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ABSTRACT BOOK
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Joint Paper Session
SECTION I – BIOLOGICAL SCIENCES
SECTION VII: STEM EDUCATION
CANVAS:
Thursday Morning, 8:30 AM – 9:50 AM

Brad Bennett and Jeff Morris, Presiding

Biological Sciences Paper

1. 8:30 **u Detection of Large Cat Species in Central Belize Using Camera Trap Technology. *Anjolaoluwa Lawani*, Talladega College; Andrew Coleman, Talladega College.

   The use of trail cameras to document the presence of elusive and secretive species has increased in recent years. Valuable data can be obtained on aspects of behavior and ecology that otherwise may not be collected. The present study utilized a series of trail cameras in the central region of Belize to document the presence of native big cat species: Jaguar (*Panthera onca*), Puma (*Puma concolor*), Jaguarundi (*Puma yagouaroundi*), Oscelot (*Leopardus pardalis*), and the Margay (*Leopardus wiedii*). Six Browning wildlife cameras were set up in 2018 at various locations on the 48,000 acre property of Sleeping Giant Rainforest Lodge, which sits adjacent to the government owned and protected Sibun National Forest Reserve in central Belize. Data analyzed for the current study were collected from five cameras from March to September 2019. Catch per unit effort was calculated as the number of observations per 100 trap days. The most observed large cat species was the Jaguar, followed by Pumas and the Jaguarundis. No Oscelots or Margays were observed on the trail cameras during the course of the study. These data can contribute to the conservation and management of these top-level predators, which, at times, can come into conflict with local human populations.

STEM Education Papers

1. 8:50 **u Podcast as an Engagement Tool in the Classroom and Beyond. *Derek Dang*, Emily Stephens, Parbhoo Karishma, Sahar Moughnyeh, Ryleigh Fleming, Sarah Adkins-Jablonsky, and Samiksha Raut, University of Alabama at Birmingham.

   The realm of higher education in STEM undoubtedly integrates the use of technology and Web 2.0 tools as primary modes to deliver content to undergraduate students. Despite the usage of Learning Management Systems (LMS) acting as primary platforms for online instruction and fostering peer interactions, there still exists the need to re-think approaches towards student engagement in the classroom and beyond. The formidable challenge posed by the on-going pandemic has enabled instructors to envision tools for effective student engagement. One such tool is the podcast, which serves as an effective platform for engaging students. Podcasts have been used on many social media platforms. Specifically, they are episodic audio files that present information in a spoken word format. For example, podcasts can

include interviews, discussions, and or be used to convey research and academia. A few studies have correlated positive experiences listening to podcasts, additionally others have shown the benefits of on learning outcomes and retention in STEM. Furthermore, podcasts serve as versatile media platforms that allow the students to reflect on content rather than solely reciting newly acquired information. Above all, given the nature of an audio recording in a podcast, it serves to foster inclusion by helping to avoid barriers posed by video recordings such as students' being conscious of their appearance, confidence, and various socioeconomic barriers. Therefore, as a classroom engagement tool, students are empowered to utilize podcasts as a collaborative tool that helps them to reflect and synthesize course content in a cohesive manner.

2. 9:10 Genetics Course-Based Undergraduate Research Experience (CURE) Exploring Disease Utilizing Bioinformatics & Nematodes in Hybrid Learning. *Ashley Turner*, Jacksonville State University; Natalie Forte, Jacksonville State University; Anil Challa, University of Alabama at Birmingham; Katelyn Cooper, Arizona State University.

With the intent to explore disease utilizing the *Caenorhabditis elegans* model, we developed a semester-long course-based undergraduate research experience (CURE) in a hybrid (online/in-person) learning environment. Using a combination of bioinformatics and 'wet lab' tools, students analyzed the conservation of a gene and structure-function analysis of disease-associated variants of unknown clinical significance. The course was offered fall 2020 with 39 students enrolled. Embedded in the course were a series of workshop-style research sessions, tutorials, and 'wet lab' sessions. Each student selected a human/animal disease of interest and worked through a series of tools to identify a disease-associated gene with a *C. elegans* ortholog and disease-associated variants. Students took identified conserved variants into 'wet lab' sessions to design and test a PCR-based assay to serve as a downstream genotyping assay. Discussions, responsible conduct of research training, electronic lab notebooks, iterative project reports, quizzes, and group oral presentations were assessed for mastery of learning objectives and research progress. We assessed the impact of the CURE on students' cognitive and emotional ownership using a closed ended survey administered at the end of the semester. We also examined to what extent students' reasons for choosing their disease of interest influenced their cognitive and emotional project ownership. We found that students developed notably high cognitive and emotional ownership, comparable with CUREs taught in-person. Early analyses also suggest that students with more personal reasons for disease selection demonstrate higher cognitive and emotional ownership compared to students without a personal reason for disease selection.

3. 9:30 **g Fostering Online Student Engagement with Effective Technological Tools. *Bre Minniefield* and Samiksha Raut, University of Alabama at Birmingham.

The onset of the covid-19 pandemic compelled many schools and colleges across the world to switch to an online mode of instruction. As a result, the once bustling classrooms have been moved to an asynchronous and synchronous modes of instruction. Regardless, this has further heightened the need for professional

development activities that can help faculty to become proficient in using online engagement tools. This presentation therefore focusses on discussing some easily implementable online tools that help faculty to effortlessly transform their online teaching environment. Herein we describe three user-friendly platforms like padlet, jamboard, mural and kahoot. These tools can be utilized by faculty as per their class needs. Finally, we will engage the participants in a hands-on demo of padlet as an effective online engagement tool. We hope that educators can utilize these platforms to creatively engage their students in synchronous lecture activities and transform the isolated online lecture environment into an active, engaging learning environment.

4. 9:50 **g Why Does Our Work Matter? Connecting Microbiology Laboratory Curricula to North Birmingham Stakeholders. *Sarah Adkins-Jablonsky*, University of Alabama at Birmingham; Qutia Roberts, University of Alabama at Birmingham; Brad Bennett, Samford University; Rob Akscyn, Jeff Morris, University of Alabama at Birmingham. (2020).

10:10 BUSINESS MEETING [Election of Chair and Vice-Chair for Biological Sciences Section]

**u* or **g* Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

SECTION I – BIOLOGICAL SCIENCES
Thursday Morning & Afternoon
CANVAS:
Authors Present: Sessions 1 & 2: 10:20 AM – 12:20 PM Viewing and Judging
Sessions 3 & 4: 1:00 PM – 3:00 PM Viewing and Judging
Brad Bennett, Presiding

SECTION I – BIOLOGICAL SCIENCES
Posters
Session 1: 10:20 – 11:20 am

2. **u Genetic and Evolutionary Conservation Analysis in *C. elegans* to Examine the Functional Conservation of Human Genes and Decipher Variants of Uncertain Significance. *Amira Carter*, Trinity Elston, Alexis Petty, Alan Holderfield, Tanner Vandever, Natalie Forte, and Ashley Turner, Jacksonville State University.

   Impressive technological advances in genome sequencing have surpassed our capability to interpret the clinical implications of the genetic variation we discover. The majority of genetic variants identified in patients are currently clinically classified as "variant of unknown significance," (VUS) where their causation of disease or association with disease risk are unclear. Explorations of VUS in genetically tractable model organisms, such as *Caenorhabditis elegans*, are integral studies for assessing the functional conservation of human genes and understanding the functional consequences of disease-associated variants. VUS tend to be missense variants that are particularly challenging for interpretation. We examined missense VUS identified in patients with a wide range of diseases with *C. elegans* orthologous genes, including attention deficit hyperactivity disorder, type 2 diabetes mellitus, cystinuria, and supravalvular aortic stenosis. We identified conserved missense VUS in the following human genes and orthologous C. elegans genes: *DRD5* and *dop-2*; *INSR* and *daf-2*; *PEPD and K12C11.1*; *SLC3A1* and *atgp-2*; *ELN* and *ssq-1*. Preliminary genetic, evolutionary conservation, and protein modeling analyses suggest structural and functional impact for some of these VUS, warranting further *in vivo* investigation. We are working to optimize polymerase chain reaction-based genotyping assays and phenotyping assays to generate and assess CRISPR-Cas9-engineered *C. elegans* models containing each VUS. These findings fuel our research pipeline that facilitates assessment of the functional conservation of human genes and structure-function analysis of disease-associated variants through CRISPR-Cas9-engineered C. elegans models with in vivo functional assays to decipher variants of uncertain significance.

3. **g Evaluating the Impacts of Wild Pigs on Water Quality and Wetland Ecosystem Health in Alabama. *Elizabeth Bradley* and Graeme Lockaby, Auburn University.

   Wild pigs (*Sus scrofa*) are an extremely prolific and destructive invasive species in the United States reportedly worth $1.5 billion in damages and control costs annually. Around half of the nation's wild pigs reside in the Southeast, where their preferential habitat selection, diet, and behavior pose a significant threat to wetland ecosystems. Wild pigs alter numerous chemical and geophysical processes in wetlands, such as modifying soil chemistry, nutrient cycling, and water quality. These alterations to natural processes can have cascading impacts on the biodiversity and ecological function of wetlands. Ranking 5th in the nation in biodiversity with over 2.3 million acres of wetlands and 132,000 miles of rivers and streams, Alabama is particularly vulnerable to the threat that wild pigs pose. As part of the Alabama Feral Swine Eradication and Control Pilot Program and in coordination with the USDA-NRCS and USDA-APHIS, this project aims to evaluate the impacts of wild pigs on ecosystem health and water quality of palustrine wetlands in the Gulf Coastal Plain region of Alabama. Our project will assess standard water quality

measurements, the influence of rooting on soil chemistry, vegetative characteristics and interactions, and monitor for water-borne pathogens in selected watersheds in south Alabama prior to and post wild pig removal efforts.

4. **u Intraindividual Sequence Variation in pre-rRNA cistrons of the Ectoparasitic plant *Cuscuta*. *Megan Elliott*, David A. Johnson, and Megan K. Elliott, Samford University.

   The dodder (*Cuscuta*, family Convolvulaceae) is a plant ectoparasite that we previously demonstrated shows intraindividual variation in rDNA sequences. In the present study, we PCR-amplified the 5.8S rDNA along with its two flanking internal transcribed spacers from a single dodder plant from Demopolis, AL, then cloned and colony sequenced the amplicons in order to determine whether the multiple copies of the 5.8S and other rRNA genes are all used to make rRNA. Here we report these multiple sequences found from this plant as well as preliminary rRNA data. rRNA sequences were obtained by extracting whole RNA from the same plant followed by RT-PCR, cloning, and colony sequencing.

5. **g Evaluating the Role of SOX10 in Innate Immune Gene Regulation. *Alex Dawson*, University of Alabama at Birmingham; Melissa Harris.

   The convergence theory of vitiligo, the most accepted theory of vitiligo pathogenesis, states that vitiligo is the contribution of multiple factors such as oxidative stress and autoantigenicity that causes T-cell infiltration. However, it is unknown if a particular innate immune signature could be predictive of melanocyte fragility that could trigger the onset of vitiligo. To test whether gene expression changes in melanocytes are sufficient to cause melanocyte fragility, we will employ a transgenic mouse line, C57B6/J.Tg(Dct-Sox10). Tg(Dct-Sox10) mice conditionally overexpress SOX10, a transcription factor necessary for several melanocyte specific functions, in the melanocyte. Tg(Dct-Sox10) mice exhibit elevated sensitivity to viral activation, characterized by acute hair graying after exposure to viral mimic poly I:C. RNA-seq performed on skin samples of untreated Tg(Dct-Sox10) mice shows upregulation of innate immune genes related to viral reception compared to wildtype littermates, and we hypothesize that intrinsic innate immune dysregulation potentiates the response of Tg(Dct-Sox10) mice to viral activation. One hypothesis is the sensitivity to viral reception may be due to gene regulation by SOX10. If this hypothesis is supported, then our results highlight a novel link between SOX10 expression and viral sensitivity. Using data obtained through ChIP-seq, we propose that SOX10 can directly bind the promotors of *Ifit2*, an interferon stimulated gene which is differentially regulated in Tg(Dct-Sox10) mice. However, these results do not conclusively determine that SOX10 regulates *Ifit2*, and our current efforts focus on evaluating the direct relationship between Sox10 and innate immune gene expression using in vitro transfection and gene expression analysis.

6. **g Effects of Sublethal Methylmercury Exposure on Songbird Hippocampal Neuroanatomy. *Cara Brittain*, Auburn University; Daniel Cristol, College of William and Mary; Haruka Wada, Auburn University.

   Songbirds are important bioindicators of environmental contaminants, yet effects of neurotoxicants such as methylmercury on songbird cognition are not well studied. Previous studies have shown that lifelong exposure to methylmercury suppresses spatial learning and memory in a model songbird, the zebra finch (*Taeniopygia guttata*); however, we observed that methylmercury-exposed birds displayed similar hippocampal volume compared to that of controls. The hippocampus is a region of the brain related to spatial cognition, so this

difference in performance could be due to effects of mercury on neural processes in the hippocampus rather than simply volume. We hypothesized that methylmercury would hinder neural processes such as migration of young neurons to the hippocampus, survival of immature neurons to this region, and integration of immature neurons into existing neural networks within the hippocampus. To test this hypothesis, we extracted brains from zebra finches that had been exposed through their diets to methylmercury their entire lives and whose spatial cognition had been tested. We predicted that mercury-exposed birds display decreased density of immature and mature neurons in the hippocampi, quantifying these measures utilizing immunohistochemical staining. We also predicted that density of neurons in the hippocampus correlates with spatial cognitive performance.

7. **u Abundance of Jaguar (*Panthera onca*) Prey Species in Central Belize. *Rekenia Cole* and Andrew Coleman, Talladega College.

One method to study the ecology and conservation of an apex predator is to observe the abundance of its prey. The Jaguar (*Panthera onca*) is a large felid species, whose range extends from extreme southwestern United States to South America, that feeds on a variety of mammalian, avian, and reptilian species. It has even been documented to feed on carrion. The current study examined photographic evidence captured through the use of wildlife cameras to examine the prevalence of Jaguar prey species in central Belize. Six Browning wildlife cameras were set up in 2018 at various locations on the 48,000-acre property of Sleeping Giant Rainforest Lodge, which sits adjacent to the government owned and protected Sibun National Forest Reserve. Data analyzed for the current study were collected from five cameras from March to September 2019. Catch per unit effort was calculated as the number of observations per 100 trap days. Whereas all non-large felid species' abundance was examined, special attention was paid to the documented, favored prey species of Jaguars: Nine-banded Armadillos (*Dasypus novemcinctus*), Paca (*Cuniculus paca*) and Collared Peccary (*Tayassu tajacu*). Over exploitation of prey species by humans has resulted in increased Jaguar predation on livestock, which could threaten the survival of this protected species. Abundance data of Jaguar prey can lead to better management, and, hopefully, less conflict between Jaguars and humans.

