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Cover Photograph: Located between Alumni Hall and the Mitchell Center, Moulton Tower and Alumni Plaza stands as a symbol of unity for the University community, a campus landmark and a gathering place. – Excerpt from the University of South Alabama website linked below:
<https://www.southalabama.edu/departments/mitchellcenter/tower/promoter.html>

Photo is courtesy of: Dr. Brian R. Toone, Samford University, who took this photo at the 2017 Annual Meeting of the Alabama Academy of Science while bicycling around campus.

Editorial Comment:

For my inaugural issue as editor, I would like to thank everyone in the Academy for their patience as I learn all the procedures and tools to continue producing an excellent journal.

Thanks!

Brian Toone

Editor: Alabama Academy of Science Journal

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CONTENTS

Abstracts from the 94th Annual Meeting of the Alabama Academy of Science

Biological Sciences	6
Chemistry	37
Physics and Mathematics.....	42
Engineering and Computer Science.....	49
Social Sciences.....	54
Anthropology.....	63
STEM Education	69
Environmental and Earth Science	74
Health Sciences.....	76
Bioethics and History and Philosophy of Science.....	83
Minutes of the Executive Committee Meeting, February 2017.....	85

ABSTRACTS

**The 94th Annual Academy of Science Meeting
University of South Alabama
Mobile, AL
February 22-24, 2017**

BIOLOGICAL SCIENCES PAPER ABSTRACTS

REVERSE ENGINEERING WORM MUSCLE USING CRISPR GENE EDITING. *RYAN LITTLEFIELD*, UNIVERSITY OF SOUTH ALABAMA.

The *Caenorhabditis elegans* roundworm is the simplest model animal that has striated muscle. Use CRISPR gene editing techniques, my lab is developing and testing novel molecular biology tools to follow and perturb muscle development and growth in living worms by fluorescence microscopy. By precisely separating the "head" and "tail" domains of muscle myosin isoform A, we found that the myosin "tail" was able to assemble into thick filaments in the absence of the motor function contained in the "head" domain and that the lengths of the actin filaments may have been re-specified to a new length.

OPTIMIZING BODY COMPOSITION IN LABORATORY FED SEA URCHIN *LYTECHINUS VARIEGATUS*. *YUAN YUAN*, *LAURA HEFLIN*, *MICKIE POWELL* AND *STEPHEN WATTS*, UNIVERSITY OF ALABAMA AT BIRMINGHAM.

Optimization of formulated sea urchin food could improve nutrient utilization and biochemical composition of the gonad, which could directly affect the quality and economic value of sea urchin roe. Studies have examined the relationship between diet and body composition using single formulated diets which provided no options in dietary content. It is not known if sea urchins can or will preferentially store specific macronutrients or macronutrient ratios when food choices of varying macronutrient content are offered. In this study, individual urchins were offered pairwise moist gel-based diet combinations varying in the proportion of protein and carbohydrate for 43 days. Urchins offered diet combinations generally preferred the diet with most balanced macronutrients (equi-proportioned protein: carbohydrate ratio, i.e., least extreme protein: carbohydrate ratio). High protein diets were correlated with high protein content of gonads (48- 61% dry weight). High proportion of carbohydrate diets were correlated with increased carbohydrate content of gonads (9- 20% dry weight). Gonad lipid content ranged from 19- 24% dry weight, with the highest lipid levels found among urchins consuming high levels of carbohydrate. These data indicate that sea urchins choose between diets of varying macronutrients and can preferentially store specific macronutrients. In contrast to other organisms, *L. variegatus* can store protein while limiting carbohydrate storage. This can be an advantage to the organisms living in an environment where protein availability is episodic. We further hypothesize that gonad composition will affect the commercial appeal of roe.

THE EFFECT OF INCUBATION TEMPERATURE ON SEX AND MORPHOLOGY IN A LIZARD. *ARIEL STEELE* AND DANIEL WARNER, AUBURN UNIVERSITY.

The developmental environment plays a pivotal role in shaping phenotypes and fitness of all organisms. Perhaps the most enigmatic example of environmental effects is the influence of developmental temperature on an individual's sex, a phenomenon known as temperature-dependent sex determination (TSD). The first description of TSD was based on a study conducted 50 years on an African lizard (*Agama agama*). Although novel at this time of publication, this landmark study consisted of low sample sizes and provided a poor description of the sex-determining reaction norm in this species. Our goal was to revisit this work and better characterize the pattern of TSD in *A. agama*. In addition, we aimed to quantify the effects of constant and fluctuating incubation temperatures on a variety of fitness-relevant traits of offspring. Eggs were obtained from an invasive population of *A. agama* in Miami, FL, and randomly assigned to one of nine incubation treatments: six constant temperature treatments and three fluctuating treatments that mimic field conditions. We then measured hatchling morphology (snout-vent length, head size, mass), growth, and sprint performance as indicators of fitness. Size measurements will be continuously taken every six weeks to determine the ontogenetic timing of sexual dimorphism and to determine if sexual dimorphism is influenced by incubation temperature. Preliminary data suggest that warm incubation temperatures produce mostly female offspring. This ongoing research will provide a critical evaluation of the long-term effects of developmental temperature on fitness-relevant traits, and provide insights into the adaptive significance of TSD.

THE EFFECT OF INCUBATION TEMPERATURE ON SEX AND MORPHOLOGY IN A LIZARD. *ARIEL STEELE* AND DANIEL WARNER, AUBURN UNIVERSITY.

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SUBTLE TEMPERATURE DIFFERENCES MAY WELL DETERMINE WHO WINS: A STORY OF FOUR SUBMERGED AQUATIC PLANT SPECIES. MOLLY MILLER, DAVID NELSON AND TIMOTHY SHERMAN, UNIVERSITY OF SOUTH ALABAMA. JAMES MAHAN, 2PLANT STRESS AND WATER CONSERVATION LABORATORY USDA/ARS.

As temperatures increase globally, shifts in the distribution of plant species are expected, with unknown effects on invasive species abundance. It is then of value to understand the role increased temperature may have on invasive species. Although nonhomeothermic organisms are the mercy of environmental temperatures, their physiology is still temperature dependent, with species dependent thermal optima. By identifying the thermal optimum of a species and determining the amount of time spent annually in that optimal temperature zone, success can be predicted under different temperature regimes. Here we identify species-specific differences in the thermal optima of four submerged plants, *Ceratophyllum demersum*, *Hydrilla verticillata*, *Myriophyllum spicatum*, and *Vallisneria spiralis*. Utilizing a biochemical approach, activity of a key metabolic enzyme NADH malate dehydrogenase (MDH) was used to assess the thermal dependencies of K_m and V_{max} in each species. A Michaelis-Menten model was then employed to predict reaction velocity across a range of temperatures (10 - 40°C). The predicted reaction velocities were compared to multiyear in situ temperature data. At low temperatures (10 - 20°C), all three species had similar thermal behavior. However, at temperature > 20°C, enzyme activity *H. verticillata* exhibited a sharp increase to a level 2-3 times higher than *M. spicatum* and *V. spiralis*. *H. verticillata* is metabolically more competent at lower temperatures (earlier in season) allowing rapid growth earlier than other coexisting species. This data suggests that as water temperatures increase, the highly invasive *H. verticillata* will be favored over concurring species. Additionally, a northward expansion of the dioecious, southern biotype of this species is likely.

ECOLOGY OF BALD EAGLES (HALIAEETUS LEUCOCEPHALUS) IN ALABAMA. ANDREW COLEMAN, ALABAMA A&M UNIVERSITY.

A knowledge gap exists regarding the ecology of Bald Eagles (*Haliaeetus leucocephalus*) in Alabama. This species was reintroduced by the Alabama Department of Conservation and Natural Resources in the mid-1980s, and the nesting population currently stands at 100-200 nesting pairs. The present study initiated an examination of nest site selection and predation behavior of Bald Eagles in Alabama. The locations of a collection of eagle nests were compared with USGS land cover data in ArcMap 10. A buffer of one mile was set around each nest location, and the total acreage of each land use category that was within that buffer was summarized. Additionally, many of these nests were surveyed for discarded prey items, and the presence of turtle remains was noted. A variety of turtle species, including Eastern Musk Turtle (*Sternotherus odoratus*) and Common Map Turtle (*Graptemys geographica*), were documented on the ground beneath nests. If possible, the carapace length and width of the recovered turtle shells were measured to examine potential size limits of turtle prey that Bald Eagles can seize.

CAPTURING CAVITY-NESTING ANTS WITH ARTIFICIAL NEST TRAP CONSTRUCTED OUT OF PLASTER. *ISAAC HEINKEL, GLENN MARVIN AND PAUL DAVISON, UNIVERSITY OF NORTH ALABAMA.*

Artificial nest traps (a.k.a. artificial nesting sites, supplemental ant nests) made of various materials including bamboo internodes, plastic tubes, and wood (dowels, lathing, wood blocks) contain preformed cavities which attract entire ant colonies, founding queens, or colony fragments. Such nest traps have been used in studies of colony structure, resource limitations, and ant diversity. Given the common use of plaster of Paris (often augmented with activated powdered charcoal) as a substrate for artificial nests in laboratory studies of ants, springtails, and other arthropods, we tested the efficacy of artificial nest traps constructed out of plaster (Ant-Coops) with and without activated powdered charcoal. Ant-Coop design and construction details will be presented along with ant capture data from 1000 Ant-Coops placed in an oak-hickory upland forest in northwest Alabama. These inexpensive and easily constructed nest traps can be an important new tool to investigate ant ecology (e.g., distribution, abundance, and life history)

SOLVENT EFFECT ON THE EXTRACTION OF ANTIOXIDANTS. *WYVOLYN KIRKLAND, JACKSONVILLE STATE UNIVERSITY. NIXON MWEBI, JACKSONVILLE STATE UNIVERISTY.*

Numerous fruits and vegetables are believed to be rich in antioxidants. Antioxidants are key in preventing cell damage caused by oxidants found in biological systems. Garlic and red pepper are an excellent source of foods rich in antioxidants. In order to effectively study, quantify, or evaluate antioxidants, one needs to extract them from such foods. A brief literature survey portrays an array of extraction procedures that may at times be confusing. It is therefore imperative to determine the key factors that promote effective extraction of these active biomolecules from vegetables. This forms the basis of our study: to determine the solvent effect on the extraction of antioxidants and polyphenols. We used a spectrophotometric technique that employs the Ferric Reducing Antioxidant Power (FRAP) as a means of measuring the total antioxidants extracted from the vegetables. Our findings indicate that 40% aqueous Acetone, 80% aqueous Ethanol, and 40% aqueous Methanol solvents when used, yield the highest concentration of antioxidants

GEOGRAPHICAL DISTRIBUTION OF ANIMAL-ROAD MORTALITY INCIDENTS IN MOBILE COUNTY, ALABAMA: A PRELIMINARY ANALYSIS. *ADAM STERN AND STEPHANIE JETT, UNIVERSITY OF SOUTH ALABAMA.*

Our study investigates how roadkill assemblages change across a rural to urban gradient in Mobile County, Alabama and explore factors (e.g. habitat, resource availability, behaviors) that may be inclusive or exclusive to specific species. The current project is one part of a larger project designed to assess specifically scavenger ecology across urban to rural gradient, focusing on factors that shape scavenger assemblages. Roadkill surveys are recognized as a useful tool in assessing the presence of animal species in a study area. The current study will supplement the larger study on scavenger ecology by providing insight into the variety of species who are active in the study area as well as knowledge about human-animal interactions

as a result of human encroachment into these species' environments. Currently, there is a sizable body of work that seems to indicate that urbanization may present many obstacles to nonhuman animal species, such as an increase in road density and habitat fragmentation. Select species in some areas may be better adapted to the pressures of urbanization (e.g. better vehicle avoidance methods) and, therefore, be less susceptible to succumbing to animal-road mortality incidents. Preliminary results will be presented discussing differences in roadkill assemblages across the gradient as well as preliminary analyses of patterns in geographical distribution as it pertains to land use and habitat structure.

SEDIMENTARY RECORDS OF RECURRENT PHOSPHATE SPILLS TO A COASTAL ESTUARY. *RUTH CARMICHAEL*, UNIVERSITY OF SOUTH ALABAMA. *JACOB HALL*, *ELIZABETH HIEB* AND *PAVEL DIMENS*, DAUPHIN ISLAND SEA LAB. *ELIZABETH D. CONDON*, UNIVERSITY OF NORTH CAROLINA AT WILMINGTON. *KIMBERLY CRESSMAN*, GRAND BAY NATIONAL ESTUARINE RESEARCH RESERVE.

At least two large phosphate spills are known to have occurred from a fertilizer processing facility to the Grand Bay National Estuarine Research Reserve's Bangs Lake on the northern Gulf of Mexico since 2005. Following these spills, there was a spike in phosphate concentrations (as high as 7 mg/L), a significant drop in pH (to as low as 3.7), and on one occasion, fish and shellfish kills. To define spill periods and determine the fate of phosphorus within the estuary through time, we measured the concentration of phosphorus retained in sediments relative to distance from the spill site. Sediment cores (8 cm diameter X 50 cm long) were compared spatially within Bangs Lake and to cores collected in nearby Bayou Heron, a site more remote from the spill area. Cores were sectioned at 1 cm intervals down to ~24 cm, and each section was analyzed for grain size, particulate organic phosphorus concentration (POP), and porewater phosphate concentration. Core sections also were dated by Lead-210 activity to trace historical phosphorus inputs to each site, and trace element analyses will be used to further corroborate the source of residual phosphorus. We found higher phosphate concentrations in sediments and porewater in Bangs Lake compared to the reference site (while other nutrient concentrations were similar or lower). Peaks in POP concentrations in southeastern Bangs Lake corresponded in time to at least one known major phosphate spill (2005). Although the known source of phosphorus to the estuary is on the western side of Bangs Lake, hydrological processes that flush sediments and nutrients from the Lake may concentrate finer sediments and associated particulate phosphorus in the southeastern part of the Lake. These data provide a spatial and temporal record of phosphorus additions and retention within Bangs Lake to inform companion studies on water quality and primary production as well as future studies of effects on biota.

