its high recyclability, less than 10% of HDPE bottles are currently recycled. This study delves into the development of low-cost, robust feedstocks with enhanced impact strength and rheological properties, focusing on post-consumer high-density polyethylene (rHDPE). The investigation explores the impact of the degree of maleation on the rheological and mechanical properties of maleated rHDPE. Rheological measurements indicate a significant increase in the complex viscosity of rHDPE with the degree of maleation, particularly up to 15 wt%, making this formulation suitable for extrusion processing. Maleated rHDPE exhibits higher impact strength, maximum tensile at break strength, and elongation at break compared to non-maleated counterparts. The findings of this study are anticipated to contribute to enhanced resource efficiency and a more sustainable supply chain, aiming towards a waste-free economy and greater sustainability.

X. BIOETHICS, HISTORY, PHILOSOPHY OF SCIENCE

A Poster Presentation

Ethical Issues Surrounding the Use of Synthetic Human Embryos in Scientific Research. Shuntele Burns, Alabama State University.

Scientists have succeeded in creating synthetic human embryos from embryonic stem cells, a remarkable feat that may lead to increased knowledge and understanding concerning embryonic development, genetic diseases, and the causes of miscarriages. Because stem cells have the capability of developing into a variety of cell types, they can be coaxed to form structures that are not identical to but resemble embryos created by the combination of eggs and sperm. Synthetic embryos or embryo models represent a significant scientific breakthrough that holds considerable promise for advancing medical research, potentially providing a workable alternative to using IVF-derived embryos. However, the creation of synthetic human embryos, although an important achievement, also raises challenging ethical issues that require serious and thoughtful consideration. For example, the 14-day rule allows a human embryo to be grown in a lab for 14 days for research purposes. Should this rule be applied to synthetic human embryos? Research to date has demonstrated that monkey and mice synthetic embryos die shortly after implantation into a uterus. However, if emerging technologies eventually render synthetic human embryos capable of continuing to develop, is it ethical to create and use them for research? What limits, if any, should be imposed on research using synthetic embryos? To address these and other ethical questions, scientific and public debate is essential, and new laws and guidelines may be needed to regulate the use of synthetic human embryos in scientific research.