Session 2: 11:20 am – 12:20 pm

8. **u An Analysis of Fecundity Density for Black Crappie (*Pomoxis nigromaculatus*) at Lake Purdy, Birmingham, Alabama. *Jacqueline Hintz*, Anthony Overton, and Kaitlynn Wade, Samford University.

Lake Purdy, located in Birmingham, Alabama, preserves the population of Black Crappie, *Pomoxis nigromaculatus*. Estimating individual reproductive potential is key to understanding the reproductive biology of fishes. We compared gravimetric methods and digital image analysis to calculate fecundity estimates in Black Crappie. The image analysis approach represents a highly time-efficient procedure compared to the traditional gravimetric techniques. We analyzed 20 Black Crappie oocytes and distinguished the oocyte density approximating between the gravimetric and image systems. Processing time, including the manual preparation of the sample for analysis and the data processing afterward for the gravimetric method, was approximately two hours per sample, whereas; image analysis processing time was roughly one hour. There was a significant relationship between the gravimetric and image oocyte density estimates ($Y=0.89x+103.5$; $r^2=0.91$).

The imaging system oocyte density estimates were routinely lower than the gravimetric method. This is possible because of the oocyte's diameter. Our samples were collected from fish early in the pre-spawn season whose oocytes were smaller and lesser developed. We hypothesize that more significant, more developed oocytes would provide more accurate oocyte density estimates and more straightforward processing methods. Accurate and more precise measurement of oocyte density is vital in assessing the maturity and spawning of fishes.

9. **u An Analysis of Fecundity Age and Length Relationship for Black Crappie (*Pomoxis nigromaculatus*) at Lake Purdy, Birmingham, Alabama. *Kathryn Jones,* Kaitlynn Wade, Jacqueline Hintz, and Anthony Overton, Samford University.

   Black Crappie (*Pomoxis nigromaculatus*) is a popular recreational fish species that is sought after by a multitude of anglers every year. However, their popularity has led to several populations in water bodies becoming overfished or stunted in growth. As recreational fishing regulations are implemented to help improve the overall number and health of their populations, it is important to regularly evaluate the demographics of these populations. We collected 78 Black Crappie from Lake Purdy, Alabama during the spring of 2020 and we investigated their overall reproductive potential (Gonadosomatic index GSI) and growth patterns. We observed that GSI increased throughout the spring from 6.34 in January to 7.17 in March. The age of fish collected ranged from age 1 to age 5. There was a positive correlation between fish length and fish age as the fish increased in length with age. Males were larger than females by up to age-3. By age 4, females were larger than males and females age-3 and older were 1.36mm to 25mm longer in length.

10. **u Effects of Pumpkin Seed and Flesh Diets on Testicular Superoxide Dismutase 2 Expression. *Jaylon Vaughn,* Chastity Braford, and Olga Bolden-Tiller, Tuskegee University.

    Hypertension, the leading cause of cardiovascular disease in the United States, is extremely prevalent in the Black Belt. Hypertension can affect testicular morphology and can induce oxidative stress yet can be prevented by dietary intervention. Superoxide Dismutase (SOD) 2 is an antioxidant found in the intercellular matrix of the mitochondria. To elucidate the antioxidant efficacy of pumpkin-based dietary intervention in a hypertensive state, the expression of SOD2 in the testes was examined. Pumpkin (*Cucurbita pepo*) is known to have antioxidant properties. However, there are no studies on the effect of pumpkin-based diets on testicular antioxidant expression. We hypothesized that pumpkin seed and flesh would increase testicular SOD2 expression. SHR and WKY rats (14-weeks) were fed a diet of either pumpkin seed, pumpkin flesh, or a pumpkin seed and flesh blend for 8 weeks or treated with captopril. Testes were weighed and Western blot analysis was performed with homogenates. Statistical significance was determined by one-way ANOVA. There was a significant decrease in testicular SOD2 expression in SHR control compared to WKY control animals. WKY animals fed pumpkin seed and flesh had increased SOD2 expression compared to SHR animals fed pumpkin flesh only. Upon blending pumpkin flesh and seed diets, a decrease in mean arterial blood pressure in SHR animals was shown, with implications for testicular antioxidant enzyme expression. It is therefore possible that dietary intervention with pumpkin seed and flesh may increase testicular SOD2 expression. Further studies are needed to understand the correlation between hypertension, diet, and testicular structure and function.

11. **u Prevalence of Scute Abnormalities in Olive Ridley Sea Turtle (*Lepidochelys olivacea*) Hatchlings. *Amber Ellington* and Andrew Coleman, Talladega College.

The presence of scute abnormalities in turtle hatchlings can indicate reduced fitness and lower chances of reaching maturity. These abnormalities can be caused by genetic factors, high incubation temperatures, exposure to pollution, etc. Scute abnormalities were characterized in Olive Ridley sea turtle (*Lepidochelys olivacea*) hatchlings from a nesting beach located near Zihuatanejo, Mexico. The nesting season for this population begins in late July and continues through March. Hatchlings from twenty nests (n=1,412) that were laid from late October to mid-December 2020 were examined. The number of marginal scutes, costal scutes, and vertebral scutes on each hatchling's carapace was counted. Modal scute patterns for each nest was summarized and compared to data previously collected from this population. These data could be compared to the presence of scute abnormalities in nesting females to determine if the percentage of scute abnormalities in adults are similar to hatchlings.

12. **g Detecting Toxoplasma gondii in the giant African snail (*Lissachatina fulica*) in Oahu, Hawaii. *Olivia Stogner*, Auburn University; Kenneth A. Hayes, Bishop Museum; and Christopher A. Lepczyk and Sarah Zohdy, Auburn University.

Toxoplasmosis is a zoonotic disease caused by the parasitic protozoan *Toxoplasma gondii* and has severe negative effects on many endangered wildlife species as well as humans. Although *T. gondii* completes its lifecycle in cats, there are several intermediate species that facilitate the spread of the parasite. Brown turban snails (*Chlorostoma brunnea*, *Chlorostoma montereyi* and *Promartynia pulligo*) can ingest and pass undigested Toxoplasma gondii oocysts into the marine environment through their feces (Krusor et al. 2015), but there is no research showing if land snails can do the same. The goal of this project is to solve this information gap by determining if land snails can ingest *T. gondii* oocysts in the environment and transfer them from place to place through their feces, thus acting as mechanical vectors for the disease. Fecal samples were collected from 160 giant African snails (*Lissachatina fulica*), the model species for the project, which were collected from 3 feral cat infested sample sites in Honolulu, Hawaii during December 2020 and January 2021. Each sample will be evaluated using nested PCR to detect presence/absence of *T. gondii* DNA and positive samples will be genetically sequenced to confirm that the amplified locus belongs to *T. gondii*. For samples that test positive for nested PCR and genomic sequencing, light microscopy will be performed on the remaining feces to see if full *T. gondii* oocysts are present. The first nested PCR amplification process was completed for 1/3 of the fecal samples and potentially positive samples will undergo the second nested PCR amplification process. If positive again, the samples will be genetically sequenced and prepared for light microscopy. If confirmed to be positive, these samples indicate that giant African snails can consume *T. gondii* from the environment and could potentially be distributing the parasite across the landscape.

13. **u Expenditures on Invasive Species Management Across the United States. *Allison Foster*, Christopher A. Lepcyk, and Jean E. Fantle-Lepczyk, Auburn University; and Daniel Rubinoff, University of Hawaii.

Invasive species are an increasing, global issue as they can wreak havoc on ecosystems and economies. In the United States invasive species like zebra mussels (*Dreissena polymorpha*), wild hogs (*Sus scrofa*), and Chinese tallowtree (*Triadica sebifera*) cause millions of dollars of damage annually by outcompeting desired plants, causing structural

damage, and disrupting natural processes. While a great deal of effort is expended to manage invasive species, there are no estimates of the economic costs associated with this management effort. To better understand the scale of the invasive management costs, our goal was to quantify state level expenditures of invasive species across the US. We addressed this goal by contacting natural resource management officials from each of the US states following a standardized protocol with contact tracing. We confined our data collection to natural resource agencies, as departments such as agriculture and health can have different definitions of invasive species. Across the 50 states, a total of 38 expended resources towards managing invasive species. Expenditures ranged from $8,400 (Connecticut) to $57,488,910 (Hawaii) per year directed towards management costs. Furthermore, we found a lack of coordination in invasive species management between and within states. Understanding the true costs of invasives is difficult, as some states reported spending millions of dollars, while others report little to no spending, likely as a result of not keeping track of costs. As invasive species are a national problem, we argue the need for clear records of how we are managing them, which requires a coordinated effort within and between states.

Session 3: 1:00 – 2:00 pm

14. **u Apolipoptotein E Mimetics Preferentially Target Phosphatidylserine Potentially Decreasing Apoptosis. *Zaurayze Rehman*; James Boyett; Samantha Giordano-Mooga; GM Anantharamaiah; Paul Wolkowitz; CR White, University of Alabama at Birmingham.

Apolipoprotein E, found in HDL, has anti-atherogenic, anti-inflammatory, and anti-apoptotic properties. A novel apolipoprotein E mimetic (AEM) consisting of twenty-eight amino acids with amphipathic and cationic domains, LRKLRKRLLRDWLKAFYDWLKAFYDKVAEKLKEAF (AEM-28-2), synthesized in our lab was shown to inhibit apoptosis, decrease intracellular cholesterol, and decrease inflammation. The cell membrane is a phospholipid bilayer consisting of many phospholipids including phosphatidylcholine (PC), neutrally charged, and phosphatidylserine (PS), negatively charged, which are distributed asymmetrically between the inner and outer leaflets. Apoptotic signaling involves PS's movement from predominantly in the inner leaflet to the outer leaflet where it signals phagocytosis by macrophages. We hypothesize that AEM-28-2 inhibits apoptosis through its interaction with PS. To test this hypothesis, AEM-28-2 was added to PC and PC+10% PS vesicles and vesicle clearance was measured via absorbance and viewed via microscopy. Fast protein liquid chromatography (FPLC) was used to determine size differences among peptide-phospholipid complexes following vesicle clearance. Next, increasing concentrations of AEM-28-2 and apoptosis inducers, camptothecin (CMPT) and hydrogen peroxide (H2O2), were introduced to cell plates seeded with Vero and RAW cells to assess cytotoxicity and anti-apoptotic effects using neutral red and Reliablue cell death assays. The data suggests that AEM-28-2 showed preference for PS and increased vesicle clearance. CC50 for AEM-28-2, CMPT, and H2O2 are 25μM, 10μM, and XXμM after twenty-four hours, respectively. Current work is focused on determining the antagonistic effects of AEM-28-2 on CMPT and H2O2 induced cell death in RAW and Vero cells. This work could lead to novel anti-apoptotic therapies associated with HDL.

15. **g Fungal Volatile Organic Compounds Can Mediate Between Bark Beetles and Ophiostomatoid Fungi. *Sylvester Menanyih*; Lori Eckhardt, Auburn University.

The southeastern forest industry of the US plays a major role in the wood dynamics of the country, contributing over 50% of the wood demand. Nonetheless, the sustainability of the wood resource base is of concern to stakeholders within the forestry sector due to the incidence of pest and diseases. Southern pine decline (SPD) is one of the complex disease syndromes which slowly and progressively weakens the trees ability to grow. Unfortunately, *Pinus taeda* (loblolly pine), the predominant and economically important tree crop in the southeast US suffer from SPD. Bark beetles and their associated ophiostomatoid fungi contribute to SPD after predisposition by abiotic factors. The relationship between bark beetles and their associated ophiostomatoid fungi are mediated by fungal volatile organic compounds (FVOCs). The FVOCs have been hypothesized as potential biocontrol agents. The study seeks to identify and quantify volatile organic compounds associated with ophiostomatoid fungi. Volatiles are sampled from previously isolated strains of *Leptographium terebrantis*, *L. procerum*, *Grosmannia huntii* and *G. alacris* at the laboratory. The study will potentially identify volatile chemical compounds to be incorporated into integrated pest management strategies to minimize economic losses from SPD.

16. **g Evaluation of Kemp's Ridley Sea Turtle Clutch Frequency using Ultrasound Technology. *Robby Brannum*, Thane Wibbels, Erika Navarro, Manuel Rosas, Martha Lopez, and Pat Burchfield, University of Alabama at Birmingham.

The Kemp's Ridley (*Lepidochelys kempii*) is considered the world's most endangered sea turtle and this species declined drastically over four decades due to a variety of factors. This species was on the brink of extinction by the mid-1980's but has gradually begun to recover due to intense conservation efforts by the Binational Kemp's Ridley Recovery Program. Although it appeared to be on an exponential path to recovery, there was an unexpected decline in nesting numbers following 2009, and it has not yet regained its exponential recovery rate. Several hypotheses have been proposed as to this apparent loss of the exponential recovery rate. To better understand the causal basis of this decline in nesting, we have been investigating the reproductive biology of adult females on the nesting beach. Specifically, the current study evaluated clutch frequency of nesting females by utilizing ultrasonography during the 2015 and 2016 nesting seasons. The results suggest that individual turtles are nesting at least two times during a nesting season. These results are consistent with previous studies two decades earlier. This would suggest that the clutch frequency has not significantly declined in recent years and is not the cause for the loss of exponential recovery rate of the Kemp's ridley.

17. **g Histological Analysis of Sex Ratios in Kemp's Ridley Sea Turtles. *Katie Presz*, Thane Wibbels, and Ken Marion, University of Alabama at Birmingham.

A variety of reptiles possess temperature-dependent sex determination (TSD), where the incubation temperature of the egg determines the sex of the hatchling. TSD can potentially produce highly biased sex ratios. Therefore, this form of sex-determination has significant implications for the ecology, evolution, and conservation of these reptiles. Further, the existence of TSD necessitates the monitoring of sex ratios produced in conservation. The current study evaluated hatchling sex ratios produced in the Kemp's Ridley Recovery Program.

Histological analyses were utilized to determine the sex of hatchlings from nests laid on the Padre Island National Seashore in Corpus Christi, Texas. These tissues were obtained from hatchlings that were found dead in the nest after all live hatchlings had emerged. The results from that program indicate that a significant female bias has been produced over multiple years. It is plausible that the significant female bias could enhance the recovery of this population, by increasing the reproductive output of this species in future years.