CITIZEN-SCIENCE PROVIDES DATA ON SEASONAL OCCUPANCY OF WEST INDIAN MANATEES (*TRICHECHUS MANATUS*) IN THE NORTHCENTRAL GULF OF MEXICO. *ELIZABETH HIEB*, *COURTNEY NELSON-SEELY* AND *NICOLE TAYLOR*, DAUPHIN ISLAND SEA LAB. *RUTH H. CARMICHAEL* AND *ALLEN AVEN*, DAUPHIN ISLAND SEA LAB, UNIVERSITY OF SOUTH ALABAMA.

The northcentral Gulf of Mexico was historically considered outside the typical range of the endangered West Indian manatee (*Trichechus manatus*); however, in recent years reported manatee sightings have increased in this region. To better define the extent of manatee occurrence in the northcentral Gulf of Mexico, we used citizen-science methods, compiling data from opportunistic public sightings of manatees in understudied areas of Alabama and Mississippi. More than 2,000 live manatee sightings were documented from 1978-2015, with peak sightings occurring in rivers and subembayments along the AL-MS coastline during warm months (Jul - Aug). Manatee mortalities, which have significantly increased since the mid-1980s, were most often recorded Nov - Feb and attributed to cold stress. We analyzed the effect of public education and outreach activities on the number and timing of reported sightings to detect potential bias in our use of citizen-science methods. Our results indicated that while targeted outreach efforts were effective in generating manatee sighting reports, the temporal distribution of sightings was primarily driven by manatee presence in local waters. We found that quantitative and consistent documentation of opportunistic, citizen-sourced data enhanced knowledge of manatee habitat use over a broad geographic area and on a decadal time-scale, demonstrating the importance of the northcentral Gulf of Mexico as seasonal manatee habitat. This long-term monitoring effort has increased our understanding of manatee movement ecology and population distribution and is essential to guide effective management and recovery efforts, especially in light of ongoing anthropogenic impacts and large-scale environmental perturbations to local waters.

AGE SPECIFIC PATTERNS IN WINDOW MORTALITY IN AVIAN POPULATIONS. *EMMA RHODES, JOEL BORDEN AND JOHN MCCREADIE, UNIVERSITY OF SOUTH ALABAMA.*

Building collisions, especially window collisions, pose a major anthropogenic threat to birds. Mortality caused by building collisions is estimated to be between 100 million and 1 billion annually, and it is the second largest source in the U.S. for direct human-caused bird mortality. While several studies have focused on the frequency of building/window collisions in avian populations and the role played by temporal differences in abundance during migration, little research has explored the possible relationship between age and mortality in window strike collisions. If juvenile birds exhibit a pattern of higher mortality from window strikes, it might possibly be attributed to less experienced individuals. However, various other factors need to be taken into account including the species specific ratio of adult to juvenile birds and how these ratios might change seasonally in periods of migration. The primary goal of this study is to determine if there is a direct age-mortality correlation in avian window strikes using a large dataset of curated museum specimens that will classify birds by age based on physiological, morphological, and plumage features. This project is a collaboration of multiple universities and museums in order to examine window strikes on a regional scale and its impacts primarily in the Southeastern U.S. In addition to the lack of research on a possible age correlation with window strikes, there is also a paucity of data from southern states, including Alabama, on window strike mortality and no known study has been done in Alabama examining a correlation with age. Current findings of this project include considering species specific ratios of age groups in avian populations as well as aging avian specimens based on presence/absence of the bursa of Fabricius, which is a key developmental organ currently considered to only be found in juvenile birds. With more increasing anthropogenic threats affecting bird populations, it is vital that preventive measures are taken to prevent unnecessary mortality due to window

collisions, which is accomplished by studying the impact of the threat. In conclusion, the goal of this research is to provide significant implications on how window strike mortality affects avian populations and to identify the mechanisms driving window strike mortality for the conservation of avian populations.

MOLECULAR CLONING OF A CDNA ENCODING A SARCO/ENDOPLASMIC RETICULUM CA²⁺ ATPASE (SERCA) FROM Y-ORGANS OF THE BLUE CRAB (CALLINECTES SAPIDUS) AND ANALYSIS OF SPATIAL AND TEMPORAL PATTERNS OF MRNA ABUNDANCE. MEGAN ROEGNER AND RD WATSON, UNIVERSITY OF ALABAMA AT BIRMINGHAM. HY CHEN, JAPANESE INTERNATIONAL RESEARCH CENTER FOR AGRICULTURAL SCIENCES.

Stage-specific increases in intracellular free Ca²⁺ stimulate ecdysteroid production in the molting glands (Y-organs) of crustaceans. Intracellular Ca²⁺ levels are regulated by proteins intrinsic to the plasma membrane and membranes of organelles. These include Ca²⁺ pumps, e.g., plasma membrane calcium ATPases (PMCAs) and sarco/endoplasmic reticulum calcium ATPases (SERCAs). In order to better understand the role of intracellular calcium signaling in the regulation of ecdysteroidogenesis, we used a PCR based cloning strategy (RT-PCR followed by 3'- and 5'-RACE) to clone a full-length cDNA encoding a putative SERCA protein from the Y-organs of the blue crab (*Callinectes sapidus*). The cDNA includes a 3060-bp open reading frame that encodes a 1020 amino acid SERCA protein with 80% identity to known crustacean SERCA sequences. Phylogenetic analysis showed the blue crab SERCA protein clusters with other arthropod SERCAs. An assessment of tissue distribution revealed the SERCA transcript was widely distributed across tissues of the crab. SERCA transcript abundance in Y-organs was assessed by quantitative PCR after eyestalk ablation, and during a natural molting cycle. The observed stage-specific changes in SERCA cDNA levels are consistent with the hypothesis that Ca²⁺ signaling and intracellular Ca²⁺ regulatory proteins play a critical role in the endocrine regulation of crustacean molting.

THERMAL SPIKES CAUSED BY THE URBAN HEAT ISLAND EFFECT RESULT IN DIFFERENTIAL EGG SURVIVAL OF A NON-NATIVE LIZARD (ANOLIS CRISTATELLUS). JOSHUA HALL AND DANIEL WARNER, AUBURN UNIVERSITY.

Embryonic development in ectotherms is very sensitive to abiotic nest conditions. In reptiles, high incubation temperatures often result in relatively short incubation periods and large hatchling size, but extremely high temperatures can result in cardiac arrest and death. Human altered habitats, which potentially create novel thermal conditions in the soil due to the urban heat island effect, may therefore create new selection pressures for developing embryos. The urban heat island effect can increase temperatures in cities as much as 12°C, and our preliminary data suggests that soil temperatures differ markedly between urban and natural areas in locations where reptiles deposit eggs. We measured the temperatures of potential nest sites of the Puerto Rican Crested Anole (*Anolis cristatellus*) in both urban and natural areas of Miami-Dade county where this lizard and several other anole species are naturalized. We bred

crested anoles in the lab and subjected their eggs to 5 incubation treatments that mimic potential temperature regimes from our field data, three of which included a thermal spike \rightarrow° of the way through embryonic development. Preliminary results suggest that thermal spikes increase metabolism and reduce egg survival and that each are a function of the magnitude of the spike. These results suggest that urban environments create novel selection pressures that potentially result in embryonic adaptation to novel temperature regimes or in novel nest-site selection strategies by females.

IMPAIRED SOCIAL BEHAVIOR IN MICE WITH TYROSINEMIA TYPE I IS ASSOCIATED WITH INCREASED MYELINATION OF THE CEREBRAL CORTEX. *MARISSA MOORE AND GORDON MACGREGOR, UNIVERSITY OF ALABAMA IN HUNTSVILLE.*

Social behavior and cognitive deficits have recently been observed in individuals with the rare disorder tyrosinemia type I, which is caused by an autosomal recessive fumarylacetoacetate hydrolase (FAH) deficiency. Without treatment with NTBC the lack of FAH causes an accumulation of harmful metabolites that leads to severe liver dysfunction within the first years of life. While the current treatment with NTBC has drastically increased the survival rate of tyrosinemia type I patients, it is unable to prevent the neurological impairments affecting them. In order to investigate the recent social behavior deficits, the sociability of mice with tyrosinemia type I treated with NTBC (Fahmut), wild-type mice drinking NTBC (WT-NTBC) and wild-type mice drinking water (WT-Water) was analyzed. The social behavior of mice was investigated using Crawley's three-chambered social test. The buried food test was also conducted in order to analyze mouse olfaction, which is critical for mouse social behavior. Mice brains were extracted and microscopically evaluated for myelin after staining the cerebral cortex with Luxol Fast Blue. Our results show that Fahmut mice spend twice as much time investigating a dummy mouse rather than a novel mouse in comparison to wild-type controls, indicating sociability deficits are caused by the disease and not NTBC treatment. Mice with Fahmut also show abnormal behavior in that they do not spend more time with a novel mouse over a familiar mouse. Tyrosinemia type I mice displayed increased myelination of the cerebral cortex compared to wild-type mice. The increased myelination could create malformed neuronal pathways and synapses that could be a causative factor in the behavioral impairments seen in mice with tyrosinemia type I.

MICROBIAL ART: AN EMERGING SCIENTIFIC INQUIRY MODEL. *SARAH ADKINS AND J. JEFFREY MORRIS, UNIVERSITY OF ALABAMA AT BIRMINGHAM.*

Microbial art has long been used as a creative outlet for microbiologists and even had a hand in the discovery of the first therapeutic antibiotic. Yet in the school setting many science students do not get to dabble in the creativity that can lead to scientific discoveries. In fact, students often do the opposite by completing "cook-book labs", i.e. prearranged labs that leave little room for curiosity and exploration.

We have proposed a new scientific inquiry model for the microbiology lab classroom at UAB that is anchored on creativity: a petri dish art model. This new curriculum allows students to create personalized living artwork as a platform for scientific inquiry. Over the course of the semester, students isolate colored microbes from natural soil samples, create artwork using

these microbes, use standard microbiology techniques to identify their isolates, and finally create personalized experimental designs to answer their own questions about the microbial ecology revealed in their paintings. During this curriculum change, we are collecting data on how effective the curriculum is to a comparable control group on the topics of student engagement, course material, and how students view the role of creativity in science.

BIOLOGICAL SCIENCES POSTER ABSTRACTS

INTERCELLULAR SIGNALING BY MICROPARTICLES CONTAINING CYCLIC AMP. APRIL SCRUGGS, UNIVERSITY OF ALABAMA. THOMAS RICH AND NATALIE BAUER, UNIVERSITY OF SOUTH ALABAMA.

Microparticles (MPs) are important for the exchange of information between cells. MPs are extracellular vesicles that range in size from 0.1 to 1 μm in diameter. They are constitutively released from many cell types and are thought to play a role in vascular homeostasis. Further, the number and content of MPs are altered in pathologies involving inflammation and vascular cell activation. MPs carry intracellular constituents from parent cells that affect target cell function. However, the mechanisms of delivery of the MP payload to target cells are unknown. Understanding the payload delivery system between MPs and target cells is the focus of this research.

We recently discovered that cyclic adenosine monophosphate (cAMP), a ubiquitous second messenger, is found in MPs released from pulmonary microvascular endothelial cells (PMVECs). Additionally, MPs isolated from PMVECs treated with beta adrenergic agonists and phosphodiesterase (PDE) inhibitors have increased cAMP levels. This suggests that different levels of cAMP are packaged in MPs depending on parent cell stimuli. MPs containing maximal cAMP were therefore used to study the delivery of MP payload to target cells.

First, we developed mathematical models of MP payload delivery to subcellular compartments of target PMVECs to better understand how the cAMP signaling pathway may be altered by MP-mediated cAMP delivery. Simulations indicate that the cAMP content of MPs would elevate bulk cytosolic cAMP levels to activate protein kinase A (PKA) for several minutes.

To experimentally test the predictions of this model, MPs were collected from PMVECs treated with rolipram (a PDE type 4 inhibitor; 10 μM , 5 min) and isoproterenol (a beta adrenergic agonist; 1 μM , 10 min). These MPs were added to cells transfected with a cytosolic cAMP FRET sensor. Time lapse hyperspectral image stacks were acquired using a Nikon AIR confocal microscope. Custom hyperspectral analysis scripts in MATLAB were used to linearly unmix fluorescent spectra and quantify cAMP concentration changes throughout the target cell. Preliminary results indicate that MPs significantly increase cAMP levels in target cells compared to control. Additionally, several MPs are often internalized by a target cell and their combined cAMP content would sufficiently elevate bulk cytosolic cAMP levels to activate PKA. Together, these data indicate that MPs can deliver cAMP as a functional payload. Future studies will determine whether MP-delivered cAMP is sufficient to activate PKA in target cells and contribute to MP-mediated signaling events.

SOURCE-TRACKING E. COLI IN LAKE WINDERMERE, ENGLAND. BRIAN BURNES, UNIVERSITY OF WEST ALABAMA.