18. **g Evaluations of Stable Isotope Signatures in Diamondback Terrapins. *Forrest Collins*, Thane Wibbels, and Ken Marion, University of Alabama at Birmingham.

The diamondback terrapin, *Malaclemys terrapin pileata*, inhabits saltmarshes in the Northern Gulf of Mexico including along the coast of Alabama. Due to a variety of factors, this species has declined drastically in the salt marshes of Alabama, and it is designated a species of highest conservation concern. Understanding the ecology of this species is a prerequisite to the recovery of this population. The current study has implemented stable isotope technology as a method to investigate the foraging ecology of this species. Carbon and nitrogen isotope signatures were evaluated in both "head-started" and wild caught terrapins. The tissues from prey items were also collected for stable isotope analysis. Initial results revealed specific stable isotope signatures from the "head start" turtles versus wild caught turtles. Further, the wild caught turtles also exhibited a variety of signatures indicating potential differences in foraging. The use of stable isotope technology is providing new insights regarding the foraging ecology of the diamondback terrapins within Alabama.

19. **g Loblolly Pine and Brown-spot Needle Blight: An Emerging Relationship Threatens Timber Industry. *Debit Datta*, Scott Enebak, Jeffrey Coleman, and Lori Eckhardt, Auburn University.

Loblolly pine is a leading productive timber species in the southeastern USA. Over the past 3 years, an emerging threat is expressed by successive needle defoliation followed by stunted growth and tree mortality in loblolly pine plantations. Considering economic significance, it has now become a rising concern among landowners, forest managers and forest health state cooperators. However, the symptoms of the disease were perplexed somewhat with root disease (s) and recurrently attributed to invasive *Phytophthora* species due to the similarity of disease nature and devastation. Therefore, the study investigated the potential causal agent of this disease and characterized the fungi associated with loblolly pine needle defoliation in the southeastern USA. Besides, 70 trees were selected at seven long-term monitoring plots at Chatom, Alabama to monitor and record the annual disease incidence and severity. Based on colony morphology and ITS-rDNA sequence data, a total of 28 species of fungi representing 17 families have been recovered from diseased loblolly pine needles. Native brown-spot pathogen, *Lecanosticta acicola*, was the species most frequently recovered from unhealthy loblolly pine needles in combination with some other common needle cast and rust pathogen (s). Identification was confirmed using morphological similarity and amplification of translation elongation factor 1-alpha gene of interest. Tagged trees were consistently found chlorotic and defoliated from 2019 to 2020. The current emergence of the brown-spot pathogen causing loblolly pine mortality necessitates the investigation of the role of climate change which might be associated with increased pathogen pressure to loblolly pines in the southeastern USA.

Session 4: 2:00 – 3:00 pm

20. **g Analysis of the Human Variant Lys859Arg in Cullin-4B (Cul4b). *Travis Mitchell*; Brittanee West; Eric Johnson, Alabama College of Osteopathic Medicine.

Background: Cullin-4B (Cul4b) is a protein encoded by the CUL4b gene located on the X chromosome. Cul4b acts as a major regulator within the cell. This protein forms a complex that functions as a ubiquitin ligase. Cul4b has been implicated in X-linked intellectual disability with relative macrocephaly, short stature, lack of speech development, hypogonadism and abnormal gait. Numerous mutations have been discovered, many of which are of unknown clinical significance.
Methods: The Cul4b crystal structure was generated using the swiss model and compared to the fasta structure through UniProt. The Lys859Arg variant was also added. Each .pdb file was used to simulate the protein dynamics. Statistical analysis was performed to compare root mean square deviation (RMSD) of the alpha carbons of the proteins. A Student's t-test was performed using nine time points from each set.
Results: Polyphen-2 report presented results suggesting the mutation is probably damaging, with a score of 1.00 (sensitivity 0.00 and specificity 1.00). The PROVEAN prediction model was also used and deemed the variant to be deleterious with a score of -4.683.
Conclusions: Predictive modeling and simulations indicate the variation K859R in Cullin-4B leads to significant alterations in the protein structure and function. PolyPhen-2 predicts this mutation as "probably damaging", which indicates a high probability of protein modification. The characteristics of these changes are uncertain, but this substitution would most likely disrupt the interchain cross-link with the ubiquitin-like protein NEDD8. This modification could disrupt ubiquitin ligation, which would lead to alterations in numerous cellular activities.

21. **g In silico and in vitro Experiments Analyzing Novel Human Variants of the GALT Gene Yield Contradictory Results. *Travis Mitchell*; Eric Johnson, Alabama College of Osteopathic Medicine.

Background: Galactose-1-phosphate uridylyltransferase (GALT) is an enzyme responsible for converting ingested galactose to glucose. The attenuation or lack of GALT activity leads to the disease classic galactosemia. The buildup of galactose in classic galactosemia leads to failure to thrive, liver damage, and neurologic developmental delay. Numerous mutations in the GALT gene have been documented, and many of these have unknown clinical significance.
Methods: HMS174 E. coli was transformed with GALT expression plasmids. GALT protein production was then induced. This GALT protein was purified, and an enzymatic assay was performed. Protein structures were run in molecular dynamics simulations to compare the alpha-carbon root mean squared deviation (RMSD) of each protein. We compared the activity of three variants to native GALT (nGALT), and to a variant of known clinical significance to determine what impact on enzyme activity these mutations confer. We also compared the assay results to the RMSD simulations for the native GALT and various mutants.
Results: When compared to nGALT, all three variants tested had significantly reduced Vmax. The RMSD simulations for these variants did not predict significant reduction in enzyme activity, which contradicts the results of our assay.

Conclusions: Our experiments indicated a statistically significant decrease in enzymatic activity of the variants when compared to nGALT. These experiments also demonstrated significant differences between *in silico* predictions and *in vitro* results. These results show that mutations in various locations across the protein negatively affect enzymatic activity, not just those mutations that are found within structurally significant areas of GALT.

22. **g The Gut Microbiota in Naturally Occurring and Laboratory Aquaculture *Lytechinus variegatus* Revealed Differences in the Community Composition, Taxonomic Co-occurrence Network, and Predicted Functions. *George Green*, Joseph Hakim, Jiung-Wen Chen, Casey Morrow, Stephen Watts, and Asim Bej, University of Alabama at Birmingham.

In this study, we have compared the gut microbiota between naturally occurring (ENV) and formulated diet-fed laboratory aquaculture (LAB) sea urchin *Lytechinus variegatus* by amplicon sequencing of the 16S rRNA gene and bioinformatics tools. Overall, both ENV and LAB gut tissue showed a high abundance of *Campylobacteraceae* (>90%) primarily represented by *Arcobacter* spp., whereas gut digesta had taxa from *Gammaproteobacteria*, particularly *Vibrio* spp. Moreover, the ENV group gut digesta had higher overall taxa richness with an abundance of *Propionigenium*, *Photobacterium*, *Roseimarinus*, and *Flavobacterales*. In contrast, the LAB group had less richness, but a noticeable abundance of *Arcobacter*, *Agarivorans*, *Sulfurimonas* and *Shewanella*. The co-occurrence network displayed complex taxonomic organizations interconnected by *Arcobacter* and *Vibrio* as being the key taxa in gut tissues and gut digests, respectively. Predicted functional analysis of the microbiota in the gut tissue of both groups showed a trend of energy-related metabolisms, whereas amino acid, carbohydrate, and lipid metabolisms heightened in the gut digesta. The outcome of this study revealed that although the gut tissue of both ENV and LAB *L. variegatus* mostly maintained a similar microbial profile in the gut tissues, there were marked differences in the diversity and richness of taxa of the gut digesta.

23. **g Nutritional Combinatorial Impact on the Gut Microbiota and Plasma Short-chain Fatty Acids Levels in the Prevention of Mammary Cancer in Her2/neu Estrogen Receptor-negative Transgenic Mice. *Manvi Sharma*, Manvi Sharma, Itika Arora, Matthew Stoll, University of Alabama at Birmingham; Yuanyuan Li, University of Missouri, Columbia; and Shizhao Li and Trygve Tollefsbol, University of Alabama at Birmingham.

Breast cancer is the second leading cause of cancer-related mortality in women. Various nutritional compounds possess anti-carcinogenic properties which may be mediated through their effects on the gut microbiota and its production of short-chain fatty acids (SCFAs) for the prevention of breast cancer. We evaluated the impact of broccoli sprouts (BSp), green tea polyphenols (GTPs) and their combination on the gut microbiota and SCFAs metabolism in Her2/neu transgenic mice that spontaneously develop estrogen receptor-negative [ER(-)] mammary tumors. The mice were grouped based on the dietary treatment: control, BSp, GTPs or their combination from beginning in early life (BE) or life-long from conception (LC). We found that the combination group showed the strongest inhibiting effect on tumor growth volume and a significant increase in tumor latency. BSp treatment was integrally more efficacious than the GTPs group when compared to the control group. The mice on all dietary treatment groups incurred a significant increase of *Adlercreutzia*, *Lactobacillus* genus and Lachnospiraceae, S24-7 family in the both BE and LC groups. We found no change in SCFAs levels in the plasma of all dietary groups of mice in the BE group. Marked changes were observed in the mice of the LC group

consisting of significant increase in isobutyrate in GTPs-fed and combination-fed mice. The findings suggest that temporal factors related to different time windows of consumption of nutrients such as BSp and GTPs during the life-span can have a promising influence on the gut microbial composition, SCFAs profiles and ER(-) breast cancer prevention.

24. **g Regulation of Mg^{+2}-Dependent Phosphatidic Acid Phosphatase Enzymes in the Yeast *Yarrowia lipolytica.* *Sagar Pasham* and Stylianos Fakas, Alabama A&M University.

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

25. Identification and Expression of NAD^+ Synthesis Salvage Pathway Enzymes in *Lactobacillus*. Silvia Kinnebrew, Bryce Pierce, *Brad Bennett*, Samford University. (2020)

26. **g Uncovering the Dirt on North Birmingham. *Sarah Adkins-Jablonsky*, Anuradha Goswami, Qutia Roberts, Robert Aksycn, Sam Gregory, Kathryn Aler, Alex Dawson and Jeff Morris, University of Alabama at Birmingham; and Brad Bennett, Samford University (2020).

***u* or ***g* Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

Joint Paper Session
SECTION II – CHEMISTRY
SECTION III – PHYSICS AND MATHEMATICS
SECTION IV – ENGINEERING AND COMPUTER SCIENCE

CANVAS:
Thursday Morning, 9:00 AM– 11:40 AM
Wen Yan and Ravi Gollapalli, Presiding

SECTION II – CHEMISTRY SESSION

SECTION III – PHYSICS AND MATHEMATICS SESSION:

1. 9:00 **u Constructing an Optical Tweezers. *Charles Harville*; D. Brian Thompson, University of North Alabama.

   We describe construction of an optical tweezers from individual optical components. An optical tweezers consists of a single beam of focused laser light, and it is used to trap micron-sized particles at the focal point of the light. The tweezers creates an optical trap by focusing an infrared laser through the large-numerical-aperture objective lens held in an inverted orientation. A digital camera records images from the objective lens at rates up to 80 frames per second. Optimizing the tweezers individual optics created a strong optical trap, and improved images of a particle in the trap. The trap can move and position plastic microspheres ranging from 15 microns to 0.7 microns. Future plans include measuring the optical trap's maximum force on these particles by the method of transverse acceleration of the fluid containing the trapped particle.

2. 9:20 **u Measurements and Simulations of a Gauss Gun Projectile's Kinetic Energy. *Hannah Miller*; D. Brian Thompson, University of North Alabama.

   A Gauss gun (aka Gauss rifle, magnetic cannon) is a set of magnets and steel balls arranged to create a magnetic chain reaction to launch one ball with some kinetic energy. A commercially available Gauss gun allows adjustment of spacing between magnets. Altering magnet spacing from factory settings, measuring the speed of the launched ball determines if its kinetic energy depends upon magnet spacing. The Gauss gun's axial symmetry allows use of Finite Element Method Magnetics (FEMM) software to model the magnetic field of the initial arrangement of magnets and balls, and the field of the final arrangement after launch. Assuming conservation of energy, the change in magnetic field energy should equal the launched ball's kinetic energy. Comparing experimental measurements to calculation results show that, during the chain reaction, a fraction of available magnetic energy is lost in collisions between balls and magnets.

3. 9:40 Mathematical Scheme for Ranking the Great Wicketkeepers and Wicketkeeper-Batsmen in Test Cricket. *Arjun Tan*, Alabama A&M University.

In the game of Cricket, the wicketkeeper is one of the most important positions in a cricket team. Many catches, runouts and all stumpings are affected by the wicketkeeper. The wicketkeeping job is tedious, laborious and sometimes back-braking. Yet, wicketkeeping is not as discussed or debated as batting or bowling. In this study, wicketkeeping statistics are analyzed to rank the greatest wicketkeepers and wicket-keeping batsmen in Test cricket history. It is found that the total dismissals per innings by a wicketkeeper can be taken as a parameter to rank them in order. Based on this parameter, the greatest wicketkeepers in Test cricket were Gilchrist, Haddin, Akmal, Bairstow and Boucher in that order. There was a negative correlation between catches per innings and stumpings per innings. Most wicketkeepers were also decent to good batsmen and some were outstanding batsmen. In order to rank the greatest wicketkeeper-batsmen, wicketkeeping and batting were equally weighted by converting the batting average into an equivalent parameter. In this scheme, the greatest wicketkeeper-batsmen were Gilchrist, Flower, Sangakkara, Bairstow, Haddin and McCollum in that order.

4. 10:00 Mathematical Scheme for Ranking the Great All-Rounders of Cricket History. *Arjun Tan,* Alabama A&M University.

In the game of cricket, the all-rounder is a player who can excel in both batting and bowling and is therefore one of the most important positions in a cricket team. In this study, we formulate a mathematical scheme to rank the greatest all-rounders in post-war cricket history. An All-round Quotient is defined as the ratio of the batting average to the bowling average of the all-rounder. This quotient is a direct mathematical quantity – the greater its value, the better the all-rounder is considered to be. Based on the all-round quotient, the greatest all-rounders in post-war Test cricket are determined to be Garry Sobers, followed closely by Jacques Kallis, Imran Khan and Keith Miller in that order. Graphical representations of the all-round quotient were constructed. In a plot of the bowling average against the batting average, the loci of equal all-round quotients were straight lines through the origin, with the quotient decreasing with slope. In a plot of the reciprocal of the bowling average versus the batting average, the loci of equal all-round quotients were rectangular hyperbolae with the quotient increasing with the area under any point on the hyperbola.