Lake Windermere, England is the largest natural lake (14.73 km² or 5.69 sq mi) in England. It was formed in a glacial trough after the retreat of ice at the start of the current interglacial period and is now located within the Lake District National Park. Lake Windermere has become highly developed in areas and is frequented by thousands of recreational boaters and swimmers at all times of the year. Additionally, wild geese nest on the lake, often in proximity to swimming areas. Occasional high E. coli counts from Lake Windermere have raised the question of whether geese or humans may be responsible, in some part, for the bacterial contamination. In this study, 117 E. coli isolates from various sites in Lake Windermere were analyzed by antibiotic resistance analysis and DNA markers to investigate their population structure and possible sources of origin. The correct classification rate was 97.2% for isolates from humans, geese, and a laboratory reference strain 25922. Of the isolates collected from sites in Lake Windermere, 34% were classified as human in origin by antibiotic resistance analysis and 21% by DNA marker analysis.

CROP PRODUCTION ON THE RISE AS FUNGAL ENDOPHYTES HELP WITH THE CAUSE. MANTRICIA DENSMORE, AUSTIN TUBBS AND MUSTAFA MORSY, UNIVERSITY OF WEST ALABAMA.

Climate change is a serious problem that affect not only the environment, but also human's food security. Drought, heat waves and increased soil salinity associated with climate change is having an impact on the United States crop production. For example, the last three years were recorded as the driest weather ever in California, where a significant agriculture products are made. Another example, the rise of sea levels along the coast of Florida has increased soil salinity, where a 10% increase in salinity resulted in rapid and dramatic changes in the microbial activity in plants. Fungal endophytes are present in almost every plant growing on Earth. Those fungal endophytes obtain carbon from plants and in return they provide plants with some metabolites that can improve plants' environmental stress tolerance. We hypothesized that endophytes associated with wild plants growing in high stressed areas can improve crop production and stress tolerance. To test our hypothesis, growth rate and yield of tomato plants colonized with twelve fungal endophytes isolated from wild plants growing in saline soils were compared to non-symbiotic plants. The use of fungal endophyte is very promising and can help other crops flourish under harsh conditions like drought and salinity. While stressing the tomato plants under drought and salinity conditions, we have found that potentially five of our fungal endophytes are promising. *Fusarium oxysporum*, *Purpureocillium lilacinum*, and *Ophiocordyceps heteropoda* were able to provide tomato plants with both salt and drought stress.

ANTIBIOTIC DISCOVERY IN THE SALINE GRADIENT OF THE SIMPSON WILD LIFE SANCTUARY VIA UNDERSTANDING THE BIOLOGICAL DIVERSITY OF BACTERIA. MARA DELUCA, RILEY KING AND MUSTAFA MORSY, UNIVERSITY OF WEST ALABAMA.

Salt works and the Stimpson Wildlife Sanctuary in Clarke County, Alabama is located at the Tombigbee River drainage, and it had many natural salt springs. The area is characterized by the presence of a gradient of salt, as a result there is a range from fresh water to water with up

to 500mm Total Dissolved Salts (TDS). The varying concentrations of salt across the land provides an opportunity to explore levels of bacterial and antibiotic diversity in response to salt stress levels. The goals of this study are: 1) to examine the diversity of bacteria found within the varying concentrations of salt in the soil of the Stimpson Wildlife Sanctuary, and if diversity is found to 2) examine if the varying salt levels impact the diversity of antibiotic producing bacteria, specifically. We collected multiple soil samples from the saline gradient of the Simpson Wild Life Sanctuary, and ensured that we had samples which ranged across the 0-500mm TDS. Soil bacteria was isolated by plating serial dilutions of soil extracts onto various bacterial media and grown at two different temperatures, in order to ensure the highest bacteria recovery possible. Nearly 3,000 bacterial colonies have been isolated. We have identified inhibition zones as a results of more than 130 unknown bacteria. The results showed that soil with higher salt tends to have more antibiotic producing bacteria. We have identified all antibiotic producing bacteria based on 16S rRNA sequencing and in the process of physiological characterization of these bacteria to gain more insight into the effect saline concentration has on antibiotic discovery as well as diversification of bacteria.

ANABOLIC GLUCOSE METABOLISM IS SIGNIFICANTLY ENHANCED IN PANCREATIC CANCER DURING THE EVOLUTION OF DISTANT METASTASIS. ALEX COLEY AND GLEN BORCHERT, UNIVERSITY OF SOUTH ALABAMA. OLIVER MCDONALD, VANDERBILT UNIVERSITY.

Pancreatic ductal adenocarcinoma (PDAC) is an extremely lethal malignancy that is predicted to become the second leading cause of cancer deaths in the United States by 2020 . This is attributed to the fact that early stage PDAC is difficult to detect, and late stage PDAC is resistant to treatment. Aware of this reality, our study aims to identify new molecular cues to facilitate novel detection methods and therapeutic targets for treatment.

PDAC is a stepwise, evolutionary process by which a primary tumor grows in the immediate pancreas and differentiates itself into subclonal populations which will inevitably metastasize and end the life of the patient . It is known that driver mutations are acquired early in PDAC progression and are important for PanINs and establishing primary tumor growth, however no genetic drivers of metastasis have been identified.

Knowing that the primary tumors grow within nutrient-poor environments, we hypothesized that divergent metabolic properties may arise during the evolution of distant metastasis to nutrient-rich organs. To test this, we first examined datasets tracing carbon-13 labeled glucose uptake into matched peritoneal and distant metastatic subclones collected from the same patient, which revealed that the distant metastatic subclones possessed hyperactive glucose flux through glucose-driven pathways. Next, by the use of steady state metabolomics, we detected high levels of metabolites pertinent to lipid, nucleic acid, and protein biosynthesis in the distant metastatic subclones and high levels of metabolites pertinent to the breakdown of fatty acids and scavenging of purines and methionine in the localized subclones.

From these results, we discover that anabolic glucose metabolism emerged late in PDAC progression during the evolution of distant metastasis, while catabolic and scavenging properties that are thought to emerge early were inherited during peritoneal carcinomatous. Applying this novel information, targeting the enzymes that drive these evolutionary divergent malignant metabolic pathways could represent a novel therapeutic approach for patients with metastatic PDAC, one of the most lethal of all human malignancies.

THE POTENTIAL NEUROPROTECTIVE EFFECT OF 24-EPIBRASSINOLIDE ON PC12 CELLS. MARY ANNE SAHAWNEH, SHANNON GILSTRAP AND KRISTIAN MARTINEZ, SAMFORD UNIVERSITY.

Brassinosteroids are plant steroid hormones that have effects on enzyme activity and resistance to environmental stressors (Bajguz and Tretyn, 2003, Khripach et al., 2000). 24-Epibrassinolide (24-Epi) has been studied for its proliferative and antioxidant activities in plants (Mazorra et al. 2002, Howell WM et al. 2007, Ali et al., 2008, Ikekawa et al., 1988). Here, we are investigating a potential antioxidant role for 24-Epi in mammalian cells.

C. ELEGANS THICK FILAMENTS ASSEMBLE WITH A DECAPITATED MYOSIN A. HALLEA WARD AND RYAN LITTLEFIELD, UNIVERSITY OF SOUTH ALABAMA.

Striated muscle makes up about 40-70% of animal muscle mass, and around 40% of that consists of contractile filaments. Actin (thin) and myosin (thick) filaments, in striated muscle, assemble together in such a way that they slide past one another to generate contractile force and shortening. Thick filaments in the body wall muscle of the nematode *Caenorhabditis elegans* have a unique bipolar structure that is composed of myosin A (myoA) and myosin B (myoB) isoforms. These two isoforms are located in distinct regions of the thick filament and are encoded by different genes, thus making it possible to investigate muscle assembly by genetically altering one isoform while still keeping the other isoform functioning appropriately. We used CRISPR-Cas9 homologous gene editing to make a transgenic strain that expresses the myoA head and tail domains as separate polypeptides to create a large bare zone in the center of the thick filament. By using fluorescence microscopy, we found that the myoA tail domain localizes to thick filaments in all expected muscle types including body wall muscle (BWM) and that the sarcomere organization is normal. Surprisingly, viability, development, growth, and locomotion of the transgenic and wildtype worms are indistinguishable from each other under normal laboratory conditions. Our results show that the thick filament assembly can occur when the myoA head is separated from the myoA tail. We propose an assembly model where the myoA tail is capable of nucleating thick filaments independent of thin filament interactions.

GREEN SYNTHESIS OF SILVER NANOPARTICLES, THEIR CHARACTERIZATION, AND ASSESSMENT OF THEIR ANTIMICROBIAL ACTIVITY AGAINST GRAM-POSITIVE AND GRAM-NEGATIVE BACTERIA. AFEF JANEN, FLORENCE OKAFOR AND TATIANA KUKHTAREVA, ALABAMA A&M UNIVERSITY.

Silver nanoparticles (Ag-NPs) have been largely studied due to their antiviral and antibacterial properties, and their uses as antimicrobial agents, topical creams in the health industry, and various other applications. This is due to their characteristics such as surface-enhanced Raman scattering and electrical conductivity. Several preparation techniques have been described for the synthesis of Ag-NPs, but the need for environmentally friendly synthesis methods is growing. In this research, leaves plants such as *Magnolia grandiflora*, *Geranium*, *Aloe*, 'Tinginkie' leaves broth, *Actaea racemosa* (black cohosh), and *Eucalyptus angophoroides*

extracts were used as reducing agents to produce nanoparticles. Synthesis of colloidal Ag-NPs was performed by UV-Visible spectroscopic analysis. UV-Visible spectrum showed a peak between 417-425 nm corresponding to the plasmon absorbance of the Ag-NPs that were produced within several minutes. The Ag-NPs size and shape were characterized using techniques including Dynamic Light Scattering (DLS), Atomic Force Microscopy (AFM), and Transmission Electron Microscopy (TEM) which showed a size range of 5 to 15 nm. The antibacterial activity of Ag-NPs was investigated at various concentrations ranging from 2 to 15ppm. Staphylococcus aureus, Kocuria rhizophila, and Bacillus thuringiensis (Gram-positive organisms); Escherichia coli, Pseudomonas aeruginosa, and Salmonella typhimurium (Gram-negative organisms) were treated with Ag-NPs using Bioscreen C to measure bacterial growth. Our findings indicated that, at concentrations of 2 and 4 ppm, Ag-NPs significantly inhibited bacterial growth. Our future goal is to determine the minimum inhibitory concentration of Ag-NPs for bacterial growth and to assess the effects of biosynthesized Ag-NPs on cancer cells.

A STUDY OF SOME KINDS OF VIBRIO AND THE EXTENT OF RESISTANCES TO ANTIBIOTICS. ASIM BARNAWI, HUSSAIN MAJRSHI, MOHAMMED ALAHMADI AND BRIAN BURNES, UNIVERSITY OF WEST ALABAMA.

Detection and analysis in the marine pathogen vibrio vulnificus and antibiotic resistance. 16 samples and 2600 colony were obtain from three different location. These samples will be test it to find out the resistance for antibiotics. In order to get more result we still work in this project until present.

USING VIDEO MANIPULATION AND VIDEO PLAYBACK TO STUDY THE INFLUENCE OF COLOR ON COMMUNICATION IN GECKOS. NATHAN KATLEIN, YLENIA CHIARI AND MARIA BYRNE, UNIVERSITY OF SOUTH ALABAMA.

Body color and color patterns are fundamental in prey escape mechanisms, thermoregulation mate selection, and intra- and inter-specific communication. Among the various functions, color and color patterns have been observed to be used for individual recognition (conspecific, an individual of the same or different sex, or an individual of another species). Individual recognition can have direct benefits to the viewer by limiting energy expenditure trying to mate with the wrong gender or risking injury by approaching a dangerous opponent. Individual recognition is therefore important for evolutionary processes such as speciation and sexual selection. Among lizards, geckos vary greatly in color and color pattern, ecology, habitat, and social interaction. Color and color patterns may therefore play a role in individual recognition in this group of lizards and despite its importance, knowledge on this in geckos is largely lacking. To address this question, we will compare gecko behavior in the context of direct individual interaction and playback videos that have been edited using MATLAB. Direct individual interaction will provide a baseline of behaviors occurring during individual encounters with the same or opposite species and the same or opposite sex. In the video manipulations for playback videos, we will change separately saturation, hue and brightness of the color of the gecko or of the background. Saturation, hue, and brightness of the videos (geckos and background) are manipulated independently to uncover the influence that each of these aspects of coloration has on individual recognition in geckos. This approach allows

collecting data 1) to assess if individual recognition occurs in geckos; 2) on the type and frequency individual behavioral displays shown during individual recognition; and 3) to discriminate which component of color, color pattern or background color influence individual recognition in geckos. For this study, we are using three species, of which two are nocturnal and one diurnal, and a total of 34 individuals, including both males and females. Although playback experiments are common in animal behavior studies, our approach is unique in that we will be using video streaming to isolate which aspect of coloration and color patterns, the background matching, the saturation, the hue or the brightness, stimulate a response. Our experimental approach has been designed to allow us to exclude acoustic and chemical signals, which are considered important in gecko communication. Video editing will also allow us to create an unlimited number of variants by changing the color, color pattern and background of each of our geckos to show back in playback experiments. This experiment will set a baseline for future studies of sexual selection and trait evolution in geckos and closely related species and begin to explain the coloration in such a diverse radiation of lizards.