5. 10:20 Analysis and Interpretation of the USA-193 Satellite Fragmentation in Orbit. *Arjun Tan,* Alabama A&M University.

On 21 February 2008, the disabled radar imaging reconnaissance satellite USA-193 with its unused hydrazine propellant was destroyed by kinetic impact. This study calculates the velocity perturbations of 170 fragments cataloged through 21.38 days following the breakup. Exact solutions were obtained for the velocity components by solving the energy and angular momentum equations in the parent satellite's frame of reference at the point of fragmentation. The fragments dispersion was easily the most lopsided and anisotropic amongst all breakup events ever witnessed. 90% of all fragments were ejected above the horizontal plane; 80% of all fragments were ejected in the forward direction; and an equal number of fragments were ejected to the left and right of the parent satellite when viewed from above. A full 80% of all fragments were confined in just two

adjacent octants above the horizontal plane. The 'center-of-mass' of the debris cloud was ejected at an amazing speed of 186.67 m/s from the parent, a result unseen in a satellite breakup before. The small kinetic kill vehicle could not have produced such a debris cloud out of the massive USA-193 satellite by impact alone. The only possible inference was that the hydrazine tank had suffered a massive explosion in the 'clam' model of the explosive fragmentation of orbiting propellant tanks.

SECTION IV – ENGINEERING AND COMPUTER SCIENCE SESSION:

1. 10:40 Connected Vehicles Cloud Computing (CVCC) Applications, Challenges and Communications Model. *Anthony Winchester*, Birmingham-Southern College.

If the dream of autonomous vehicles is to be realized, sophisticated computational and communication frameworks must be developed. While it is immediately apparent that such a system must be accurate, it may be less obvious that it must also be very efficient. In this paper, an autonomous vehicle system framework is presented. A case study, prepared to demonstrate the system, is detailed.
Connected Vehicular Cloud Computing (CVCC) is a mobile computing model that substitutes the stationary nodes of traditional cloud computing for mobile nodes attached to vehicles. CVCC architecture involves a one-to-one communication with a Cloud platform. This situation is very efficient for inter-vehicle operations. However, for inter-vehicle events, such a communication system can result in unacceptable delays in response time. To deal with this fact, a parallel systems have been proposed.
One such system is the Vehicular Ad-Hoc Network (VANET). The VANET employs sensors and transmitters on vehicles to convey traffic information to stationary roadside units. The roadside units rely on Cloud resources to process the incoming information, and then convey results to affected vehicles within range.
It is proposed that CVCC and VANET could be combined to produce real-time monitoring and smart adjustment for autonomous vehicles in traffic conditions. The data collected by such a system make possible new artifacts and processes for traffic management and public safety. Several proposals are discussed in this paper.
The limitations of the CVCC/VANET system are set out, as well as the limitations of competing systems. Finally, the Least Action Principle (LAP) is introduced. The LAP is proposed for use as a method to simplify the complex communication network required for the safe regulation of autonomous vehicle traffic.
Communication network required for the safe regulation of autonomous vehicle traffic.

2. 11:00 **u A Novel Technique to Increase the Sensitivity of SPR-based Biosensors. *Jeremy Reid*, Tingyi Wei, Cameron Gren, and Ravi Gollapalli, University of North Alabama.

   While todays optics-based biosensors can readily detect biomolecules up to concentrations of 5 ng/ml, there is significant room for improvement to reliably identify and detect very minute concentrations of biomolecules. Surface plasmon resonance (SPR) biosensors are optical sensors widely used in pharmaceuticals, food sample analysis, and antigen-antibody studies and biomolecular reactions. The working principle of a SPR biosensor is a function of the refractive index of the sensor surface and the test sample at the sensor surface and manifests itself as an absorption of the light source that is used for exciting the surface plasmon. One of the key issues with the present technique of commercially available SPR biosensors is the inability to provide a tunable sensor surface. We have numerically investigated a novel technique to design a biosensor with a tunable sensor surface and also increase its sensitivity. This is accomplished by the application of electrical bias across the sensor surface. Our calculations have shown that the sensitivity of the SPR based biosensors using this novel technique can be increased by multi fold under certain conditions. In our presentation we will present our results for different sensor configurations.

3. 11:20 Surface Engineering of Bio-materials Using Cold Plasma Processing. *Vinoy Thomas,* University of Alabama at Birmingham. (2020)

   ***u* or ***g* Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

Joint Poster Sessions
SECTION II – CHEMISTRY
SECTION III – PHYSICS AND MATHEMATICS
SECTION IV – ENGINEERING AND COMPUTER SCIENCE

CANVAS:
Authors Present: 11:40 AM – 12:40 PM; Viewing and Judging
Donna Perygin, Wen Yan and Ravi Gollapalli, Presiding

SECTION II – CHEMISTRY

1. **u Maleimide Homoepibatidine Derivatives. *Kaylee Rawlins* and Stephen Slauson, Jacksonville State University.
   Chronic pain is extremely debilitating for every day human function. Long term, serious complications can arise due to such pain, making it a necessity to treat these conditions with pain relievers. A major disadvantage to most pain relievers is their addictive nature, especially when utilized with any frequency. By synthesizing an agonist for the nicotinic receptor, pain relief could be achieved without the risk of addiction, making such a compound an ideal candidate to replace medications such as morphine. Epibatidine, secreted by the Ecuadorian frog Epipedobates tricolor, is a natural compound that targets the nicotinic acetylcholine receptors, functioning as an analgesic without the addiction associated with compounds that bind to the opioid receptors. The secretion is highly toxic, however, meaning that it must serve as a starting point to synthesize other molecules rather than being used directly. Due to the wide variety of nicotinic sub-types, minute structural changes can have significant impact on the binding and expression of a compound. One such set of alterations is the synthesis of maleimide homoepibatidine derivatives. This poster will explore the work done towards experimentally synthesizing two of these such derivatives through the Diels-Alder reaction.

SECTION III – PHYSICS AND MATHEMATICS

6. **u Phonon Thermal Conduction At Low Temperatures. *Delya Sligh*; Prakash Sharma, Tuskegee University.

   A Theoretical model is revisited under the framework of Botltzmann Approximations. An equation has been developed. It has been applied to explain the thermal conductivity of semiconductor. The phonon scatterings by various scattering centers in the material have been studied. The results will be discussed showing that the model explains phonon conductivity of semiconductors at low temperatures.

7. Nanostructure evolution and void surface reconstruction in nanovoid rich locally hydrogenated amorphous material. *Durga Paudel*, Alabama A&M University; Parthpratim Biswas, The University of Southern Mississippi, Alabama School of Mathematics and Science.

The effect of the nanostructure evolution and void surface reconstruction in nanovoid rich locally hydrogenated amorphous silicon is studied via hydrogen dynamics and temperature. Within the realistic void-volume, the dynamics of Si and H atoms and correlated surfaces of the nanostructure are examined in simulated models obtained from first-principles density-functional simulations calculations the modified Stillinger-Weber potential. The hydrogen dynamics and temperature effect on nanostructure evolution and void surface reconstruction are reported using the 3D rendering using convex-hull approximation and 2D X-ray scattering intensities corresponding to those nanostructures in small angle region. The sizes of nanostructures obtained from radius of gyration of the corresponding convex hulls surface and small angle X-ray scattering intensities are compared.

8. **u Absorption and Laser-Induced Fluorescence Studies of Chlorophyll. *Clay Thompson*, Archana Sharma, and Akshaya Kumar, Tuskegee University.

Chlorophyll is one of the most significant components of plant leaves. Chlorophyll has a crucial role in photosynthesis. The present study involves examining chlorophyll from plant leaves and recording their UV-VIS-NIR absorption spectrum and laser-induced fluorescence spectrum. The plant leaves were placed and submerged in acidic solutions for different periods before extraction of chlorophyll.

SECTION IV – ENGINEERING AND COMPUTER SCIENCE

4. **u Comparing Two Prototype Designs On The Effectiveness Of Gas Separation In Spatial Atomic Layer Deposition. *Vivek Kumar*, Dongqing Pan, Tingyi Wei, John Lucius, Griffin Tull, and Puneet Paul, University of North Alabama.

Atomic Layer Deposition or (ALD), is a technique used for creating thin-film layers for micro components and microstructures such as transistors, processors, memory drives that are crucial components extensively used in everyday electronic devices such as smartphones, computers, and gaming systems. ALD is a proven effective nano-manufacturing technique to deposit nano-scale thin films with remarkable uniformity and conformity in surface geometry. However, confined by the fashion of alternately injecting chemicals to enable the surface reactions, ALD is a very slow process. For instance, a conventional single wafer ALD system can only achieve a few nanometers of layer thickness per minute of deposition. Therefore, this project is dedicated to designing and developing a spatial ALD system, which adopts the spatial concept to deposit materials much faster than the traditional way of ALD by eliminating the significant amount of waiting time. Two different system designs were proposed, designed, and developed, and the flow in spatial ALD was simulated using the computational fluid dynamics method. Two different prototypes based on the designs were created and developed, and flow tests were carried out and the effectiveness of separating gases in the spatial ALD system was tested and verified.

12:40 PM BUSINESS MEETING [Election of a Vice-Chair for Section III]

BUSINESS MEETING [Election of a Vice-Chair for Section IV]

***u** or ***g** Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

SECTION V – SOCIAL SCIENCES
Paper Session
Thursday Morning 9:00 AM – 11:40 AM
CANVAS:
Susan D. Herring, Presiding

1. 9:00 Aging Veterans in the State of Alabama. David Albright, University of Alabama; Justin McDaniel, Southern Illinois University; and *Zainab Suntai*, Kirsten Laha-Walsh, and Candi Williams, Alabama AARP, University of Alabama.

   By the year 2024, the proportion of aging veterans is expected to increase, comprising of Gulf War-era veterans (7.6 million), followed by Vietnam-era veterans (6.3 million) and Korean-era veterans (1.2 million). As this population ages, factors related to military experience can affect several health and well-being outcomes. As such, the purpose of this study was to explore specific life course domains among aging veterans in the state of Alabama. The American Association of Retired Persons (AARP) conducted a survey of Alabama military veterans (n = 556) in 2018 related to health issues, healthcare utilization, home stability, food stability, and caregiving status. Prevalence rates for each outcome were calculated and then further examined by socio-demographic variables, including age, sex, race, marital status, combat experience and geographic residence. The most common health issue among aging veterans in Alabama was high blood pressure (55.36%), then diabetes (30.88%), followed by heart disease (16.49%) and finally cancer (14.27%). 11.06% of veterans reported using mental health services in the last 12 months. 20.09% reported having housing instability, 9.94% reported being caregivers and 5% reported that they experienced food insecurity. Veteran support organizations could help the veteran population by addressing health, healthcare, home and food stability, and caregiving issues. These include providing financial support to caregivers, increasing mental health awareness, increasing access to health services for rural-dwelling veterans and ensuring food security for all veterans. Interventions should encompass individual, community and policy levels.

2. 9:20 Learning Experiences that Enhance Learning Profiency in Higher Education. *Dana Wilchcombe,* Oakwood University.

   The use of mastery learning pedagogical approach to learning was coined by John B Carroll when he measured the amount of time on task for a person to learn. He suggests that enough time on task impacts achievement. The research of Bloom in the 1970's suggest that the Mastery Learning approach may improve academic achievement. Most college students can learn everything they are taught at a mastery level with little expenditure of instructional effort (Guskey 2007). Guskey suggest that some college students are deficient in important areas of learning because they lack effective time on task, feedback and varied learning opportunities. The notion is that teachers should manage learning more than learners by setting goals. This study seeks to discover which teaching method - KWL or KWHL - is likely produce better mastery learning outcomes. This study utilizes a quantitative approach in which data was collected from participants in two general education courses at a local Historically Black College or University

(HBCU) that has open enrollment. Our findings suggest that KWL is more effective than KWHL. The group that employed the KWL graphic organizer had a mean score 10.5 SD 1.4. The group that used the KWHL graphic organizer had a mean score 8.96. SD 1.7. There was a mean difference of 1.5825; F=46.15, p<.000 The partial eta2 = .518, indicating a strong size effect.

3. 9:40 Churchill and the "Ungentlemanly" War. *Susan Herring* and Bryan Kennedy, Athens State University.

   Philosophers who adopt the institutionalist approach to the concept of war believe in prescribing morally justified laws of war and having these laws followed by the combatants. But is this a useful approach in the contemporary world? This was the debate in Great Britain in the late 1930s, as Hitler became a growing threat. Churchill saw the need to deviate from the traditional philosophy and move toward techniques that were morally questionable. The War Office had established a special section, Section D, to research and implement new techniques in intelligence, weapons, and operations. One man selected to work in Section D found inspiration in the tactics of Michael Collins of Sinn Fein, Lawrence of Arabia, and the American gangster Al Capone. The questions considered in this case study center on the moral questions that stem from the application of these tactics.

4. 10:00 **u An Examination of Punctuating Events and the Future of Nursing: Policies, Pandemics, and Beyond. Courtney Haun and *Ethan Haydel*, Samford University.

   Since the mid-1980s, appropriate nurse staffing has been an intense issue for the health care industry and population health outcomes. In the United States (U.S.), the health care sector has responded to the heightened need for more nurses due to the increase in the aging population, chronic illnesses, and the shortage of nursing educational resources. This article examines whether nurse staffing policy trends can be generalized to Punctuated Equilibrium Theory (PET), the idea that policy monopolies are stable over long periods of time and usually change because of sharp, short-term shocks to the policy system. Since the early 2000s, two particular punctuations occurred during the same time. In 2010, the Institute of Medicine (IOM) report titled The Future of Nursing gave thorough recommendations for states to implement regarding nursing workforce improvement. The nursing and health industry were, nevertheless, greatly influenced by this report. In addition to the IOM report, the controversial Patient Protection and Affordable Care Act (ACA) sought to not only strengthen Medicare and Medicaid but also implement tighter restrictions on both state and federal health care policies. The context of COVID-19 is creating yet another punctuation and has subsequently led to an increase in both acute and non-acute hospital admissions and in turn the need for nursing services. We posit that the IOM report, the ACA, and the coronavirus pandemic have served as punctuations in the policy system where nurse staffing policies have significantly changed.