USE OF FLUORESCENCE EXCITATION-SCANNING HYPERSPECTRAL IMAGING TO DETECT DIFFERENCES IN SPECTRAL PATTERNS BETWEEN NORMAL COLON AND COLON CANCER TISSUES. MALVIKA LALL, MALVIKA LALL, SHANTE HILL, PAUL RIDER, CAROLE BOUDREAUX, THOMAS RICH AND SILAS LEAVESLEY, UNIVERSITY OF SOUTH ALABAMA.

Prior studies on hyperspectral imaging have shown theoretical promise in differentiating between normal tissue and cancerous tissue with high sensitivity and specificity. The objective of this study is to examine the potential of hyperspectral imaging experimentally by demonstrating spectral changes that are concurrent with early changes in colon cancer tissues compared to surrounding normal tissue using hyperspectral imaging fluorescence excitation-scanning microscopy. Specimen pairs of fresh normal and adenocarcinoma were obtained from surgical resections of colon tissue in collaboration with University of South Alabama Departments of Surgery and Pathology, and scanned by excitation scanning hyperspectral imaging using a novel microscope constructed at University of South Alabama. All procedures were carried out in accordance with Institutional Review Board protocol # 13-120. Spectral results extracted from the imaging data demonstrated consistent spectral information among spectra of normal tissue compared to spectra extracted from colon cancer. Spectra from colon cancer tissue were more heterogeneous than that demonstrated in the normal tissue. We conclude that hyperspectral fluorescence excitation-scanning may be a method of differentiating normal colon tissue from colon cancer tissues based on spectral patterns in the colonic mucosa. This information could be used for early diagnosis of colon cancer.

AMINO ACID RESIDUE MOVEMENT SIMILARITIES BETWEEN PLANT, INVERTEBRATE, AND VERTEBRATE MBD PROTEINS. C. JOY SHEPARD AND SARA CLINE, ATHENS STATE UNIVERSITY. JEREMY PROKOP, HUDSONALPHA INSTITUTE FOR BIOTECHNOLOGY.

The methyl-CpG binding domain (MBD) proteins have the ability to detect and bind to methylated cytosine DNA bases. Recent findings from our group have established evidence that these proteins are found within invertebrates (Cramer et al., 2016), of which these newly

discovered proteins might connect the previously identified plant and invertebrate MBD proteins. Using DNA-protein modeling, in YASARA, simulations were run to determine if there is a methyl binding domain within plants, specifically *Arabidopsis thaliana*, that functions similarly to the recently identified invertebrate orthologs. Within the YASARA based molecular dynamic simulation, we simulated the methyl binding domains of *Arabidopsis* proteins with DNA, without DNA, with 5-methyl CpG DNA, and with 5-hydroxymethyl CpG DNA. Afterwards, the data collected was analyzed for amino acid residue movement suggesting some similarities between some of the plant paralog MBD sequences to that of invertebrates and vertebrates.

THE STUDY OF E-COLI IN LAKE MARTAIN. *ARTCHANDRA MARKS*, UNIVERSITY OF WEST ALABAMA. BRIAN BURNES, UNIVERSITY OF WEST ALABAMA.

Escherichia coli, also known as *E. coli*, can be hazardous to humans. *E. coli* is also a determinant of water quality. I conducted a study by collecting over 100 water samples in Lake Martain, located east of Montgomery, Al. The samples collected showed that the *E. coli* counts averaged zero. The few *E. coli* that were collected were analyzed for their source of origin.

FACTORS DIRECTING FEED INTAKE AND SATIETY IN THE SEA URCHIN MODEL, *LYTECHINUS VARIEGATUS*. *MARLEE HAYES*, BEN MCCAFFERTY, LAURA HEFLIN AND STEPHEN A. WATTS, UNIVERSITY OF ALABAMA AT BIRMINGHAM. JOHN M. LAWRENCE, UNIVERSITY OF SOUTH FLORIDA. DAVID RAUBENHEIMER, UNIVERSITY OF SYDNEY.

Feed intake directs nutrient and energy acquisition for most organisms and factors affecting satiety may regulate feed intake. Sea urchins are an ideal model to study the fundamental factors affecting feed intake and satiety. In sea urchins, feed intake is presumed to proceed until one or more requirements are met. Factors potentially affecting satiation include volume satiation, nutrient satiation, energy satiation, or some combination thereof. The mechanism(s) controlling feed intake and satiety are not fully understood.

In this experiment adult *L. variegatus* (25-35mm) were fed to excess an agar-based formulated diet that varied in both food and nutrient density. Each day for 11 days, agar cubes, containing a formulated diet, were weighed and placed in mesh cages housing a single individual. After 24 hours, each cube was removed, rinsed, blotted dry and weighed to determine the amount consumed.

Feed intake varied inversely with food density. Volume satiation was demonstrated at the lowest levels of dry matter inclusion in this study, at which sea urchins consumed ca. 1/3 of their body weight per day. Sea urchins demonstrated satiation to apparent dry matter content of the feed. There is evidence that sea urchins demonstrate a diffuse target for protein intake, indicating some level of protein leveraging. However, intake parameters cannot be fully explained by protein and carbohydrate intake, particularly at high nutrient densities, suggesting other macro- or micronutrients may be important in regulating food intake.

THE IMPACT OF SOIL COMPACTION AND SOIL MOISTURE ON SILPHID ABUNDANCE ALONG AN URBAN RURAL GRADIENT. HOPE REAMER AND GRANT GENTRY, SAMFORD UNIVERSITY. TORI MEZBISH, UNIVERSITY OF MARYLAND:COLLEGE PARK.

The world is becoming more and more urbanized which effects numerous organisms in the ecosystems. In this study, we are looking at the effect of urbanization on scavengers and decomposers in the environment, specifically silphid beetles, in Birmingham, Alabama. In particular we determined if differences in soil characteristics, specifically soil moisture and soil compaction, across the urban-rural gradient affected silphid abundance. We sampled silphids using non-lethal pitfall traps over a four week period in July, 2016. We found that silphid abundance decreases from rural to urban areas. This was not significantly correlated to either soil compaction or soil moisture because of high variation between sites. There was a correlation with the amount of impervious surface within a square kilometer of the sampling area.

THE IMPACT OF COMMUNITY HEALTH WORKERS ON PROMOTING HEALTHY LIFESTYLE BEHAVIORS. JUSTIN ALEXANDER, JENNIFER PRATER, LATRICE LEWIS, DON BOGIE AND CYNTHIA BISBEE, THE MONTGOMERY AREA WELLNESS COALITION.

With the prevalence of chronic disease continuing to rise throughout the nation, the awareness and knowledge for self-managing health has become more and more important over time. As an initiative to educate and build health accountability, The Montgomery Area Wellness Coalition has implemented several interventions through a three year Cooperative Agreement, Racial and Ethnic Approaches to Community Health (REACH), funded by the Centers for Disease Control and Prevention. The Community Health Workers Intervention, trains liaisons from partnering organizations to identify and educate their patients concerning sustainable approaches to overcoming health barriers. Year 1 matched-case data (among other findings) indicate a decline in clients without health insurance (from 75% to 69.3%) from baseline through follow-up. There was an increase in clients obtaining a medical home (+10.2%) and clients adhering to medications as prescribed (+3.2%). Likewise, several positive changes were also indicated from baseline through follow-up for Year 2 participants, with the greatest change being in clients obtaining a medical home (+5%). Building health autonomy, raising awareness of community resources, and educating patients appear to be ways to promote healthy, sustainable lifestyle behaviors that will help to combat the threat of chronic disease.

IDENTIFICATION AND INITIAL CHARACTERIZATION OF TRICLOSAN DEGRADATION GENES IN BACTERIA ISOLATED FROM ALABAMA SOILS. TRENTON O'NEAL AND SINAD M. NCHADHAINN, UNIVERSITY OF SOUTH ALABAMA.

Triclosan is an antimicrobial incorporated into various personal care products including soaps, toothpastes, cleaning agents and medical instruments. Triclosan can bio-accumulate in higher organisms leading to negative effects such as disruption of T4 thyroid hormone. The goals of this project were to isolate and identify bacteria capable of degrading triclosan and identify the genes encoding triclosan degradation. Enrichment cultures were established using soil and

water collected on University of South Alabama campus in Mobile, AL. The enrichments were supplemented with triclosan as the sole source of carbon and energy and serially diluted onto agar plates in order to obtain pure cultures of triclosan degrading bacteria. Amplified ribosomal DNA restriction analysis and ribosomal intergenic spacer analysis were used to separate the isolates into operational taxonomic units (OTU). Forty-eight triclosan degrading bacterial isolates were assigned to 18 different OTUs. The 16S rRNA gene from representatives of each OTU was sequenced in order to classify the bacteria to genus or species. Pseudomonads were most abundant genus, representing 60% of the collection with other OTUs assigned to the betaproteobacteria. Degenerate primers were designed to amplify genes previously implicate in triclosan degradation, including the recently described *tcsAB* genes which encode a triclosan induced two-part dioxygenase. While some isolates yielded amplicons of the correct size, DNA sequencing revealed that none of the amplification products were the targeted gene. Therefore, plasposon mutagenesis was used in an attempt to identify triclosan degradation genes through loss of function. TKO29, which was identified as *Pseudomonas saponiphila*, was chosen for mutagenesis based on its high growth rate on triclosan. Three mutants lacking the ability to degrade triclosan were identified. The mutated regions are currently being sequenced in order to identify the triclosan degradation genes. Our inability to identify genes homologous to the previously described *tcsAB* genes by either PCR or Southern blot suggests that TKO29 utilizes novel enzymes to degrade triclosan. Our results indicate that the ability to degrade triclosan is widespread in the environment and that bacteria can utilize multiple strategies to degrade triclosan.

EVOLUTION OF THE GCH GENE FAMILY IN VERTEBRATES AND ITS IMPORTANCE FOR XANTHOPHORE DIFFERENTIATION. *TRENTON O'NEAL*, SCOTT GLABERMAN AND YLENIA CHIARI, UNIVERSITY OF SOUTH ALABAMA. TONY GAMBLE, MARQUETTE UNIVERSITY.

Vertebrate skin coloration is a product of specialized cells known as chromatophores that synthesize various compounds producing different pigmentations. Among the chromatophores, xanthophores are light-absorbing cells producing yellow pigments that are found in all vertebrates except for mammals and birds. A previous genomic study on a limited taxon sampling indicated that isoforms of the gene, GTP cyclohydrolase (GCH), might be involved in xanthophore loss in mammals and birds. GCH genes are expressed in the pigment synthesis pathways in xanthophores and melanophores and during the differentiation of neural crest cells into either melanophores and xanthophores or melano-phores and iridiophores. In this work, we used a larger and more representative taxon sampling than the previously published study to investigate the evolution of the GCH gene family and the gain or loss of xanthophores in vertebrates. Genomic data from 27 representative species, including five mammals, four birds, ten reptiles, two amphibians, and six fish, were obtained. A total of 42 different coding sequences for GCH were obtained, and a neighbor-joining analysis indicated that 25 and 17 of these sequences belonged to the GCH1 and GCH2 isoforms, respectively. Maximum likelihood analyses of nucleotide and amino acid sequences recovered two well-supported clades corresponding to GCH1 and GCH2. While all vertebrates analyzed possess GCH1, GCH2 only occurs in amphibians, fish, and reptiles. As previously suggested, the lack of GCH2 may be correlated to the absence of xanthophores in mammals and birds. Preliminary synteny analysis suggests that the genes neighboring GCH2 in amphibians, fish and reptiles are also present in GCH2 ancestral locations within mammals and birds. Future work will

focus on identifying how GCH2 was lost as well as other genes of the xanthophore or pteridine pathways that may be absent from mammals and birds.

PHYLOGENETIC RELATIONSHIP OF 13 SPECIES OF EMBERIZIDAE (AVES, PASSERIFORMES) BASED ON COMPLETE MITOCHONDRIAL GENOME. JANINE ANTALFFY, YONG WANG, FANGQING LIU AND LONGYING WEN, ALABAMA A&M UNIVERSITY.

Emberizidae, one of the largest families of Passeriformes, is characterized by many morphologically similar species and, therefore, historically controversial taxonomic status. To better resolve the phylogenetic relationship of Emberizidae, we sequenced the complete mitochondrial genome of *Emberiza leucocephala* (Pine Bunting; 16754 bp in length) and *E. elegans* (Yellow-throated Bunting; 16780 bp in length). We obtained complete mitogenome data from GenBank for 11 additional Emberizidae species representing *Emberiza*, *Latoucheornis*, and *Melophus*. Complete mitochondrial genomes were used to reconstruct the phylogeny of 13 species based off of Maximum Parsimony (MP) and Bayesian Inference (BI). MP and BI trees were similar with the exception of *E. spodocephala* (Black-faced Bunting) and all nodes were supported with values greater than 50%. *E. cioides* (Meadow Bunting), *E. jankowskii* (Rufous-backed Bunting), and *E. leucocephala* form a clade, with *E. leucocephala* having diverged earlier than *E. cioides* and *E. jankowskii*. Results also indicate that *Latoucheornis siemsseni* (Slaty Bunting) is nested within the genus *Emberiza* and forms a sister clade with *E. elegans*. Additionally, calculated genetic distances indicate that the *Melophus lathamii* (Crested Bunting) is more closely related to *Emberiza* than previously suspected (maximum p-distance = .120). Our results are concordant with previous studies and question the classification of *Melophus* and *Latoucheornis* as monotypic genera and suggest they be placed within *Emberiza*.

EVOLUTIONARY BIOGEOGRAPHY OF THE WHITE-BROWED LAUGHINGTHRUSH IN CHINA'S SICHUAN BASIN. JANINE ANTALFFY, YONG WANG AND LONGYING WEN, ALABAMA A&M UNIVERSITY.

It is widely accepted that geographic complexities have influenced the evolution of distinct lineages by periodically isolating populations during historical climatic fluctuations. The Sichuan Basin is a globally recognized biodiverse eco-region characterized as a continental island isolated by mountainous topography. Such geo-physical complexity creates a unique landscape feature that has likely facilitated the present patterns of biodiversity in and around the Sichuan Basin. While the topography of neighboring regions has been recognized as factors shaping biodiversity, the Sichuan Basin has received little attention regarding its role in influencing local biogeographic patterns. The White-browed Laughingthrush (*Garrulax sannio*) is both abundant and widely distributed throughout much of southern Asia, making this species an appropriate model organism to demonstrate the role of the Sichuan Basin in influencing biogeographic patterns in this region. Through phylogenetic analysis of RADseq data I will investigate the genetic structure and estimate periods of historical isolation among populations of *G. sannio* in and around the Sichuan Basin. I will utilize morphological data to detect patterns of geographic variation in morphology along environmental gradients within this species. To estimate the historical response of *G. sannio* to extreme climate fluctuations I will

generate contemporary and paleo-distribution models to estimate periods of range expansion and contraction. This research will provide the scientific community with a better understanding of the factors shaping contemporary biogeographic patterns while allowing for predictions toward species' response to future climate fluctuations providing us with the tools to maintain biodiversity in one of the world's most biologically rich regions

INTERACTIONS OF NITROGEN AND CARBON METABOLISM IN THE SUBMERGED AQUATIC PLANT, HYDRILLA VERTICILLATA. MOLLY MILLER, DAVID NELSON, KELLY MAJOR AND TIMOTHY SHERMAN, UNIVERSITY OF SOUTH ALABAMA.

Hydrilla verticillata is an invasive, submerged aquatic plant that has been dubbed the „Áperfect aquatic weed,Äù (Langeland, 1996). This nickname is appropriate for many reasons, not least of which is the incredible phenotypic plasticity exhibited by this plant. *H. verticillata* is a facultative C3-C4 intermediate with both mechanisms operating in the same cell (i.e. in the absence of Kranz anatomy). Although carbon metabolism has been well-characterized in the species, we know very little about nitrogen metabolism and its tight coupling to carbon status in this plant. Thus, the objective of this work was to determine how photosynthetic state affects nitrogen uptake and assimilation in *H. verticillata*. C4 photosynthesis was induced over 14 days; C4 status was confirmed via enzyme assay for phosphoenolpyruvate carboxylase (PEPC). Plants maintained in the C3 state served as experimental controls. Upon confirmation of C4 induction, plants were placed in N-free Hoagland's medium for 24 h to deplete nitrogen stores, after which plants were exposed to 100 μ M KNO₃- for 24 h. Subsequent assays for nitrate reductase (NR) activity and nitrate uptake were conducted. Within the first 3 h of induction, C3 plants had significantly higher uptake rates than C4 plants (0.49 \pm 0.02 μ mol NO₃- g FW⁻¹ h⁻¹ cf. 0.28 \pm 0.04 μ mol NO₃- g FW⁻¹ h⁻¹). After 8 h nitrate exposure, NR activity in C3 plants was 14-fold higher than in plants undergoing C4 photosynthesis (1651.3 \pm 295.6 nmol NO₂- g FW⁻¹ h⁻¹ cf. 115.5 \pm 9.3 nmol NO₂- g FW⁻¹ h⁻¹). These data suggest that nitrogen uptake and assimilation in *H. verticillata* is influenced by photosynthetic state, and that this metabolic coupling influences resource use and competitive outcomes in nature.

SPONTANEOUS RHYTHMIC SPIKING AT THE TENTILLA AND TENTACULAR BULB OF MNEMIOPSIS LEIDYI. GEN DONG AND ANTHONY MOSS, AUBURN UNIVERSITY.

Ctenophores have attracted considerable attention regarding their role in the evolution of nervous systems; yet we know little about their nervous systems due to limited electrophysiological data. Previous studies of *Pleurobrachia pileus* by Moss and Tamm (1993) demonstrated an afferent integrative center within the tentacular bulb. The present study used extracellular recording to examine the electrical activity of tentillae and tentacular bulb of *M. leidyi*. We found spontaneous slow trains of robust biphasic action potentials (0.1-0.3 mV, 0.25-1 spike s⁻¹) in the tentilla bundles which are attached to the tentacular bulb of adult animals. Similar rhythmic firing (0.02-0.04 mV, 0.5-1 spike s⁻¹) could also be detected in tentacles of 4 mm pre-metamorphic cydippid larvae, i.e. bearing only two tentacles. Lesion analysis of excised bulb/food groove complexes were mapped to assess distributed bioelectrical activity by electrophysiological recordings from multiple locations. This revealed

that spontaneous rhythmic spiking originated in the aboral end of the bulb. Furthermore, we demonstrate through paired electrode recording, that rhythmic spiking is conducted into the food groove tentillae. To our surprise to date we have not been able to evoke propagated action potentials by application of food (*Artemia nauplii*), mechanical or electrical stimulation in this region of the nervous system. In conclusion, we report here for the first time that spontaneous rhythmic action potentials likely originate inside the tentacular bulb of *Mnemopsis leidyi* and propagate into the embedded tentilla. Surprisingly, our results are in contrast to those of Moss and Tamm with *P. pileus*, which does not exhibit spontaneous firing, and which responded to the application of food and electrical stimulation with afferent activity. Our data further suggest that there appears to be a central oscillator that drives spontaneous rhythmic activity in the bulb. Future efforts will focus on the cellular source(s) of the signal, the signal conduction pathway, its chemical neurotransmitter sensitivity and its sensory and/or motor functions.

TESTING THE CYTOTOXICITY EFFECTS OF THE RAW VENOM FROM CTENUS HIBERNALIS. BRAD BENNETT, JONATHAN BERKUTA, SHANNON GILSTRAP, ROBERT HATAWAY AND MARY ANNE SAHAWNEH, SAMFORD UNIVERSITY. ADAM KRAHN, HOPE COLLEGE.

The venom of *Ctenus hibernalis*, a wandering spider native to Alabama, has not been previously characterized or tested for antimicrobial properties. However, an antibacterial effect has been found for the venom of *Cupiennius salei*, a species within the same family. Specimens of *C. hibernalis* were collected from a nearby forest preserve, and venom was extracted from anesthetized spiders by electrical stimulation of the venom gland. Different concentrations of venom were added to growth cultures of various bacterial species in order to determine any antimicrobial activity. Growth inhibition assays in liquid (broths) and solid (agar plates) media were conducted; however, no negative effects on the growth of any tested microbial species was observed. The raw venom was also tested for effects on C2C12 mammalian cells, a myocyte (skeletal muscle) culture. The venom significantly reduced the viability of the C2C12 cells in a dose-dependent manner in subsequent colorimetric assays. We also noted detachment of cells growing in culture and gross morphological changes to the myocyte cell structure upon treatment with venom. Using *C. hibernalis* genomic DNA as a template, an attempt was made to amplify the Tx1 toxin gene in order to recombinantly express the protein for testing. However, the amplification failed to work, most likely due to non-specific primer sequences.

MECHANISTIC INSIGHTS ON THE ROLE OF HUMIC ACID ON BLADDER CANCER CELLS. HANNAH BROOKS, HANNAH BROOKS, JIMMIE MCGEHEE, SHAHRZAD BADRI, ALEXANDRA STENSON AND PADMAMALINI THULASIRAMAN, UNIVERSITY OF SOUTH ALABAMA.

Whereas genetics play an important role in the development of carcinoma tissues, environmental factors have also been shown to affect the development and growth of carcinoma tissues. Humic acids occur naturally in the decomposition of natural organic matter and have pharmacological properties which suggest that humic acids could affect cancer cell growth. The purpose of this study was to examine the effects of humic acids on the growth of

RT-4 bladder cancer cells and to identify by what mechanism, if any, humic acids impacted cellular growth. Results from this study showed that treatment with 25 $\mu\text{g/L}$ and 50 $\mu\text{g/L}$ humic acids decreased RT-4 cellular growth. Our data showed that treatment of RT-4 cells with 25 $\mu\text{g/L}$ and 50 $\mu\text{g/L}$ humic acids decreased the expression of vascular endothelial growth factor A (VEGFA). However, treatment of RT-4 cells with humic acids did not alter the expression of anti-apoptotic protein, B-cell Lymphoma 2 (Bcl-2) and pro-apoptotic protein Bax. These findings provide mechanistic insight into how humic acids may regulate angiogenesis and growth inhibition of RT-4 cells.

THE STRUCTURE AND ORGANIZATION OF TENTACULAR BULB AND TENTILLA OF CTENOPHORE MNEMIOPSIS LEIDYI. DONG GEN AND ANTHONY MOSS, AUBURN UNIVERSITY.

The tentacular bulb and the tentilla are important physiological structures in ctenophores that minimally are involved in feeding. They are likely involved in a diversity of sensory functions. There are two bulbs, located at the base of the tentacular structures each individual Mnemiopsis. In this species each tentacle is located just aboral to the mouth. Each tentacular bulb is the source of multiple short tentilla, what originally appeared to be a thick but very short tentacle, and two epithelially-embedded apparent tentacles. There have been many studies of Mnemiopsis since the work of Mayer in 1912, yet there is little information on the morphological organization, and detailed cellular composition of the tentacular bulb and tentilla of Mnemiopsis. The present study employs light microscopy and time-lapse video recording to examine the structure and relationship between tentacular bulb and its tentacular structures of Mnemiopsis. Close examination using off-axis illumination revealed a ridge of tissue located on the center of the bulb. Bundles of hundreds of tentilla arise from the edge of ridge, indicating the location of the formation of the tentilla. Many tentilla fibers were found connected to the aboral end of the tentacular bulb, suggesting that each tentilla is directly connected to the bulb. These findings are contrary to previous belief that the tentilla are embedded in the epithelia of the food groove. We created a lesion in the food groove and used time lapse recording to reveal the behavior of the food groove post-incision. This revealed the following: 1) the immediate separation of the distal end of the tentilla, 2) aggregation of tentilla at the proximal edge of the lesion, 3) regeneration of the food groove, and 4) aboral migration of tentilla along the food groove, during restoration of normal function after focal resection of the tentacular groove. This study of tentilla formation and localization will help us reconstruct tentilla and food groove organization which is crucial for understanding feeding behavior and their remarkable regenerative abilities. Future efforts will focus on the cellular composition of both the tentacular bulb structure and the formation of tentilla.

SPONTANEOUS RHYTHMIC SPIKING AT THE TENTILLA AND TENTACULAR BULB OF MNEMIOPSIS LEIDYI. GEN DONG AND ANTHONY MOSS, AUBURN UNIVERSITY.

Ctenophores have attracted considerable attention regarding their role in the evolution of nervous systems; yet we know little about their nervous systems due to limited electrophysiological data availability. Previous studies of *Pleurobrachia pileus* by Moss and Tamm (1993) demonstrated a signal integrative center in the tentacular bulb. The present study used extracellular recording to examine the electrical activity of the tentilla and tentacular bulb

of *M. leidyi*. We found spontaneous slow trains of robust biphasic action potentials (0.1-0.3mV, 0.25-1 spike s⁻¹) in the tentilla bundles which are attached to the tentacular bulb of adult animals. Similar rhythmic firing (0.02-0.04mV, 0.5-1 spike s⁻¹) could also be detected in tentacles of 4mm nonmetamorphic cydippid larvae, i.e. bearing only two tentacles. We also performed a lesion analysis, in which we excised the tentacular bulb and took electrophysiological recordings from multiple locations. This revealed the origin of rhythmic spikes to be in aboral end of the bulb. Furthermore, through paired electrode recording, we found that rhythmic spikes are conducted in the direction from the aboral end of the bulb to the tentillae located in the food groove. In conclusion, we report here for the first time that spontaneous rhythmic action potentials likely originate inside the tentacular bulb of *Mnemopsis leidyi* and propagate into the embedded tentilla. Surprisingly, the results are in contrast to those of Moss and Tamm in *P. pileus*, which does not exhibit spontaneous firing. Our data further suggest that there appears to be a central oscillator that drives spontaneous rhythmic activity in the bulb. Future efforts will focus on the cellular source(s) of the signal, the signal conduction pathway and its sensory and/or motor functions.

ASSESSMENT OF URBANIZATION IN THE RANGE OF PSEUDEMYIS ALABAMENSIS (ALABAMA RED-BELLIED TURTLE). NICKOLAS MORENO, SCOTT GLABERMAN, DAVID NELSON AND YLENIA CHIARI, UNIVERSITY OF SOUTH ALABAMA.