5. 10:20 Managing Contracts: DOD Approach. *Charles Roberts*, Bryan Kennedy, Athens State University. (2020)

6. 10:40 An Ethical Dilemma, or Different Perspectives. *Thomas Pieplow*, Bryan Kennedy, Susan D. Herring, Athens State University. (2020)

7. 11:00 The Development of a Competitive-Advantage Model for Online Education in a Small State University. *Michael Essary,* Athens State University. (2020)

8. 11:20 Contracting in the Presence of Insurance: The Case of Bioenergy Crop Production. *Mohit Anand,* Miles College; Ruiqing Miao, Auburn University; Madhu Khanna, University of Illinois at Urbana-Champaign. (2020)

9. 11:40 **u Continuous Supply Chain Improvement Using Artificial Intelligence. Cynthia R. Lovelace and *Samantha Montgomery,* Athens State University.

   The supply chain concept is evolving thanks to innovative technologies such as artificial intelligence (AI). Many of these technologies, such as the Internet of Things (IoT), machine learning, and cloud-based information systems, are already utilized. When these applications are combined, supply chains greatly benefit. In particular, the use of AI in the supply chain will help to increase efficiencies and improve decision-making. Supply chain managers strive for visibility, connectivity, and efficiency within the chain; and advanced technologies such as these help them achieve the highest visibility, connectivity, and efficiency. Merging AI with advanced technologies, the cloud, and automation will help the supply chains become self-thinking. The goal for the future of supply chains is for them to be self-thinking and capable of handling any issues before they become a significant problem.

Noon BUSINESS MEETING [Election of a Vice-Chair for the Section]

***u or **g* Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

SECTION V – SOCIAL SCIENCES
Poster Session
Thursday Afternoon
CANVAS:
Authors Present: 1:00 - 2:00 PM; Viewing and Judging
Susan D. Herring, Presiding

10. **u Cyber Dating Aggression Amongst Adolescents. *Carmen Brown* and Krista Mehari, University of South Alabama.

Youth in dating relationships frequently interact through electronic communication technologies. However, there has been little research conducted on cyber dating aggression among adolescents, especially related to longitudinal predictors of such. Understanding these predictors could inform prevention of cyber dating aggression.
Participants were 142 ninth grade students in one public high school in the southeastern U.S. who reported currently dating someone (ages 13-17). The sample was 50% female; 91% reported being Black or African American.
A linear regression was conducted to determine the extent to which cyber dating aggression was predicted by gender stereotypes, self efficacy for nonviolence, and attitudes towards dating violence, while controlling for prior levels of cyber dating aggression and victimization. Together, gender, Wave 1 cyber dating victimization, and Wave 1 cyber dating aggression explained a significant amount of the variance in cyber dating aggression perpetration ($F[3, 139] = 23.57$; $R2\text{-}\Delta = .34$; $p < .001$). Specifically cyber dating perpetration from Wave 1 predicted increases in cyber dating perpetration. ($\beta = .5105$, $p < .0010$). Of the hypothesized predictors, only attitudes about cyber dating aggression at Wave 1 uniquely predicted increases in cyber dating aggression three months later. ($\beta = .243$, $p = .004$)
These findings highlight the importance of early intervention in cyber dating aggression, perhaps prior to ninth grade, given the early established stability of perpetration. One possible target of intervention is changing youth's attitudes about the acceptability of cyber dating aggression. More research is needed to identify additional factors that can account for attitudes towards dating violence, and cyber dating violence.

11. **g Combat Veterans With Polytrauma and Traumatic Brain Injury: Exploring Variables Affecting Access to Social Work Outpatient Services. *Kirsten Laha-Walsh*, University of Alabama; David Albright, University of Alabama; Bruce Thyer, Florida State University; Kelli Godfrey, University of Alabama; Raymond Waller.

Polytrauma, or injuries sustained across multiple body locations or systems, has been acknowledged by the Department of Veterans Affairs as an issue of significance for combat veterans of the conflicts commonly referred to as the "war on terror" due to the large number of service members surviving the combat arena who have sustained such injuries. Polytrauma, in the majority of cases, is comorbid with traumatic brain wounds sustained from blast injuries. However, little research guides this area of practice following acute care, especially in relation to social work services, though social workers are the most common outpatient service providers to veterans with these diagnostic sequelae. This exploratory study examines variables associated with access to health care within a large southern Department of Veterans Affairs hospital that is 1 of 5 in the Polytrauma System of Care, a recent addition to veteran's services. Implications are present that suggest more

research in needed with a focus on veterans with polytrauma and or traumatic brain injury who are using social work services. This research is important as the veteran polytrauma population is growing along with additional comorbidities. Culturally competent education and training is needed for social workers engaging with this population, especially seeing that the Department of Veterans Affairs is the largest employer of social workers in the United States.

12. **g The Indirect Relation of Parenting to Relationship Satisfaction through Attachment in Emerging Adults. *Damion Whittington* and Silje Lindstad, University of South Alabama.

Introduction: Previous research suggests that parenting is related to young adults' relationship functioning (i.e., Xia et al., 2018), and that romantic attachment is related to relationship satisfaction (Givertz et al., 2019). In this study, we explored a mediation model where parental psychological control would be indirectly related to romantic relationship satisfaction through romantic attachment.
Methods: Participants were 173 students who were enrolled in a psychology course at a southeastern university and completed measures on retrospective parental psychological control (controlling, manipulative parenting that disregards children's thoughts and feelings; Barber et al., 2012), anxious romantic attachment (the consistent desire to be close to a partner combined with the fear that the partner will leave) and avoidant romantic attachment (the desire to remain distant from a romantic partner; Fraley et al., 2000), and their current relationship satisfaction (Vaughn & Baier, 1999).
Results: Using PROCESS (Hayes, 2018), the proposed model was partially supported. The indirect effect of psychological control on satisfaction through anxious attachment was significant (b = -.09, SE = .02, 95% bootstrap CI [-.15, -.05]); the direct effect of psychological control on relationship satisfaction was not significant (b = .09, 95% CI [-.01, .18]). Avoidant attachment was not a mediator.
Discussion: Current findings suggest that perceived parental psychological control is related to anxious attachment which is related to relationship satisfaction. These findings are correlational and causal relations cannot be inferred. Future longitudinal research is needed to better understand these relations.

***u or **g* Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

SECTION VI – ANTHROPOLOGY
Paper Session
Thursday Afternoon 2:00 – 4:40 PM
CANVAS:
Jason Heaton, Presiding

1. 2:00 Calculating Torsion Values in Common Skeletal Elements: Creating an Accessible Method. *Jason Heaton*, Birmingham-Southern College; Andrew Brock, Augusta University; and Mark Rupright, Birmingham-Southern College.

   To understand the functional significance of morphological variation, the ability to easily quantify an element's shape change is paramount. Among primates, the twisting (or torsion) of metatarsals can indicate whether their foot had grasping abilities or not. Yet, the computation of torsion typically requires specialized software. Historically, the most frequently used, GRF-ND (N-Dimensional Generalized Resistant Fit), is a DOS-based program that is difficult to run on modern computers. Yet, there is a need to have continuity in reported values to allow comparisons across studies. Therefore, we aimed to develop an alternative method using more readily available software (i.e., Excel and R). Four landmarks were placed on complete metatarsals, and then the 3-dimensional coordinates for each landmark were obtained. From these landmarks, two vectors were calculated, one proximally (e.g., along the base) and one distally (e.g., along the head), for each metatarsal. In doing so, we accounted for the differences in projection along the longitudinal axis (i.e., removing variation in the y-axis). The result was a computation of the torsion angle from the dot product of the plane-projected vectors. Then, we compared torsion values calculated through this methodology with values derived with GRF-ND. Our results showed a significant correlation [$r(16) = 0.997$, $p < 0.001$] between methodologies with a low average degree (0.60) difference in values (i.e., range difference: 00 – 2.40). Therefore, we conclude that our results are comparable to those given by GRF-ND but may be more accessible given their ability to be run in common software programs.

2. 2:20 The Role of Religion in Primate Conservation: Muslim Perceptions of Barbary Macaques in the Rif Mountains, Morocco. *Sherrie Alexander*, University of Alabama at Birmingham.

   Cultural perceptions of primates play a critical role in understanding the human dimension of conservation. Moreover, religious values may drive behaviors towards nonhuman primates. While religious perceptions of primates vary widely, they are often integrated with cultural norms and personal experiences. Here, I explore the entanglement of these elements among three groups of respondents (n=24) in the Rif Mountains of Morocco and discern the range of Islamic pro-conservation behaviors towards Barbary macaques (*Macaca sylvanus*). Findings demonstrate religious values influence attitudes towards macaques for all three groups: rural shepherds, urban working-class, and urban students. While negative religious references were present, these were secondary to positive religious values connected to respect, protection, and purpose. More specifically, rural respondents were more likely to use reflexive references to describe macaques and fused conservation concerns to broader religious values and local forests

where respondents frequently interacted with macaques. They were also less likely to refer to specific Koranic passages. In contrast, urban respondents referred more frequently to Koranic passages and made connections between 'biodiversity' and Barbary macaque conservation. In this case, Muslim values were focused on protection of macaques as a key element of a regional ecosystem, consistent with urban respondents' interactions with macaques through tourism, study, and travel. As expected, respondents integrated their personal experiences and group norms with religious values. Such variations demonstrate how underlying religious values may shift based on intergroup variation. However, they may also provide insight for conservation initiatives where religious values permeate the cultural landscape.

SECTION VII: STEM EDUCATION
Joint Session with SECTION I: BIOLOGICAL SCIENCES
Paper Session
Thursday Morning 8:30 – 10:10 AM
CANVAS
Brad Bennett and Jeffrey Morris, Presiding

Biological Sciences Paper

1. 8:30 **u Detection of Large Cat Species in Central Belize Using Camera Trap Technology. *Anjolaoluwa Lawani*, Talladega College; Andrew Coleman, Talladega College.

   The use of trail cameras to document the presence of elusive and secretive species has increased in recent years. Valuable data can be obtained on aspects of behavior and ecology that otherwise may not be collected. The present study utilized a series of trail cameras in the central region of Belize to document the presence of native big cat species: Jaguar (*Panthera onca*), Puma (*Puma concolor*), Jaguarundi (*Puma yagouaroundi*), Oscelot (*Leopardus pardalis*), and the Margay (*Leopardus wiedii*). Six Browning wildlife cameras were set up in 2018 at various locations on the 48,000 acre property of Sleeping Giant Rainforest Lodge, which sits adjacent to the government owned and protected Sibun National Forest Reserve in central Belize. Data analyzed for the current study were collected from five cameras from March to September 2019. Catch per unit effort was calculated as the number of observations per 100 trap days. The most observed large cat species was the Jaguar, followed by Pumas and the Jaguarundis. No Oscelots or Margays were observed on the trail cameras during the course of the study. These data can contribute to the conservation and management of these top-level predators, which, at times, can come into conflict with local human populations.

STEM Education Papers

1. 8:50 **u Podcast as an Engagement Tool in the Classroom and Beyond. *Derek Dang*, Emily Stephens, Parbhoo Karishma, Sahar Moughnyeh, Ryleigh Fleming, Sarah Adkins-Jablonsky, and Samiksha Raut, University of Alabama at Birmingham.

   The realm of higher education in STEM undoubtedly integrates the use of technology and Web 2.0 tools as primary modes to deliver content to undergraduate students. Despite the usage of Learning Management Systems (LMS) acting as primary platforms for online instruction and fostering peer interactions, there still exists the need to re-think approaches towards student engagement in the classroom and beyond. The formidable challenge posed by the on-going pandemic has enabled instructors to envision tools for effective student engagement. One such tool is the podcast, which serves as an effective platform for engaging students. Podcasts have been used on many social media platforms. Specifically, they are episodic audio files that present information in a spoken

word format. For example, podcasts can include interviews, discussions, and or be used to convey research and academia. A few studies have correlated positive experiences listening to podcasts, additionally others have shown the benefits of on learning outcomes and retention in STEM. Furthermore, podcasts serve as versatile media platforms that allow the students to reflect on content rather than solely reciting newly acquired information. Above all, given the nature of an audio recording in a podcast, it serves to foster inclusion by helping to avoid barriers posed by video recordings such as students' being conscious of their appearance, confidence, and various socioeconomic barriers. Therefore, as a classroom engagement tool, students are empowered to utilize podcasts as a collaborative tool that helps them to reflect and synthesize course content in a cohesive manner.

2. 9:10 Genetics Course-Based Undergraduate Research Experience (CURE) Exploring Disease Utilizing Bioinformatics & Nematodes in Hybrid Learning. *Ashley Turner*, Jacksonville State University; Natalie Forte, Jacksonville State University; Anil Challa, University of Alabama at Birmingham; Katelyn Cooper, Arizona State University.

With the intent to explore disease utilizing the *Caenorhabditis elegans* model, we developed a semester-long course-based undergraduate research experience (CURE) in a hybrid (online/in-person) learning environment. Using a combination of bioinformatics and 'wet lab' tools, students analyzed the conservation of a gene and structure-function analysis of disease-associated variants of unknown clinical significance. The course was offered fall 2020 with 39 students enrolled. Embedded in the course were a series of workshop-style research sessions, tutorials, and 'wet lab' sessions. Each student selected a human/animal disease of interest and worked through a series of tools to identify a disease-associated gene with a *C. elegans* ortholog and disease-associated variants. Students took identified conserved variants into 'wet lab' sessions to design and test a PCR-based assay to serve as a downstream genotyping assay. Discussions, responsible conduct of research training, electronic lab notebooks, iterative project reports, quizzes, and group oral presentations were assessed for mastery of learning objectives and research progress. We assessed the impact of the CURE on students' cognitive and emotional ownership using a closed ended survey administered at the end of the semester. We also examined to what extent students' reasons for choosing their disease of interest influenced their cognitive and emotional project ownership. We found that students developed notably high cognitive and emotional ownership, comparable with CUREs taught in-person. Early analyses also suggest that students with more personal reasons for disease selection demonstrate higher cognitive and emotional ownership compared to students without a personal reason for disease selection.

3. 9:30 **g Fostering Online Student Engagement with Effective Technological Tools. *Bre Minniefield* and Samiksha Raut, University of Alabama at Birmingham.

The onset of the covid-19 pandemic compelled many schools and colleges across the world to switch to an online mode of instruction. As a result, the once bustling

classrooms have been moved to an asynchronous and synchronous modes of instruction. Regardless, this has further heightened the need for professional development activities that can help faculty to become proficient in using online engagement tools. This presentation therefore focusses on discussing some easily implementable online tools that help faculty to effortlessly transform their online teaching environment. Herein we describe three user-friendly platforms like padlet, jamboard, mural and kahoot. These tools can be utilized by faculty as per their class needs. Finally, we will engage the participants in a hands-on demo of padlet as an effective online engagement tool. We hope that educators can utilize these platforms to creatively engage their students in synchronous lecture activities and transform the isolated online lecture environment into an active, engaging learning environment.