Turtles are among the organisms in the Southeastern US in greatest need of assessment, as Alabama is within one of the three global turtle priority areas for conservation and has high turtle biodiversity. *Pseudemys alabamensis* (Alabama red-bellied turtle) is an endemic species that occurs only in the lower drainage systems of Alabama and Mississippi, with the Mobile Tensaw delta being the northern limit of its range. It is classified as endangered by the U.S. Fish and Wildlife Service and has been placed on the IUCN Red List. The range for this species is narrow around Mobile Bay, Alabama, which is heavily urbanized and prone to large amounts of chemical runoff. Some chemicals that may be found in runoff have the potential to be genotoxic. With little currently known about the current populations of *P. alabamensis*, assessment of the effects of urbanization across the species range will help identify populations suffering from genotoxicity and to establish the effect that habitat quality has on them. Chemical runoff from agricultural fields has been shown to be harmful to amphibians and reptiles in ovo exposure, including increased levels of DNA damage, which may cause cancers and birth malformations. In this work, we used ARC GIS to identify watershed habitats of *P. alabamensis* that are heavily developed (high levels of urbanization and agriculture). The U.S. EPA Toxic Release Inventory was then used to identify industrial sites around the known habitat of this species and potentially toxic chemicals used at these sites. Of all the sites, Dog River watershed was the most developed with 61% (36124.78 acres) of its land usage being defined as developed. Toxic compounds that may be found at industrial and agricultural sites in the area include hydrazine, polycyclic aromatic hydrocarbon compounds, heavy metals, atrazine, trifluraline, and glyphosate. Future directions of this study include assessment of DNA damage in *P. alabamensis* at the studied sites. The results of this work will permit the development of management strategies and effective conservation actions, such as identifying areas that would require habitat restoration.

GENETIC IDENTIFICATION OF BLOOD PARASITES IN GALAPAGOS MARINE IGUANAS (AMBLYRHYNCHUS CRISTATUS). SHIRLEY ZHANG, REGIS BURKHARDT, YLENIA CHIARI AND SCOTT GLABERMAN, UNIVERSITY OF SOUTH ALABAMA.

The relationship between hosts and their parasites is one of the most fundamental issues in biology with repercussions for both conservation and public health. All animals, including humans, are infected by pathogens that could affect the survival and reproduction of individuals or species. In this project, we used the Galapagos marine iguana and their blood-borne pathogens as a model system to study host-parasite relationships. Island systems such as the Galapagos are ideal for studying the interaction between hosts and pathogens because each island is a discrete geographical unit that is isolated, thereby avoiding the complex interconnections that are often characteristic of mainland systems. We analyzed 18S ribosomal sequences of Haemogregarine parasites isolated from the blood of 20 marine iguanas to identify which species are causing infection and whether these pathogens are similar or variable among marine iguanas from different islands. The parasites isolated from all individuals closely matched species from the genera Hemolivia and Hepatozoon, which occur in other reptile species. We also found very little variation in parasite genetic sequences from marine iguanas within and between islands indicating that the parasite disperses easily between islands.

CURRENT STATUS OF ALNHS: THE HERBARIUM OF THE ALABAMA NATURAL HERITAGE SECTION. WAYNE BARGER AND CHRIS TAYLOR, NATURAL HERITAGE SECTION, AL-DCNR.

Alabama's plant biodiversity is well documented. However, due to consolidation of herbarium collections, emphasis on molecular analysis, and lack of student/public interest, the number of repositories has decreased. The fundamental mission of this herbarium is to offer an outlet for plant research and to house every plant taxa that occurs in the state. Herbarium holdings, ongoing floral projects and future plans will be presented.

DEVELOPING A 21ST CENTURY SKILLS INVENTORY. JENNIFER BRANTLEY, CHARLES BROWN AND LAURA POWELL, UNIVERSITY OF SOUTH ALABAMA.

Developing a 21st Century Skills Inventory

The National Academy of Sciences has proposed that beyond being competent in their discipline, today's college graduates should be positioned to transfer their knowledge across disciplinary boundaries to successfully address problems in completely novel, unfamiliar domains. According to the report developed by the Division on Behavioral, Social Sciences and Education (Pellegrino and Hutton, 2012), the capacity to transfer knowledge across disciplines is a cardinal skill that is dependent on the emergence of three competencies:

- Cognitive Competency: The mastery of facts and ability to reason in reference to the content of their discipline.
- Intrapersonal Competency: The ability of students to manage their behavior appropriately to achieve their learning goals.

- **Interpersonal Competency:** The ability of students to comprehend the intentions of others, work in teams, and personally reflect on the content of their discipline.

In harmony with this perspective, we seek to develop and establish reliability and validity of the 21st Century Skills Inventory. This instrument will allow educators the opportunity to systematically evaluate their curricula and determine which experiences, courses, pedagogies, and strategies support the development of these competencies. To this end, we have developed a 36-question inventory, and collected data from 800 students. In this poster, we present the result of our initial factor analysis, and discuss our current changes in approach to establishing the reliability and validity of a revised instrument.

Authorship: Jennifer Brantley, Dr. Charles H. Brown, Dr. Laura A. Powell

Summary: This poster will present research on the development and validation of a new instrument to help educators assess 21st Century Skills in college students.

SURVEY AND PHYLOGENETIC IDENTIFICATION OF ENDOPHYTIC FUNGI ON TWO AQUATIC PLANTS FOUND IN MOBILE BAY. GRAY F. SCARBROUGH, UNIVERSITY OF SOUTH ALABAMA. JOSEPH M. CORTOPASSI AND JUAN L. MATA, U. SOUTH ALABAMA.

Endophytes, including fungi, are organisms found inside living plants. These organisms are considered ubiquitous amongst terrestrial vascular plants, but insufficient research has been performed and documentation is scarce on aquatic vascular plants. Mobile Bay is a large estuary with a high level of species diversity. In this project we searched for fungal endophytes on plants commonly found in this aquatic ecosystem. The two plant species studied were *Vallisneria neotropicalis* (native; Tapegrass) and *Myriophyllum spicatum* (invasive; Eurasian Water Milfoil). Plants were collected from a location off the north side of the Battleship Parkway/ Causeway on three separate days over a span of six weeks. Roots, stems, and leaves were cut, sterilized with diluted household bleach, rinsed in sterile water, plated on nutritive agar, and incubated at room temperature in the lab. On a daily basis plant samples were carefully examined to detect fungal growth, upon which portions of fungal mycelium were transferred to new plates to achieve pure growth. At the end of 10 weeks most fungal growth was observed in the stems of *M. spicatum* (97.7%) and in roots of *V. neotropicalis* (73.3%). However, only 75 endophytes were recovered (out of 182 isolates in plates). Endophyte isolates were subjected to morphological examination, but not all could be taxonomically identified due to absence of reproductive structures. Therefore, isolates were grown in liquid medium to obtain pure mycelium for subsequent DNA extraction, amplification and sequencing of the ITS rDNA region. Sequences were blasted against databases in GenBank for matching sequences with a fungal name. Confident identification was possible for only 27 isolates. Most names belong to the Ascomycetes, of which *Curvularia lunata* was the most common. Many of these names have been reported as endophytes in terrestrial vascular plants, some in aquatic plants, and even *Mycolepodiscus terrestris* in *M. spicatum*, the aquatic invasive plant in our study.

DIFFERENTIAL PRODUCTION AND SECRETION OF POTENTIALLY TOXIGENIC ECPS FROM AN EPIDEMIC STRAIN OF AEROMONAS HYDROPHILA. PRISCILLA BARGER, JOSEPH NEWTON AND MARK LILES, AUBURN UNIVERSITY.

Aeromonas hydrophila is a bacterial pathogen ubiquitous in aquatic ecosystems. Disease outbreaks in fish are common in spring and summer, particularly in Southeastern pond systems. Traditionally, *A. hydrophila* has been considered a secondary pathogen with low morbidity and mortality. However, in 2009 a new, highly-virulent strain of *A. hydrophila* was responsible for widespread outbreaks of motile aeromonad septicemia in Alabama catfish production ponds. The bacterium continues to cause significant losses in the Southeastern catfish industry. This epidemic strain, referred to as virulent *Aeromonas hydrophila* (vAh), shows significant genetic variation from the traditional *A. hydrophila* (tAh) and is capable of producing disease as the primary pathogen, resulting in rapid and devastating mortality in catfish production ponds. Experimental infections via intramuscular or intraperitoneal injection in channel catfish result in death within hours with only minor gross and histologic lesions present in tissues, suggesting a toxin-mediated mode of pathogenicity. vAh are known to secrete a multitude of potentially toxigenic extracellular proteins (ECPs), potentially via a Type II secretion system. Variation in the secretome at different temperatures has been previously documented for other *A. hydrophila* isolates suggesting that, as natural vAh infections occur only during the spring and summer months when water temperatures are high, production and secretion of ECPs may be in direct relation to environmental temperature. In order to determine the role of ECPs in pathogenicity, and to evaluate the potential environmental factors affecting ECP production, secretory profiles of vAh cultured under different conditions were compared. Comparison of vAh secretomes by PAGE of culture supernatants found variability in ECP profiles based on complexity of media, culture conditions, and culture temperature. Furthermore, injection of concentrated cell-free supernatant resulted in rapid mortality, mimicking previous whole-cell bacterial challenges. These findings suggest that the rapid mortality associated with vAh outbreaks may be due, in part, to increased toxin production as a response to nutrient availability and seasonal temperature fluctuations. Fractionated supernatants are currently being evaluated to elucidate specific ECPs that may be responsible for disease.

CHARACTERIZATION OF NOVEL SMALL NON-CODING RNAS EXPRESSED BY SALMONELLA IN RESPONSE TO STRESS. MIKA HOUSEROVA, ALINE CRUCELLO, MICHAEL SPECTOR AND GLEN BORCHERT, UNIVERSITY OF SOUTH ALABAMA.

Salmonella enterica serovar Typhimurium is an enteric pathogen responsible for thousands of deaths worldwide and over a million illnesses just in the United States each year. *Salmonella* are resistant to several abiotic stresses e.g. elimination methods used in food processing. Due to this, stressful, sublethal conditions continue to lead to adaptations that influence subsequent survivability and pathogenicity. That said, while some of the mechanistic details contributing to *Salmonella* adaptation have been described, there are still many unknowns. Understanding the regulatory processes that lead to resistance and adaptation is essential to establishing new control strategies and therapeutics for this and other pathogens. Importantly, as *Salmonella enterica* experiences carbon starvation, it undergoes significant global changes in its cellular gene expression profile. These changes are mediated, in part, by small RNAs (sRNAs), short non-coding strands of RNA that have previously been shown to be involved in the regulation of many cellular processes in other prokaryotes. That said, little is known about the identities and roles of sRNAs involved in mediating the *Salmonella* stress response. Excitingly, however, through employing a cutting edge, next generation deep transcriptome sequencing technology,

we recently identified hundreds of novel sRNAs differentially expressed in response to Salmonella carbon starvation and have now selected, and are in the process of experimentally characterizing, eight of these sRNAs in order to explore their potential as novel targets for therapeutics and regulation.

ANABOLIC GLUCOSE METABOLISM IS SIGNIFICANTLY ENHANCED IN PANCREATIC CANCER DURING THE EVOLUTION OF DISTANT METASTASIS. ALEXANDER COLEY AND GLEN BORCHERT, UNIVERSITY OF SOUTH ALABAMA. OLIVER MCDONALD, VANDERBILT UNIVERSITY.

Pancreatic ductal adenocarcinoma (PDAC) is an extremely lethal malignancy that is predicted to become the second leading cause of cancer deaths in the United States by 2020 . This is attributed to the fact that early stage PDAC is difficult to detect, and late stage PDAC is resistant to treatment. Aware of this reality, our study aims to identify new molecular cues to facilitate novel detection methods and therapeutic targets for treatment. PDAC is a stepwise, evolutionary process by which a primary tumor grows in the immediate pancreas and differentiates itself into subclonal populations which will inevitably metastasize and end the life of the patient . It is known that driver mutations are acquired early in PDAC progression and are important for PanINs and establishing primary tumor growth, however no genetic drivers of metastasis have been identified. Knowing that the primary tumors grow within nutrient-poor environments, we hypothesized that divergent metabolic properties may arise during the evolution of distant metastasis to nutrient-rich organs. To test this, we first examined datasets tracing carbon-13 labeled glucose uptake into matched peritoneal and distant metastatic subclones collected from the same patient, which revealed that the distant metastatic subclones possessed hyperactive glucose flux through glucose-driven pathways. Next, by the use of steady state metabolomics, we detected high levels of metabolites pertinent to lipid, nucleic acid, and protein biosynthesis in the distant metastatic subclones and high levels of metabolites pertinent to the breakdown of fatty acids and scavenging of purines and methionine in the localized subclones. From these results, we discover that anabolic glucose metabolism emerged late in PDAC progression during the evolution of distant metastasis, while catabolic and scavenging properties that are thought to emerge early were inherited during peritoneal carcinomatous. Applying this novel information, targeting the enzymes that drive these evolutionary divergent malignant metabolic pathways could represent a novel therapeutic approach for patients with metastatic PDAC, one of the most lethal of all human malignancies.

GENOMIC VARIATION OF BREEDING META-POPULATIONS OF CERULEAN WARBLERS (SETOPHAGA CERULEA). RICHARD BORTHWICK AND YONG WANG, ALABAMA A&M UNIVERSITY.

Cerulean warblers (*Setophaga cerulea*), in addition to being one of the fastest declining songbirds in North America, are shifting their range to the northeast. This shift is resulting increased population fragmentation and may have significant implications for species management. Cerulean warblers are a significant conservation concern as they are listed as a species of greatest conservation need in each state breeding occurs. Further information on the genetic divergence of this species is required to formulate population units, a necessary step in

prioritizing conservation efforts. To this end, we propose completing genomic sequencing using a double-digest restriction-site associated DNA sequencing (RADseq) to identify single nucleotide polymorphisms. Over 240 blood samples have been collected from breeding cerulean warblers, with more collection planned this season (late April through June, 2017). We will isolate DNA from these samples using standard protease-K with phenol:chloroform extraction, and digest DNA using the restriction enzymes Sbf1 and Msp1. We will test genomic variation using kinship coefficients and assess isolation by distance using Mantel tests. This information will be used to describe and map population units. We will subsequently model the relationship between population units and habitat from the federal Forest Inventory and Analysis database, and we will model the relationship between population units and environmental parameters including precipitation and temperature. With these methods we intend to help prioritize populations for conservation efforts, explore source/sink dynamics, and understand underlying forces driving population persistence or decline.