4. 9:50 **g Why Does Our Work Matter? Connecting Microbiology Laboratory Curricula to North Birmingham Stakeholders. *Sarah Adkins-Jablonsky*, University of Alabama at Birmingham; Qutia Roberts, University of Alabama at Birmingham; Brad Bennett, Samford University; Rob Akscyn, Jeff Morris, University of Alabama at Birmingham. (2020).

***u or **g* Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

SECTION VII: STEM EDUCATION
Poster Session
Thursday Afternoon
CANVAS
Authors Present. 1:00 – 2:00 PM, Viewing and Judging
Jeffrey Morris, Presiding

5. **u Can Biology Coursework Teach Research, Teamwork, and Communication Skills? *Jenna Bae*, Julie Jung, Ryan Lauterbach, Brittney Comans, Paul Milazzo, and Samantha Giordano-Mooga, University of Alabama at Birmingham.

   Undergraduate research is an important part of the undergraduate experience as it provides students the opportunity to apply content knowledge to real world scenarios. The purpose of research in the professional and academic settings are the answering of novel questions and corresponding original contributions to the field, while undergraduate research is focused on exposure to the research process and developing skills for the future. Most undergraduate students are exposed to research experiences in course-based settings although it may not be the conventional laboratory research. We were interested in determining if students learned communication and teamwork through research experiences in biology courses. A systematic search of the literature regarding undergraduate research in biology courses in four databases resulted in 315 abstracts. Abstracts were reviewed for relevance based on a predetermined criterion by two independent reviewers resulting in 31 papers to be reviewed with 80 abstracts needing an additional reviewer. A quality control analysis of the abstracts will be conducted followed by full text review by two independent reviewers. Future plans are to determine if included coursework used parts of a modified scientific method which includes hypothesis formation, data collection, data analysis, interpretation of results, and a conclusionary product. Comparison of the level of exposure to research in biology courses between laboratory and course-based research experiences will be assessed. This comparison will be utilized to evaluate undergraduate biology research experiences, serving as a tool to increase the quality of biology research experiences outside the laboratory, thus increasing opportunities for undergraduate research experiences.

6. **u Breaking the Barriers of Traditional Service Learning in a Pandemic with E-ServiceLearning: Impacts of a COVID-19 Module in a Non-Majors Biology Course. *Ryleigh Fleming*, University of Alabama at Birmingham; Sarah Adkins-Jablonsky, University of Alabama at Birmingham; Marco Esteban, California Dougherty Valley High School; Diana Bucio, University of Alabama at Birmingham; Jeffrey Morris, University of Alabama at Birmingham; Samiksha Raut, University of Alabama at Birmingham.

   In the wake of the COVID-19 pandemic, the general public has been subjected to an "information epidemic" or an "infodemic" leading to a plethora of invalid information. We decided to educate a non-majors biology class with an intent to help advance public health awareness related to COVID-19. This is particularly important for non-major's biology students who may only ever take one science class as a part of their core curriculum. In

the light of an unanticipated transition to an online platform, an E-service-learning module was introduced for this course. In the four-week service-learning module, which included expert-led lectures and an E-service-learning assignment, students created digital infographics to inform their peers and community about COVID-19 safety precautions and completed a required post-reflection assignment summarizing their learning gains. Out of 112 enrolled students, 87 consented to have their reflections analyzed for this study and 8 students chose to participate in additional one-on-one online interviews. We categorized post-reflection and interview data into four broad categories: responses related to the service-learning, guest lectures, information on COVID-19 virus or pandemic, and those about the broader implications of COVID-19. Our post-reflection data and interview data together reveal that while some students were appreciative of an opportunity to be involved in the process of educating the community via infographics, a majority of the students reported a greater range of learning gains from expert led lectures. Continued research on E-service-learning should explore the degree to which this pedagogical tool can maximize student learning in an online classroom environment.

7. Fermentation Fun: A Straightforward Active Learning Exercise That Blends Food Science, Microbiology, Molecular Biology, and Bioinformatics. *Brad Bennett,* Silvia Kinnebrew, Samford University; and Shannon Carden, Magic City Ferments. (2020)

8. Career Development Enhances Transfer Student Success. *Betsy Dobbins* and Rita Malia Fincher, Samford University. (2020).

2:00 PM BUSINESS MEETING [Election of a Vice-Chair for the Section]

***u or **g* Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

SECTION VIII – ENVIRONMENTAL AND EARTH SCIENCES
Paper Session
Thursday Afternoon, 2:00 – 2:20 pm
CANVAS

Vinoy Thomas and Jeffrey Morris, Presiding

1. **g Alabama Cities Growth Projections and Patterns for 2040. *Megha Shrestha* and Chandana Mitra, Auburn University.

   In the US, most urbanization studies focus on large cities, with less attention paid to small and medium-sized cities (SMC). In the south-east US, Atlanta has been the focus of all urban studies; little attention is given to smaller urban aera. Some of these SMCs are growing at a very fast pace due to migration, economic investment, and warmer climate than other parts of the country. The state of Alabama has seven of the fastest-growing cities - Huntsville, Tuscaloosa, Hoover, Birmingham, Montgomery, Mobile, and Dothan - economically. These cities experience surge of population migrating with increase rate of 88 to 20 percent from 2010 to 2019. Considering this development trend, this study focuses on ten SMCs in Alabama (Population > 40000) with at least 15% increase in population size between 1982 and 2010, and two large cities (Population > 180000) which have experienced a loss in population size. The main objectives are 1) to determine the change of urban built-up areas within the ten cities over the period of 1982 to 2019 and 2) to project future urban growth scenarios (to 2040) using the Cellular Automata (CA) Markov model in the Land Change Modeler (LCM) of TerrSet. The results revealed that there has been an immense expansion of urban built-up areas from 1982 to 2019 with urban growth primarily along the transportation routes. The outcome of this research should aid with informing the planning of these cities in Alabama, as well as other similarly developed cities globally.

2:20 BUSINESS MEETING [Election of a Chair and Vice-Chair for the Section]

SECTION VIII -- ENVIRONMENTAL AND EARTH SCIENCE
Poster Session
Thursday Afternoon, 2:30 – 3:30 pm
CANVAS
Authors Present: 2:30 PM– 3:30 PM, Viewing and Judging
Vinoy Thomas and Jeffrey Morris, Presiding

2. **g Applying Machine Learning Technique Using Google Earth Engine to Access Landcover and Land-Use Change of Trivandrum, a Coastal City in India. *Sukanya Dasgupta* and Chandana Mitra, Auburn University; and Udaysankar Nair and Christopher Phillips, University of Alabama in Hunstville.

   Urbanization in the coastal regions is expected to further intensify in response to population growth and increased demand in ocean-side properties. As urbanization occurs,

coastal plain cities are face with intensified environmental pressures that can negatively impact the land-atmosphere interaction processes. A coastal city, Thiruvananthapuram (Trivandrum) is a medium sized (Tier-2) city on the southwestern edge of India bordering the Indian Ocean. This study focuses on the effects of urbanization on the land surface characteristics of Trivandrum, utilizing multiple decades satellite observations from Google Earth Engine (GEE). The data collected over a 20-year time span (2000-2020) is from GEE are from Moderate Resolution Imaging Spectroradiometer (MODIS), which provide unprecedented opportunities to conduct spatio-temporal change analysis of urban regions. The goal of the study is to evaluate the intensification of atmospheric impacts of land cover and land use (LCLU) change in coastal settings (especially urbanization). The report indicates that there are mass changes in the city over the 20-year time lapse with distinctive land surface temperature increase and loss of vegetation due to urbanization. This research is the first in series of studies that will use multi-decade National Aeronautics and Space Administration (NASA) satellite observations to expansively analyze urban LCLU atmospheric impacts in coastal region and other geographic settings, especially Tier-2 cities in other parts of the world, including the United States, to study areas of intensification and amplification.

3. **u *Solenopsis invicta* Affects the Distribution of Carrion Beetles Across Different Habitats in a Large Urban Park. *Evan Wigley*, Kyle Waldrop, Jonathan Reaves, and Grant Gentry, Samford University.

   We sought to determine whether carrion beetles and ants showed a varied distribution along an edge effect gradient in Red Mountain Park. Fire ants were expected to deter Silphid presence and be more common in the field and edge regions (Tschinkel 1988).The main hypotheses we investigated were whether precipitation and/or air temperature would influence ant activity and if this cascaded to Silphid activity. Additionally, we tested to see if there was a significant difference in species diversity among Silphid populations within and between the three regions we sampled: field, forest, and edge. Pitfall traps were baited with chicken left at room temperature for multiple days and placed along transects in the three different regions. We found that ant presence is inversely proportional to levels of rainfall, as well as between sampling areas We also found that with increased rainfall and therefore less ant presence, carrion beetles were trapped more often. Our findings indicate that carrion beetle presence is heavily impacted by ants, which are themselves strongly affected by precipitation. Ultimately, the data supported both of our hypotheses as we were able to establish a close yet inverse correlation between carrion beetles and ants with respect to weather impact on their respective activities and interactions with one another.

4. **g Uncovering Novel Spatial Relationships Between Honey Bee Health, *Varroa destructor, Nosema* species, and Environmental Conditions. *Stephen Todd*, Geoffrey Williams, and Stephanie Rogers, Auburn University.

   European honey bee (*Apis mellifera*) populations have experienced increased mortality globally for the past decade. Factors that contribute to this increased mortality include beekeeper management practices, weather and climate, pesticide use, land-use change, and parasites, including Varroa destructor and Nosema species (*Nosema* spp.). *Varroa destructor* (*V. destructor*) are one of the main threats to honey bee populations, but their spatial distribution, variability, and interaction with weather, climate, and local environmental conditions are poorly understood. Based on the first law of geography, where everything is related, but near phenomena are more related than phenomena that are

farther apart, I predict that the distribution of *V. destructor* and Nosema spp. are spatially autocorrelated. To test my prediction, I obtained longitudinal (~6 years) data from the Bee Informed Partnership (BIP) Sentinel Apiary program, which includes crowdsourced information from 262 beekeepers across the US, geographic coordinates of apiaries, *V. destructor* population levels, *Nosema* spp. infection levels, and management strategies. With these data, I will measure the level of spatial autocorrelation using the Cluster and Outlier (Anselin Local Moran's I) analysis tool in ArcGIS Pro. Then, I will relate these spatial clusters to temperature, precipitation, and humidity data from the NOAA Global Summary of the Month dataset by running spatially weighted regressions. These results will then be shared with BIP to develop better beekeeping management practices at local scales.

***u* or ***g* Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

SECTION IX: HEALTH SCIENCES
Paper Session
Thursday Morning, 9:00 AM – 11:20 AM
CANVAS
Donna Cleveland, Presiding

1. 9:00 **g The Complex Interplay between Sleep, Physical Health, Mental Health, Cognitive Health, and COVID-19. *Garrett Talley*; John Shelley-Tremblay, University of South Alabama.

   Sleep difficulties have increased during the COVID-19 pandemic, and stress levels rise during a virus outbreak due to health worries, financial consequences, changes in social life, and daily life as we know it. Cross-sectional and longitudinal analyses demonstrated average sleep quality was unchanged, or even improved early in the pandemic, but there were clear individual differences among the participants who reported their sleep quality worsened – possibly explained by stress vulnerability. The current investigation examined self-reported emotion regulation and mindfulness as protective factors in determining who would go on to ultimate contract COVID-19. Results suggest the ability to mitigate unwanted cognitive arousal may be key for maintaining mental and physical health during the pandemic.

2. 9:20 Cadaveric Dissection in the Education of Health Science Clinical Students. *Mark Caulkins*, Nick Washmuth, Brad Cantley, and Kathleen Caulkins, Samford University.

   Cadaveric dissection has long been used in the education and training of students in medicine. We present the rationale for performing and studying dissection of cadavers in the training of future clinicians, and present several interesting anomalies found in the cadavers dissected by students in the Samford University Cadaver Lab, and the UTEP Human Anatomy Teaching Laboratory.

3. 9:40 **u Exercise and the Other Guys; The Secret to a More Efficient Health Care System. *Ivy Wilson*, Samford University.

   Currently in Alabama, while there is a crisis within our healthcare system in its entirety, adversely, there is also a crisis when it comes to the health of the individuals within this system. With cardiovascular disease being the number one killer of U.S. citizens and healthcare costs skyrocketing, the proposed paper seeks to determine the effects of an individuals health and their specific conditions and how that can overall impact the costs of healthcare. In this study, a qualitative research approach is used by examining previous peer-reviewed research as well as national databases, to develop and explore the extent of the problem within the Alabama Health care system. I plan to discuss a potential system that can promote overall well-being while lowering the costs of healthcare. This is an important topic for the general population, healthcare organizations, and policymakers alike within the state.

4. 10:00 **u Outcomes of a Virtual Young Teen Asthma and Wellness Camp Conducted by an Interdisciplinary Team. *Sean Shelley-Tremblay*, University of Alabama, and Ellen Buckner, Samford University.

   Asthma is the most prevalent chronic illness among children in Alabama. In order to address this situation, a number of summer camps, dubbed asthma camps, have been established throughout the state in order to provide pediatric asthma patients with asthma management. Due to the COVID-19 pandemic, typical asthma camps became impossible, and the Virtual Young Teen Asthma Camp & Wellness was instituted to serve those who would normally attend in-person camps. We added nutritional and general health education with an emphasis on wellness to complement. Following IRB approval, the camp was conducted by a team of individuals representing the disciplines of nursing, respiratory therapy, pharmacy, physical therapy, nutrition, medicine, and social work. Faculty, students, and volunteers led the camp, recording an average of nearly 5/5 for all three dimensions of the Assessment of Interprofessional Team Collaboration Scale. Camp sessions lasted five days, which included morning asthma management lessons, and afternoon nutrition and exercise activities. Campers/parents completed pre-post surveys using the Asthma Control Test (ACT), self-efficacy surveys, and an Asthma Responsibility Questionnaire. Data revealed that following camp, students scored on average 3.84/5.00 and 3.8/5.00 in general self-efficacy and social self-efficacy assessments, respectively. Additionally, campers ranked their own asthma responsibility at an average score of 3.03/5.00 after camp versus their parents' average ranking of 2.59 (higher is more responsibility to child). Furthermore, 75% of campers who took the ACT post-camp perceived their own asthma condition as "Very Good," while only 60% of campers responded as such before camp. Ultimately, this asthma camp model seems an effective means of asthma education. Additionally it can provide access to asthma & wellness education remotely.

5. 10:20 **u The Comparative Effectiveness of Medical Treatments for Endometriosis: A Systematic Review. *Erin Huttula* and Katie Gibbs, Birmingham-Southern College.

   The goal of this systematic review was to compare the effectiveness of currently available medical treatments for endometriosis-related pain and lesion size. The Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA) guidelines were followed for this unregistered review. PubMed was the primary database used with the search terms ("endometriosis" OR "endometrioma" OR "endometriomas") AND ("medical treatment" OR "preservation" OR "therapy") and with filters selecting for randomized controlled trials or clinical trials published between 2016 and 2020. The search was conducted on January 12, 2021. Title-and-abstract screening for human studies narrowed the search to 21 articles, while full-text eligibility screening yielded 13 articles that included measured outcomes related to endometriosis treatment and pain assessment. Studies included a mean of 517 patients. All included studies involved treatment of endometriosis symptoms with hormone contraceptives, antioxidants, gonadotropin releasing-hormone (GnRH) agonist or GnRH antagonist. Some of these treatments were administered after surgical intervention. Dysmenorrhea was most effectively reduced by post-surgical progestins and GnRH antagonists. Non-menstrual pelvic pain was most effectively reduced by progestins. Estrogens and progestins were effective in reducing pain

documented without regard for timing within the menstrual cycle. No data were available for endometriotic lesion size. Desogestrel, a synthetic progestin, is the most effective overall treatment if delivered after surgical intervention. Progestin-based contraceptives are fairly reliable across pain types. GnRH antagonists are particularly beneficial for reducing dysmenorrhea. Further research directions called for investigation into lesion size throughout the duration of medical treatments and for progress towards finding a cure for endometriosis.

6. 10:40 Breast Cancer Diagnostic Technologies: Today and Tomorrow. *Donna Cleveland*, University of South Alabama. (2020)

7. 11:00 The Rett-Syndrome MECP2 Allele in Mice Does Not Appear to Increase The Nuclear or Mitochondrial Gene Mutation Rate. *Mary-Catherine Mitchell*, Hannah Olive, Katherine Wilson, Coleman Reeves, David Johnson, Samford University. (2020)

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SECTION IX: HEALTH SCIENCES
Poster Session
Thursday Morning
CANVAS:
Authors Present: 11:20 AM - 12:30 PM for Viewing and Judging
Donna Cleveland, Presiding

8. Anatomic Variants in Student Cadaveric Dissection. *Mark Caulkins*, Samford University; Nick Washmuth, Brad Cantley, Kelly Atkins, Paul Harrelson, John Hurt, Wes Johnson, and Katelynn Corder-Grier, 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. Because of the cost of cadavers many programs are increasingly using models, including holographic programs. One of the advantages of cadaveric dissection is the anomalies found in every cadaver. We present some of the interesting anomalies found in cadavers dissected at the Samford University Cadaver Lab and the UTEP Human Anatomy Teaching Laboratory.

9. **g Gas Station Pharmacies: A Case Report of Tianeptine Use in Rural Alabama. *Abby Cook* and Ian Powell-Castilla, Alabama College of Osteopathic Medicine.

   A 50-year-old male with no previous history of substance use was admitted for medical stabilization due to withdrawal symptoms from a medication he had been buying at a local gas station. For the past eight months, the supplement Tianna (tianeptine) provided great relief from his chronic neck pain, boosted his mood, and improved productivity at work. This patient later realized the addictive nature of the medication and required a three-day inpatient stay for withdrawal stabilization. Tianeptine is an atypical antidepressant used in Asia, Europe, and Latin America, with multiple mechanisms of action involving NMDA and AMPA modulation along with full-agonist activity at mu and delta-opioid receptors. The South US region had the highest percentage of calls to poison control centers in recent years related to tianeptine exposures with patients requiring emergency treatment and intensive care. The incidence of tianeptine use has been concealed by unobstructed distribution through convenience stores and more recently by the shift of focus during the COVID-19 pandemic. Legislative action to classify tianeptine supplements as a Schedule II substance was halted during 2020, due to mandated safety measures. Action items currently in place include the introduction of AL HB2 in the Alabama House of Representatives in February 2021. We hope this case report and the countless other individuals affected by tianeptine use will provide support for the reclassification.

10. **g Rural Reproductive Health: An Analysis of Education and Access for Young Alabama Women. *Abby Cook*, Alabama College of Osteopathic Medicine.

    Background: Teens and young women of Alabama consistently have poor outcomes related to their reproductive health. In the vastly rural state, many of the women disproportionately affected are low-income and minority groups. Measures such as teen birth rates, preterm birth rate and infant mortality are much higher than the national average. Strict abortion legislation within the state limits healthcare providers and discourages women from seeking

out services, if available at all. Examining what measures have been taken, evaluating their success, and considering future application to susceptible populations is important for progress.
Methods: A literature review of PubMed using search terms “sex education”, “teen pregnancy”, “contraception”, and “reproductive health” was performed, particularly focused on the state of Alabama. Well-established and credible resources such as Guttmacher Institute, Alabama Public Health Departments, Centers for Disease Control, and American College of Obstetrics and Gynecology were taken into consideration.
Results: Abstinence-only sex education fails and comprehensive education with family, peer and community engagement has shown to be most impactful. Young mothers have considerably less chance of high school graduation and poor chance of obtaining a college degree. Allocating more funding and training for family planning initiatives has a significant positive impact for young women and their infants. Often times in rural areas that lose hospitals with obstetric services, prenatal care falls to primary care physicians and can overwhelm their practices. The state of Alabama has more restrictive abortion policies in place than supportive measures, which provide expanded healthcare coverage and have been shown to improve outcomes for women, mothers, and infants.
Conclusions: A multifaceted approach would have the best possibility of expanding reproductive health resources for teens and young women in Alabama. Utilization of communities and peers in rural areas would be the favored method for reproductive health education. Healthcare providers should be aware of the limitations their patients might face, be knowledgeable about state resources and engage in shared decision-making with their patients to provide the best care. Proper reproductive health training should be given in medical education and to advocate for government support for widespread access to these resources. Providing comprehensive sex education and adequate access to healthcare resources young women need sets the foundation for their future. Educated women with the resources they need have more control over their education and have improved quality of life for themselves and their children.

11. **g Maternal Adverse Childhood Experiences (ACES) and Their Effect on Her Offspring: A Review. *Audrey Gunn* and Kasey Chelemedos, Alabama College of Osteopathic Medicine.

Introduction: It is well understood that a higher number Adverse Childhood Experiences (ACEs) is related to negative health outcomes. It has been shown that parental ACEs can negatively impact children. The ACEs studied the most are: physical, emotional and sexual abuse, physical and emotional neglect, households with mental illness, domestic violence, divorce, incarceration, and substance abuse. Method: Peer-reviewed articles were selected from PubMed database regarding parental or maternal ACEs and health outcomes of the mother and/or child. Results: Maternal toxic stress and high ACE scores may influence the transgenerational impact on offspring. For instance, pregnant women who experience personal or community violence were more likely to give birth prematurely. After birth, higher maternal ACE scores led to more health risks in pregnancy, thus having infants with more health risks, leading to lower developmental outcomes at 12 months. One study found that for each point increase in ACE score, there was an 18% increase in developmental delay in their offspring. Three or more maternal ACEs were found to be associated with postpartum mental health symptoms as well as increased severity of behavioral problems in their children. Although these negative outcomes in mothers and children are found to be associated with maternal ACEs, support factors can mitigate these outcomes. For instance, social support during pregnancy in women with high ACE scores can buffer antepartum and

postpartum health risks. Teaching Points: There is an association between maternal ACEs and postpartum outcomes, as well as offspring development and future health. However, interventions can help mitigate these effects, such as strong social support during pregnancy and the postpartum period. More research should be conducted to test social support interventions in women with high ACE scores.

12. Caring for Our Caregivers: The Implementation of a Peer Support Program for Second Victims in Healthcare. *Donna Copeland*, Ashleigh Bowman, and Amy Davis, University of South Alabama.

Background of the Clinical Issues: Many events occur throughout a shift that could be perceived as stressful by the healthcare provider. Adding to the day-to-day stress is patient-related unexpected or traumatic clinical events. These unexpected or traumatic patient events can lead to psychological trauma, resulting from an overwhelming amount of stress that exceeds one's ability to cope with the distressing event.[1] The emotional distress encountered after an unexpected or traumatic patient event is known as second victim syndrome.[2] Developing strategies for resilience and social support are recommended for mitigating the adverse effects of second victim syndrome.[3,4]
Study Purpose: A system-wide, organized approach to addressing second victim syndrome in healthcare is needed.[5,6] The aim of this IRB approved project is to provide immediate peer support for healthcare providers who experience a distressing, patient-related event.
Methods: An IRB approved mixed-methods research study was designed to evaluate the effectiveness of a second victim peer support program. Administrative stakeholder support was obtained, and an interdisciplinary project team was formed to:
• Determine staff's perceptions of current level of support after a patient-related event.
• Identify evidence-based strategies for a second victim peer support program.
• Devise a marketing and educational plan to ensure staff awareness of peer support services.
• Recruit and train a peer support team.
• Evaluate quantitative and qualitative data for program effectiveness.
Outcomes: Expected outcomes of the second victim peer support program are that healthcare providers will report an improved emotional state from the support provided by the second victim peer support team.

13. Virtual Dissection: Alternative to Cadaveric Dissection for a Pregnant Nurse Anesthesia Student. *Nick Washmuth*, Terri Cahoon, Katrina Tuggle, and Ronald Hunsinger, Samford University.

Anatomy is a cornerstone of health professional education. The use of human cadavers has been the gold standard for anatomy education for more than 2500 years. Using cadaveric dissections in anatomy education allows for various advantages: promotion of active and deep learning, preparation of the student for clinical practice, correlations of structure to pathology, exposure of students to death, and three-dimensional conceptualization anatomical structure. However, formaldehyde used in the preservation of cadavers can render the laboratory sessions a health risk. OSHA levels for formaldehyde exposure in gross anatomy laboratories has been set at 0.75 ppm TWA – 8 hrs. Formaldehyde is known to irritate the eyes, nose, throat, and skin, and sensitize the respiratory system. In addition, it is a cancer hazard, especially for the nose, throat, and lungs. Pregnant students should avoid formaldehyde exposure altogether and other means of laboratory experiences should be made available to them. This case study compared exam results of a pregnant student in the Nurse Anesthetists Program at Samford University who completed all her dissections using

an Anatomage Table with her 25-student cohort completing their laboratory requirements using human cadavers. The results of this study confirm that a significant gain in knowledge can occur with Anatomage Table "dissection" just as it can occur with actual dissections on cadavers. We conclude that no single method should be used solely to teach and learn anatomy and that student learning is more about how faculty utilize a method than the method itself.

***u or ***g* Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

SECTION X. BIOETHICS AND HISTORY & PHILOSOPHY OF SCIENCE
Paper Session
Thursday Afternoon, 1:00 PM – 4:00 PM
CANVAS:
Brian LaHaie, Presiding

1. 1:00 **u HP Printer. *Jenna Webb* and Clark Lundell, Auburn University.

   The HP Envy Photo 7155 Printer. With few pictures and many words, simplicity is key. The rectilinear box is mainly bright blue and white, yet the focus is put solely on information shown all over the box. The name, special features, and compatibility are written on all sides of the box in Spanish and English. It's obvious that this box's focus is insuring accessible information. Due to this type of packaging, it seems very clear that this engineered product is appealing to the left hemisphere of the brain. The left hemisphere of the brain is analytical, logical, and detail oriented. To appeal to this hemisphere, one must concentrate on being informational. The HP Printer box does just this. The box is simple and systematic, just like the engineered product of the HP Printer.
   However, for a product to have successful packaging, it needs to try to appeal to both hemispheres. This packaging does this by having a single picture with vibrant. Not only does this show off the implied color capabilities of the printer, it also brings the feature of photo printing to forefront of the buyer's mind. Thinking of all the happy memories and photos—just like the little girl smiling in the packaging-- one can print with this printer, creates an emotional incentive to buy this product instead of competitors.
   In all, this printer's packaging appeals primarily to the intellectuality of the left hemisphere of the brain with a secondary focus on the creativity of the right hemisphere.

2. 1:20 The Value Of Intellectual Property In Innovative Product Development. *Joyce Thomas*, Auburn University.

   In 1979, a new category in the vacuum cleaner industry was created when the Dustbuster hand vac was introduced by Black & Decker. They sold more than a million Dustbusters in that first year. Competitors were inspired knock it off and rapidly flood the market with similar products. The Dustbuster was reverse-engineered by enterprising manufacturers in Asia who tried to sell their reproductions in the U.S. market. B&D successfully liti-gated imitators because of patents covering its unique appearance and configuration.
   Eureka was looking to expand manufacturing to Asia and saw this new market category as an opportunity to do so. First they created a hand vac that did not infringe on B&D's patents. Then they followed up later with a new to the market product by adding a handle and floor nozzle. This became the very first light weight battery-operated upright vacuum cleaner on the market.
   A case study on these products discusses the value of intellectual property in innovative product development.

3. 1:40 Design For All? Members Only Need Apply. *Benjamin Bush* and Katherine Chastain, Auburn University.

   Industrial Design is no longer constrained to the physicality of "form follows function". Rather, it has grown into a discipline that addresses systemic issues, constructs services, communicates and leverages information, shapes rules and policies, and implements humanitarian relief. The emergence of industrial design influence into the digital interface space has created the ability to impact the daily lives of millions, if not more, instantly. Industrial Design is not only positioned to address human physical needs -- it has become responsible for understanding and creating thoughtful solutions for a range of cultures. The problem is, the cultural representation in the design profession and design education do not reflect the range of cultures for which they design.
   Lack of representation limits design professions and design education because the core of a designer's ideas come from personal experiences. One's history, personal relationships, analogous points of inspiration, and research findings are all interpreted through an experiential lens. Through this lens, designers critically analyze one another's proposed design solutions with the goal of strengthening each and every design. Without diverse perspectives, a robust, truly critical discussion does not occur.
   As the line between thoughtful, intuitive design and contextual understanding blurs, design schools, who produce the designers of tomorrow, will need to take strategic, intentional steps to ensure that their classrooms support diverse thoughts and perspectives. Because if design is for all people… shouldn't all people be designing?

4. 2:00 Perceptual Boundaries Based on Role and Social Context: A Collaboration between Prison Students and University Students. *David Smith*, Auburn University.