50 SHADES OF MORALITY. CASSANDRA FIGNAR, UNIVERSITY OF SOUTH ALABAMA.

Within American society colleges act as one of many institutions that socialize individuals to behave appropriately as defined by that society. According to the National Center for Education Statistics, in 2016 20.5 million individuals were predicted to enroll in college. Recent literature found that as a result of the interactions with college or higher education as a socializing structure the majority of individuals will experience a change in their view of the appropriate behaviors or morals. However the literature on this topic is incomplete. This study examines the views of morality with a close consideration to whether morality is seen as a fluid and fluctuating concept, a concrete and defined set of values, or something in between. Using the 2010 wave of the General Social Survey, this study finds that those with higher levels of educational attainment are more likely to view morality as a concept that fluctuates in value when controlling for sex, region of the country one resides in, race, age, and religiosity. It further finds that those who live in the southern region of the United States view morality as unchanging values rather than a fluctuating concept. Utilizing the results of this study, the effect of higher levels of educational attainment on views of morality display a need to expand and further teach nuanced thinking to allow for more individualized and intellectual growth.

ESTIMATES OF RELATIVE PREFERRED TEMPERATURES IN TURTLES. AUSTIN RAY, YLENIA CHIARI AND SCOTT GLABERMAN, UNIVERSITY OF SOUTH ALABAMA. PIERRE MOISSON, A CUPULATTA, VERO, 20133 UCCIANI, CORSICA, FRANCE. MIGUEL CARRETERO, CIBIO/UNIVERSIDADE DO PORTO CAMPUS AGRERIO DE VAIRO 4485-661 VAIRO, PORTUGAL.

Global climate change can negatively affect biological systems. These effects vary across ecosystems and species. However, ectothermic organisms are thought to be more sensitive to climate change as their own homeostatic processes depend on environmental conditions. Ectotherms have various strategies to regulate body temperature such as moving between sunlight and shaded areas. Because of the importance that environmental temperature has on the biology of ectothermic organisms, uncovering the preferred temperature for ectothermic species and how they select these temperatures is of vital importance to understand how

climate change may affect them. In this work, we examined the preferred temperature(s) and thermoregulatory behavior of nine different species of turtles (8 Testudinae and 1 Emydidae) in a semi-controlled environment. We examined whether individuals from each species sought higher or lower environmental temperatures in outdoor enclosures in which there were also indoor shelters available. Temperatures of each individual were continuously measured every twenty minutes for three months by attaching a data-logger on the carapace. Dataloggers were also placed in the enclosure of each species to obtain data on environmental temperatures available to the animals. Preferred temperature(s) and thermoregulatory behavior were analyzed across species and between sexes using the median of the data. Our results indicate that temperature selection generally varies between species, but not sexes, except for one species (*C. denticulata*). Among the studied species, *T. carolina* selects overall lower temperatures than the other species. Temperature selection does not seem to be necessarily related to differences in temperatures in the natural habitat of each species.

A STATE RECORD FOR THE MYGALOMORPH SPIDER *SPHODROS ABBOTI* (ARANEAE: ATYPIDAE) FROM BALDWIN CO., AL. *W. MIKE HOWELL* AND *KRISTIN BAKKEGARD*, SAMFORD UNIVERSITY. *JIM EGBERT*, ORANGE BEACH, AL.

In August 2015, Jim Egbert found two male purseweb spiders, *Sphodros abboti*, while walking along the Hugh Banyon Backcountry trail (30.279438, -87.612546) near the Orange Beach Sportsplex . They were photographed and posted to social media. We recognized that this represented a state record, returned to the area, and found several characteristic purseweb tubes, attached to bases of hardwood trees. We collected two females, now deposited in the Auburn University Museum of Natural History (AUMS 16811 & AUMS 16812) and took additional photographs of the pursewebs. Two other localities for this species in Baldwin County, AL have also been identified ,Äi Bon Secour National Wildlife Refuge and Blakeley State Park. A literature review revealed that the closest locality for this spider is approximately 155 miles (straight-line distance) to the east in Liberty County, FL. The heart of its range is eastern Florida and south-central Georgia. It is unknown as to whether this occurrence in Alabama represents a range expansion, or that the presence of this spider has, until now, remained undocumented.

ANTIBIOTIC RESISTANCE OF *VIBRIO VULNIFICUS* ON THE ALABAMA-FLORIDA STATE LINE. *SIERRA FISCHER*, UNIVERSITY OF WEST ALABAMA.

Vibrio vulnificus are flesh eating bacteria found in salt water. The flesh eating bacteria were initially discovered in Florence, Italy in 1854. The physician Filippo Pacini discovered the first species of *Vibrio* when a cholera outbreak occurred. He however did not discover *vulnificus*; instead, he discovered cholera. *Vibrio*'s shape is slightly bent similar to a comma. *V. vulnificus* is found when people consume raw oysters that can lead up to a 56.4% fatality rate. Most causes were believed to happen in the warm summer months. Florida's incidence rate is double the national rate for vibrios. Individuals with wound infection related symptoms were approximately 50.7% of the 276 cases of *V. vulnificus* from 1998 to 2007. The *V. vulnificus* were found in the Gulf Coast area in Florida and Alabama. In this study samples were collected at to 2 different sample sites, Pensacola beach area of Florida and Perdido Key. The 37 total

isolated vibrios were tested for the resistance to antibiotics. The purpose of this study is to test natural antibiotic resistance in *Vibrio vulnificus*.

TROUBLE IN THE GALAPAGOS: ARE BLACK FLIES NATIVE OR INVASIVE. JOHN MCCREADIE, ALABAMA A&M UNIVERSITY.

Most of the world, islands, if they have flowing freshwater, are inhabited by larval black flies. Most adult females take blood and hence many species are vectors of disease. One or more species of black flies from the *Simulium ochraceum* complex inhabits the Galapagos Island of San Cristobal and was first reported to attack people in the early 1990's. The Ecuadorian government wants to eradicate this species under the assumption of a recent introduction. The issue is whether the species is introduced or native. The distinction is significant because if native, sufficient time has elapsed for it to have become a keystone species in the only know running water habitats of the Galapagos Islands. This paper presents our research to date.

BIORUBE BOT, A MOLECULAR BIOLOGY GAME, IS ASSOCIATED WITH SOME EDUCATIONAL GAINS IN THE COLLEGE CLASSROOM. SARA CLINE, ADAM LEWIS AND LEIGH HESTER, ATHENS STATE UNIVERSITY.

BioRubeBot (For Biology Rube Goldberg Robot) is a Serious Educational Game (SEG) based on protein pathway images that are found in abundance in molecular biology textbooks. Gameplay uses simplifications of typical protein-protein interactions, which can easily be interpreted as a Rube Goldberg style game. Games that require students to use science-based rules in order to solve puzzles are known to be associated with learning gains in the classroom. Examples of such games are especially prominent in the field of Physics. Here we show that BioRubeBot, a game coded by Athens State University Computer Science students, may need further refinement in its depiction of receptors in order to promote a college level understanding. However, we also show that BioRubeBot is associated with increases in vocabulary usage that are comparable to a group creating playdough representations.

CHICKEN PROCESSING PLANT CONTRIBUTIONS TO NUTRIENT POLLUTION IN GRAVES CREEK WERE MODIFIED BY RAINFALL AND SEASONAL GROWTH OF WETLAND PLANTS. EMILY BRIDGE, ANNIE SMITH AND BETSY DOBBINS, SAMFORD UNIVERSITY.

Animal feeding operations create nutrient pollution in the waterways of Alabama. Less is known of the effects of processing plants and of created wetlands that seek to ameliorate such pollutants. In Blount County, Alabama a chicken processing plant discharges waste into a wetland that empties into Graves Creek. We believe higher concentrations of nitrates and phosphates will be present downstream than upstream of the plant. Water samples were collected six separate times at eight locations along Graves Creek over two years. Each sample was tested for nitrates, phosphates, conductivity, pH, and dissolved oxygen. We found that the concentrations of nitrates and phosphates downstream of Tyson Chicken plant were not only higher than upstream of the plant, but up to ten times higher than an acceptable level for drinking water (10 mg/L). An increase in nitrates and phosphates stresses inhabitants of these water systems, which can lead to community disruption. Conductivity, but not pH or dissolved

oxygen, increased downstream of wetland discharges. We found that the wetland was partially efficient during growing season at removing nitrates and phosphates from the water. However, during winter and late summer when plant growth is sparse, the wetland became saturated with nutrients and deposited phosphate into the water, further increasing the phosphate concentrations of water in the wetland. Our results suggest that wetland efficiency varies by season, so it is important that CAFO regulations consider seasonal variation as well as rainfall when creating restrictions on nutrient discharge into surface waters.

EVIDENCE OF CLIMATE CHANGE: REDUCTION IN SUGAR MAPLE GROWTH. *BRITTANY BUTCHER* AND *KETIA SHUMAKER*, UNIVERSITY OF WEST ALABAMA. *CAROLYN COPENHEAVER*, VIRGINIA TECH.

The current range of sugar maple is largely determined by climate. Models predict sugar maple's range will shift northward and eastward in response to climate change. In this study, we examined dendroclimatological data to verify these model predictions. We correlated tree-ring width data with temperature, precipitation and Palmer Drought Severity Index from study sites in the southern, western, and central parts of sugar maple's range. Sugar maple growth at the southern site was limited by drought. Sugar maple growth at the western site was limited by precipitation and in the central region sugar maple growth was not correlated to climate. The southern and western sites provided evidence of a recent (post-1950) increased sensitivity to drought. These dendroclimatic results confirm predictions of a northward and eastward shift in the range of sugar maple within the next century.

CHEMISTRY PAPER ABSTRACTS

SURVEY OF ACTIVE BIOMOLECULES IN FERTILITY PLANTS. AMANDA CRUMPTON, JACKSONVILLE STATE UNIVERSITY. MWEBI NIXON, JACKSONVILLE STATE UNIVERISTY.

The chemical analysis of plants commonly used in African herbal medicine primarily to treat infertile women may provide viable explanations for successful treatment. In African, herbal medicine has been a traditional approach to treating infertility for many years; however the active biomolecules and mechanism of action are still unclear. Polyphenols are organic phytochemicals with antioxidant properties. Because literature suggests polyphenols can act similar to aromatase inhibitors, a form of infertility treatment, it is necessary to analyze these plants for their polyphenolic content. This study employs the Using the Folin-Ciocalteu reagent (F-C reagent) method (Cicco 2009), to quantify the total polyphenols in the plant extracts. Initial screening tests of the herbs indicate presence of polyphenols, steroids, triterpenoids, flavonoids, alkaloids, saponins, glycosides whereas as analysis with the FC reagent indicated presence of polyphenols in the herbal plants.

ENVIRONMENTAL REMEDIATION OF CADMIUM, CHROMIUM AND COPPER USING TEA WASTE. MICAELA TRUETT, JACKSONVILLE STATE UNIVERSITY. NICHOLAS HELMS AND MWEBI NIXON, JACKSONVILLE STATE UNIVERISTY.

Heavy metals in the environment pose a serious threat to the health of humans and ecosystems. Once introduced into the environment heavy metals may leach into the soil and local waterways. Industrial activities, such as mining and fracking, can introduce these potentially harmful heavy metals to the environment. As more and more nations become industrialized, it will be necessary to develop a suitable absorbent to remediate heavy metals in the environment. An ideal absorbent will be cheap, readily available, and environmentally friendly. One such candidate is tea waste. Tea is the second most popular beverage in the world, making the tea waste widely available and cheap. Additionally, tea waste is biodegradable and nontoxic making it very safe to use. This study evaluates the potential uptake of various metals by tea waste. Atomic absorption spectroscopy was used to quantify the tea-waste uptake ability of cadmium, chromium, and copper. Our preliminary results show that at optimum conditions tea waste is a viable adsorbent for heavy metals in solution.

CHEMISTRY POSTER ABSTRACTS

SYNTHESIS OF ISOQUINOLINE ANALOGS AS CHEMICAL PROBES FOR SERINE/THREONINE PROTEIN PHOSPHATASE 5. *MADISON TUTTLE, LARRY YET, WILLIAM SWANN, DAVID GIDDENS, LIA CASTILLO, RICHARD HONKANEN AND MARK SWINGLE, UNIVERSITY OF SOUTH ALABAMA.*

Recent studies have shown that the overexpression of serine/threonine protein phosphatase 5 (PP5) is associated with invasive ductal carcinoma of the breast, cancer cell proliferation, and resistance to apoptosis. However, scientists currently lack the molecular equipment with which to further characterize the biological role of PP5 in tumorigenesis. Previous high-throughput screening efforts revealed a potentially selective and potent small molecule chemical probe for PP5C containing a 6,7-dimethoxyisoquinoline core. Several analogs were synthesized and evaluated by means of a homogenous fluorescence intensity-based assay in %inhibition at 50 μ M. Based on a structure-activity relationship analysis, the 6,7-dimethoxyisoquinoline series is not potent enough to warrant further study.