   Through the APAEP (Alabama Prison Arts and Education Project), a small group of students from an Alabama correctional facility and an Alabama university were able to work together on a communication project. The Design Thinking process, known for producing innovative solutions, was utilized as the catalyst for developing the project. Among the many objectives of the project, one was to discover how this unique collaboration would develop. Potentially, this process could provide greater educational impact for both groups by learning from each other. This paper is a case study on how the social context of each group impacted their views of the project, and how institutional constraints and limited resources created barriers to innovative project solutions.

5. 2:20 The Importance of In-Person Learning in Product Design Education. *Shu-Wen Tzeng*, Auburn University; Clark Lundell, Auburn University.

   The Covid-19 pandemic has affected nearly every aspect of our life, from work and school to everyday activities. However, it has also provided an opportunity for us to reflect on things and to reconsider what we do, how we do it and why we do it. After experiencing some teaching constraints during pandemic that impact the quality of education, a design educator realized that in-person learning is not just a form of education but also an essential component of product design education. In this paper, the reasons why in-person learning is essential to product design education will be examined and discussed. The three key aspects of product design education: the people, the content, and the technique are considered and investigated, which

provides a comprehensive view of teaching, learning and student achievement in typical product design education. This paper will also provide evidence to support the reasons why in-person learning is essential to product design education and why it should be a continuous effort for all product design educators even during Covid-19 pandemic.

6. 2:40 **u The Apple Watch as it Communicates with the Brain. *Rachel Ney* and Clark Lundell, Auburn University.

   A designed product is not only appealing to the eye as it captures our attention, but it also serves a purpose. The Apple Watch is not only renowned for being artful in its appearance but also highly engineered as it is a fundamental cornerstone upon which millions of Americans base their daily schedule. The sleek look of the thin, neat screen catching light as the minimalist band wraps smoothly around a delicate wrist engages the aesthetic right side of the observer's brain. As a closer look is given, they will find that this beautiful piece of technology goes beyond the function of a watch as it connects to the wearer's iphone to track their exercise, communicate iPhone notifications, and even monitor their heart. This sensibility and usefulness will appeal to the logic and rational left side of the observer's brain. The box that the watch comes in is a clean white with sharp edges feeling smooth to the touch. Because both the right and left sides of the brain are satisfied as observing the Apple Watch, an area between the two sides called the corpus callosum is at work. This bridge between the halves of the brain combines the left's engineering qualities and the right's artful tendencies to result in the brain's ability to design a beautiful and complex Apple Watch.

7. 3:00 **u Jumper Cables as an Engineered Product. *Katherine Rush* and Clark Lundell, Auburn University.

   An engineered object is an object designed specifically to fulfill a utilitarian purpose. The object must be designed to be functional, with little or no attempt to make the object aesthetic or visually pleasing. An example of an engineered object is jumper cables. Jumper cables are designed with the sole purpose to restart cars with a low battery if connected to a second, working car. Jumper cables are rated on their functionality and durability, rather than how artistic or aesthetic they look. Jumper cables are specifically engineered to deliver a service to the user safely. The colors and materials used in jumper cables are strictly for utilitarian purposes, not for aesthetics or comfort, in order to not distract from the jumper cables intended job. Engineered products, such as jumper cables, are developed with the left side of the brain. The left hemisphere of the brain involves logical, rational, and classical ideas. To design jumper cables, one must use their left hemisphere to plan the design, incorporate math and science to construct the product, and pay attention to details to create the jumper cables. To use the jumper cables, the consumer must also use their left hemisphere to be rational, logical, and cautious during the connection of the jumper cables between the two cars. Since the left hemisphere is used in both designing and using the product, and the product is geared towards functionality rather than emotion, jumper cables exhibit all the qualities of an engineered object.

8. 3:20 Is There A Universal Ethic For How To Treat The Earth? *James Bradley,* Auburn University.

Humanity is a product of biological evolution that began on Earth four billion years ago. We are part of nature, not separate from it. One might therefore argue that all of our actions are natural and that there is no plausible basis for saying that it is right to preserve and protect the natural environment and wrong to despoil it. This view makes it problematic to counter actions like mountain top removal for mining, industrial pollution of air, rivers, and streams, turning oceans into seas of plastic particles, and the unfettered emission of carbon dioxide and other greenhouse gases. Where can we get guidance about how to treat the planet? Domination forms of Christianity look to Genesis and receive permission to subdue the earth. Other forms of Christianity find in scripture a command to practice stewardship. But divine commands lack consistency and universality. Prudence implores us to be kind to the earth if we wish to survive as a species, an argument that requires an understanding of nature's interconnectivity. Aldo Leopold proposed a "land ethic" by which to judge an action: it is right if it promotes the integrity, stability, and beauty of the biotic world. This too is an ecologically-based dictum. Did natural selection instill a wisdom for taking care of our home? If so, how can we reawaken that wisdom? Through science education and experiencing nature.

9. 3:40 PET: Polyethylene Terephthalate – The Ubiquitous 500 ml Water Bottle. *Clark Lundell,* Auburn University.

In the USA 50 pounds of PET plastic (water bottles and other food packaging) pass through 125 million households each year = 6.26 bil pounds of PET / year. In the USA 30% of PET produced each year is recycled Less than 10% of worldwide PET production is recycled.
PET is associated with Single Use Plastics, used a few minutes in its' life cycle and discarded. It takes 77 million years to make the fossil fuels from which conventional PET is produced and 30 minutes to actively use and discard this material as a single use water bottle.
A PET bottle in a landfill takes 500 years to decompose. That same bottle in the ocean breaks down into micro plastics that also last 500 years. Micro plastics are consumed by organisms as part of a food chain, which includes us!!!
Decomposition rates are estimates because PET material was only first introduced 60 years ago.
Since 2009, Coca-Cola has distributed more than 35 billion PET bottles worldwide. A small part of this production is plantbottle packaging, which converts sugars in plants into ingredients that can make up 30% of recyclable PET plastic. It is possible to produce a 100% plant based PET bottle but the cost is high.
Coca-Cola, Pepsi Co and Dr. Pepper – are launching an "Every Bottle Back" initiative to keep bottles in recycling bins instead of oceans and landfills
Recycling facilities world-wide are facing mounting challenges because China stopped buying 2/3s of world's recyclable plastic in 2018.

4:00 BUSINESS MEETING [Election of a Vice-Chair for the Section]

***u or **g* Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

SECTION X. BIOETHICS AND HISTORY & PHILOSOPHY OF SCIENCE
Poster Session
Thursday Afternoon, 4:10 – 4:30 PM
CANVAS
Authors Present 4:10 – 4:30 pm, viewing and judging
Brian LaHaie, Presiding

10. Ethical Issues Involving Healthcare During the COVID-19 Pandemic. *Shuntele Burns,* Alabama State University.

The COVID-19 pandemic has presented formidable challenges on many levels throughout the country and the world. Among these challenges are ethical dilemmas and issues involving healthcare that intersect with other social and ethical concerns.
In the U.S., COVID-19 has underscored health disparities, especially as they affect minority communities. African Americans, for instance, make up less than 15% of the population but account for almost 40% of COVID-19 deaths. Pre-existing conditions exacerbated by social, economic, and environmental factors have made blacks more susceptible to COVID-19 infection and have increased the likelihood of negative outcomes after infection.
The availability of vaccines also raises ethical issues as poor and minority populations have not had the same access as wealthier communities. The problem is also a global one as wealthier countries rush to purchase vaccines, leaving poorer countries languishing.
The scale of COVID-19 hospitalizations in the U.S. has at times severely overburdened some facilities and their staff, posing a number of ethical questions. For example, what criteria should be used in deploying limited resources? How do health care providers balance their professional responsibilities against concerns for their own health and the health of their families? Do providers have an ethical obligation to become vaccinated?
COVID-19 has highlighted complicated ethical issues that nonetheless need to be addressed in advancing toward increased efficacy as well as greater equity and justice in the delivery of health care in the U.S. and around the world.

***u or **g* Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

ALABAMA JUNIOR ACADEMY OF SCIENCE
Mark Jones, State Director

Engineering/Mathematics

1. *Benjamin Davis, Development of Low-Cost Consumer Grade Autonomous Robots for Disaster Response and Relief, *Auburn High School*, Auburn
2. *Akshat Yaparla, Evolution of a Flow Field over a Dynamically Pitching Wing, *Alabama School of Fine Arts*, Birmingham
3. *Chase Burbank, Scope of Awareness, *Wetumpka High School*, Wetumpka
4. Manav Patel, Coronified Sports, *Wetumpka High School*, Wetumpka
5. Javon Jennings, Using Virtual Machines to Contain Cyber Attacks, *Homeschool*, Huntsville
6. Ashraf Mansour, Development of an Electric Wheelchair with a Wireless Electroencephalography-Based Control System, *Auburn High School*, Auburn
7. Asher Owens, The Water Skipper, *Wetumpka High school*, Wetumpka
8. *Naeim Mahjour*i, Harvesting Energy from Everyday Movements by Developing a Two-Dimensional MXene-Based Triboelectric Nanogenerator, *Auburn High School,* Auburn
9. Ahnaf Hossain, COVID-19 Monitoring Through Twitter Analysis, *Auburn High School,* Auburn

Environmental

1. **Hailey Holbert*, Sanitation is Key, *Wetumpka High School*, Wetumpka
2. **Alan Estrada*, Evolve Our Fuel, *Wetumpka High School*, Wetumpka
3. **Avery Pyles*, Light as Air: A Study of How Ultraviolet Light Air Purity, *Wetumpka High School*, Wetumpka
4. *Jordan Jennings*, A Comparison Study of Different Species of Bamboo to Common Woods Used in Building, *Homeschool*, Huntsville
5. *Greta Beumer*, Designing a Handbag Line from Recycled Polyethylene Terephthalate (PET), *Wetumpka High School*, Wetumpka

Life Sciencc

1. *Hannah Grissett*, How Molarity of Sucrose Solutions Affects Osmosis in Celery, *Fairhope High School*, Fairhope
2. *Shivani Babu*, Effects of High-Fat Diet on Phosphoprotein Enriched in Astrocytes-15kD (PEA-15) mRNA and Protein Concentration in the Cerebrum of Mice, *Auburn High School,* Auburn
3. *Bailey Worrell*, Right Vs. Left, *Wetumpka High School*, Wetumpka
4. *Allen Wright*, One Degree Closer to Identifying COVID-19, *Wetumpka High School*, Wetumpka
5. *Pierce Robinson*, The Effects of Water Quality on *Opsariichthys uncirostris*, *Wetumpka High School*, Wetumpka

Medicine Health and Behavioral Science

1. ***H**annah Ashraf*, The Effect of Checkpoint Inhibition on modulating the Hypoxic Tumor Microenvironment, *The Altamont School*, Birmingham
2. **Remy Cron*, The Effect of the Splice Mutation intron 1, bp 54, G > T in DOCK8 on DOCK8 Splicing, *Alabama School of Fine Arts*, Birmingham
3. *Ashwin Prabhakar*, 3D Imaging Based Implantable Scaffolds for Wound Healing, *Bob Jones High School*, Madison
4. *Julian Vilardi and Connor Scheeren*, Unmask Your Potential, *Wetumpka High School*, Wetumpka

Physical Science Earth and Space Science

1. **Michael Fulmer*, Banked Turns Without Friction, Wetumpka High School, Wetumpka
2. *Juliana Boyett*, Investigating the effect of temperature on the pK_a of acetic acid., Fairhope Highschool, Fairhope
3. *Luke Tessier*, The Study of Reinforced Cable Concrete, Wetumpka High School, Wetumpka
4. *Logan Hammack*, Structural Effectiveness to High Winds Produced by Tornados, *Wetumpka High School*, Wetumpka
5. *Makaila Jennings*, Using the Double Dip Transit Photometry Method to Identify Potential Habitable Planets, Homeschool, Huntsville
6. *Emma Seidel*, Precipitation Prediction with Machine Learning, Alabama School of Fine Arts, Birmingham

* Denotes AJAS student who is also entered in the Gorgas Scholarship Competition

GORGAS SCHOLARSHIP COMPETITION
Sci-Mix Session
CANVAS:
Ellen Buckner, Presiding

Session 1: 5:00 – 5:40 pm

1. *Hannah Ashraf*, The Effect of Checkpoint Inhibition on modulating the Hypoxic Tumor Microenvironment, The Altamont School, [Teacher-sponsor: Katrina Dahlgren]
2. *Chase Burbank*, Scope of Awareness, Wetumpka High School, [Teacher-sponsor: Virginia Vilardi]
3. *Remy Cron*, The Effect of the Splice Mutation intron 1, bp 54, G > T in DOCK8 on DOCK8 Splicing, Alabama School of Fine Arts, [Teacher-sponsor: Rebecca Thrash]
4. *Benjamin Davis*, Development of Low-Cost Consumer Grade Autonomous Robots for Disaster Response and Relief, Auburn High School, [Teacher-sponsor: Jacque Middleton]
5. *Alan Estrada*, Evolve Our Fuel, Wetumpka High School, [Teacher-sponsor: Virginia Vilardi]
6. *Michael Fulmer*, Banked Turns Without Friction, Wetumpka High School, [Teacher-sponsor: Virginia Vilardi]

Session 2: 5:40 – 6:20 pm

7. *Alissa Hawthorne*, Can the flexibility [cm] of the long head of the bicep femoris, short head of the bicep femoris, semimembranosus and semitendinosus (the hamstring muscles) improve after running 190 meters on a rubber athletic outdoor track?, Murphy High School, [Teacher-sponsor: Rebecca Mullins]
8. *Hailey Holbert*, Sanitation is Key, Wetumpka High School, [Teacher-sponsor: Virginia Vilardi]
9. *Jaeyoung Lee*, Environmental Conservation: Calculation of Irregular Surface Area Utilizing the Monte Carlo Method and the Law of Large Numbers, Auburn High School, [Teacher-sponsor: Jacque Middleton]
10. *Avery Pyles*, Frequent Phone Calls: A Study of How Radiofrequency Energy Affects Eyesight, Wetumpka High School, [Teacher-sponsor: Virginia Vilardi]
11. *Cary Xiao*, MADSA: Musical Accuracy Development using Spectral Analysis, Alabama School Math Science, [Teacher-sponsor: Elisa Rambo]
12. *Akshat Yaparla*, Evolution of a Flow Field over a Dynamically Pitching Wing, Alabama School of Fine Arts, [Teacher-sponsor: Rebecca Thrash]

*** Regeneron Science Talent Search Semi-Finalist*