SYNTHESIS, STRUCTURE, AND PHOTOLUMINESCENCE OF NOVEL LANTHANIDE COORDINATION COMPLEXES CONTAINING AUROPHILIC INTERACTIONS. *TAYLOR HAMBY, RICHARD SYKORA AND JEFFREY HENDRICH, UNIVERSITY OF SOUTH ALABAMA.*

This work details the synthesis of a series of isostructural lanthanide dicyanoaurates complexes containing the ancillary ligand 2,2'-bipyridine. Syntheses were carried out by reaction of Ln³⁺ triflate salts and potassium dicyanoaurate with 2,2'-bipyridine (bpy) resulting in the compound, [Ln(C₁₀H₈N₂)(H₂O)₄(Au(CN)₂)], (Ln=Tb and Gd). X-ray diffraction studies reveal the existence of dimeric aurophilic interactions as well as bipyridine pi-stacking. Photoluminescence studies reveal enhanced lanthanide-based emission due to energy transfer from the dicyanoaurate and 2,2'-bipyridine ligands and is confirmed by the augmented emission spectrum of the Gd analog.

NOVEL PROTEIN SUBSTRATES FOR THIN-LAYER CHROMATOGRAPHY. *NICHOLAS HELMS, MICAELA TRUETT AND DONNA PERYGIN, JACKSONVILLE STATE UNIVERSITY.*

Thin-Layer Chromatography (TLC) is a time-tested method which is used for; separation of substances, monitoring the progress of reactions, and determining whether a substance is present in a solution by comparison to standards. The drug development process involves several stages; discovery and development, preclinical research, clinical research, FDA review, and FDA post-market safety monitoring. The second step, preclinical research, usually involves both in-vitro and in-vivo testing methods. This work proposes to develop a novel in-vitro standard operating procedure, which may be used to validate or invalidate potential candidates before moving further down the drug development pipeline. Through the use of this technology, potential candidates which lack promising activity may be dismissed before animal testing is performed. In this way, animal testing will be greatly reduced. Reduced animal testing results in less suffering for animals, reduced expenditure, and reduced time wasted on

ineffective pharmaceutical products. This technology works through the varying affinity between the stationary phase, affixed to the plate, and the mobile phase (the solvent). We are developing novel technology which involves attaching proteins or enzymes to the TLC plate through a covalent linkage to provide a novel stationary phase. This novel stationary phase will be used to standardize a method of determination of a binding affinity of a substrate for the stationary phase. Standardization will be done by developing the plates, obtaining the native ligand for the respective enzyme, and testing the retention factor to verify the model. (A lower or higher retention factor (Rf), compared to the native ligand, will determine affinity.) This model will be used to compare the Rf value for new potential drug candidates to the standard. If a candidate exhibits a similarly low Rf value, the drug candidate can be pushed forward to an animal trial. If not, the candidate may be eliminated from the trial, leading to reduced suffering.

CHARACTERIZATION OF SUWANNEE RIVER FULVIC ACID BY ALTERNATIVE TOTAL ORGANIC CARBON ANALYSIS AND MASS SPECTROMETRY. SHAHRZAD BADRI, ALEXANDRA STENSON AND JIMMIE MCGEHEE, UNIVERSITY OF SOUTH ALABAMA.

Natural organic matter (NOM), a product of decomposing biological matter, has a complex chemical makeup consisting of numerous compounds. To reduce this complexity, NOM is frequently broken into fractions before analysis. NOM consists of fulvic acid (FA), the component soluble in acidic water, and humic acid (HA), the component insoluble in acidic water. NOM is found in all soil and surface water, and it has shown to form carcinogenic disinfection byproducts (DBPs) after water treatment. Samples of chlorinated and unchlorinated Suwannee River fulvic acid (SRFA) were analyzed through Fourier transform ion cyclotron resonance mass spectrometry (FTICR-MS), and their chemical compositions were determined from their respective mass spectra. Comparing chlorinated and unchlorinated samples aids in understanding if the chemical composition of humics is altered in the process of chlorination. FTICR-MS is accurate enough to detect the mass difference between formulas that are only one milli-Daltons apart, which is the case for many humic substances. This means that the mass spectra of humic substances reveals thousands of compounds with unique masses. Also, the effects of desalting samples through a ZipTip were observed because chlorinated samples must be desalted for proper function of FTICR-MS. Chlorinated samples were found to contain chlorine and their van Krevelen plots indicate chemical alteration by oxidation. Desalted samples demonstrated an absence of compounds containing higher O/C ratios, likely from removal of compounds containing electronegative O.

A challenge with investigating chlorinated humics is that SRFA concentrations must be consistent for all samples. To determine concentration of carbon, total organic carbon (TOC) analysis is utilized. TOC analysis directly quantifies the concentration of carbon in a sample, often by combustion. Having only a limited amount of sample, the destructive nature of TOC analysis is not feasible. An alternative method of quantifying concentration suggested by Tipping et al. was utilized to translate UV-vis data into concentration by a series of equations that yield the extinction coefficient of a sample. This method is nondestructive and comparable in accuracy to direct TOC analysis. Since humics are highly heterogeneous, Beer's Law cannot be accurately applied to find the extinction coefficient. Tipping's equations for converting UV data into dissolved organic matter (DOC) data using a set of known parameters are:

$$(1) f_A = (E_{1,B} - R E_{2,B}) / (R E_{2,A} - R E_{2,B} - E_{1,A} + E_{1,B})$$

$$(2) E = f_A * E_A + (a - f_A) * E_B$$

in which f_A and f_B are fractions of components A and B, E is the extinction coefficient, and R is the ratio of absorbances at two wavelengths. This method treats NOM as if it only consists of two components in order to relate absorbance to TOC. Solving for equation 1 yielded the fraction of A which was used to solve equation 2 at 340 nm, a wavelength SRFA is known to absorb light at. The absorbance and extinction coefficient were then applied to Beer's Law to find the concentration. This method allowed for accurate computation of concentration with relatively low standard deviations.

FRACTIONATION OF HUMIC ACID USING HIGH PERFORMANCE LIQUID CHROMATOGRAPHY. *JIMMIE MCGEHEE, DOMINIKA HOUSEROVA AND ALEXANDRA STENSON, UNIVERSITY OF SOUTH ALABAMA.*

Natural organic matter (NOM) is the material formed by the degradation of organic material in soil; it is present in all drinking water.¹ Chlorinating agents added to drinking water react with NOM to form disinfection byproducts (DBPs) linked to increased cancer risk.¹ Despite recent study of DBP formation the characteristics and health effects of unaltered NOM are still relatively unexplored. Recent studies have reached contradictory conclusions of NOM being either mutagenic or anti-mutagenic under different circumstances.^{2,3,4} Because NOM is a complex and variable mixture, it is possible that different compounds are responsible for these competing effects.

Previous experiments by this research team have had success characterizing the acid soluble portion of NOM, fulvic acid (FA), by fractionating the mixture using high performance liquid chromatography (HPLC) before analysis. The portion of NOM that is acid insoluble, humic acid (HA), is more bioactive than FA and has a higher potential to form DBPs during water treatment.^{1,2} This makes HA a likely source of NOM's health effects; however, fractionating HA is more difficult than fractionating FA. Separating weak acids such as HA with HPLC normally employs an acidic mobile phase. This is to prevent the disassociation of the analyte into polar charged ions that flow freely with the polar mobile phase, preventing separation. Because HA is insoluble in acidic solution, the problem of disassociation must instead be controlled by careful management of pH and a highly tuned mobile phase gradient.

The goal of this paper is to fractionate HA for future characterization of the compounds most responsible for NOM's bioactive effects and DBP formation potential. Utilizing a shallow gradient, HA was successfully fractionated with replicable chromatographic distribution. To fully characterize the fractions, material must be gathered from several HPLC collection cycles. Development is in progress to modify the method for faster cycling and material collection

NOVEL PROTEIN SUBSTRATES FOR THIN-LAYER CHROMATOGRAPHY. *NICHOLAS HELMS, MICAELA TRUETT AND DONNA PERYGIN, JACKSONVILLE STATE UNIVERSITY.*

Thin-Layer Chromatography (TLC) is a time-tested method which is used for; separation of substances, monitoring the progress of reactions, and determining whether a substance is present in a solution by comparison to standards. The drug development process involves several stages; discovery and development, preclinical research, clinical research, FDA review, and FDA post-market safety monitoring. The second step, preclinical research, usually involves both in-vitro and in-vivo testing methods. This work proposes to develop a novel in-vitro standard operating procedure, which may be used to validate or invalidate potential candidates before moving further down the drug development pipeline. Through the use of this technology, potential candidates which lack promising activity may be dismissed before animal testing is performed. In this way, animal testing will be greatly reduced. Reduced animal testing results in less suffering for animals, reduced expenditure, and reduced time wasted on ineffective pharmaceutical products. This technology works through the varying affinity between the stationary phase, affixed to the plate, and the mobile phase (the solvent). We are developing novel technology which involves attaching proteins or enzymes to the TLC plate through a covalent linkage to provide a novel stationary phase. This novel stationary phase will be used to standardize a method of determination of a binding affinity of a substrate for the stationary phase. Standardization will be done by developing the plates, obtaining the native ligand for the respective enzyme, and testing the retention factor to verify the model. (A lower or higher retention factor (Rf), compared to the native ligand, will determine affinity.) This model will be used to compare the Rf value for new potential drug candidates to the standard. If a candidate exhibits a similarly low Rf value, the drug candidate can be pushed forward to an animal trial. If not, the candidate may be eliminated from the trial, leading to reduced suffering.

PHYSICS AND MATHEMATICS PAPER ABSTRACTS

ENERGY HARVESTING AND STORAGE USING SMART NANOCOMPOSITE FILMS. JEMILIA POLIUS, ALABAMA A&M UNIVERSITY.

Ms. Jemilia R. Polius, PhD Student

Dr. Mohan Aggarwal, Advisor

Alabama A & M University

Department of Physics

Smart nanocomposite materials with energy harvesting and storage capabilities have been of great scientific and technological interest. Many smart materials have been classified as piezoelectric materials, which have been widely used for sensors, actuators, and transducers. Among different nanomaterial, the ZnO nanostructure possess a special place, due to its merits, such as, high specific surface area, optical transparency, nontoxicity, chemical, and photochemical stability, ease of fabrication and electrochemical. To date, this concept has not been explored, in particular, based on single smart-material(s) via both pyroelectricity and piezoelectricity. This study will explore doped metallic paint as a smart-material for energy harvesting applications. The present research will focus the following: (1) the optimization of the incorporation of the ZnO material in metallic paint; (2) the utilization of the dip coating method to deposit ZnO doped metallic paint on a copper substrate; (3) the determination of the structural and electric properties of thick films with respect to the dopant concentrations of the coatings; and (4) the suitability of the fabricated films for energy harvesting, energy storage and sensor applications. The results of these experiments will contribute toward understanding the interactive effects of the ZnO doped metallic paints, and the future production of energy harvesting materials and sensor applications.

HIGH PRESSURE METHANE SORPTION IN MOF-199 AND ACTIVATED CARBON MSC-30. JACOB BURRESS AND DONALD BETHEA, UNIVERSITY OF SOUTH ALABAMA.

Concerns about global climate change have driven the search for alternative fuels. Natural gas (NG, methane) is a cleaner fuel than gasoline and abundantly available due to hydraulic fracturing. One hurdle to the adoption of NG vehicles is the bulky cylindrical storage vessels needed to store the NG at high pressures (3600 psi, 250 bar). The adsorption of methane in microporous materials can store large amounts of methane at low enough pressures for the allowance of conformable, "flat," pressure vessels. The measurement of the amount of gas stored in sorbent materials is typically done by measuring pressure differences (volumetric, manometric) or masses (gravimetric). An instrument will be presented with which methane adsorption measurements can be performed using both volumetric and gravimetric methods in tandem. The gravimetric method presented has no buoyancy corrections and low uncertainty. Therefore, the gravimetric measurements can be performed throughout an entire isotherm or just at the extrema to verify the results from the volumetric measurements. Results from methane sorption measurements on an activated carbon (MSC-30) and a metal-organic framework (Cu-BTC, HKUST-1, MOF-199) will be shown. New recommendations for calculations of gas uptake and uncertainty measurements will be discussed.

XPS STUDIES OF SURFACE DEGRADATION OF CZT DUE TO THERMAL TREATMENTS. *JONATHAN LASSITER, RAEQUANE JONES, ROBERT SMITH II, BEATRIZ GUTIERREZ-CEREZO, KALEN MUMFORD, MELISSA SMITH AND STEPHEN BABALOLA, ALABAMA A&M UNIVERSITY.*

In order to understand the contributing factors responsible for the changes in electrical properties and detector function induced by annealing, CZT samples were treated in the temperature range of 100 - 400o C. Following each thermal treatment, X-ray photoelectron spectroscopy was performed in order to determine changes in the surface chemistry. These changes in the surface are indicative of alterations in the oxide profile, as well as deteriorating surface material quality. Electrical properties improved in the lower range of treatment, and this was most notable in the 200 and 300 degree Celsius cases. In contrast, electrical properties were shown to significantly degrade at 400 degree Celsius. The surface presence of ZnO, and changes in tellurium oxide types contributed to the degradation in electrical properties of the material.

CURRENT VOLTAGE CHARACTERISTICS OF CDZnTE-BASED RADIATION DETECTORS. *ROBERT SMITH, MELISSA SMITH, BEATRIZ GUTIRREZ-CEREZO, KALEN MUMFORD, JONATHAN LASSITER AND STEPHEN BABALOLA, ALABAMA A&M UNIVERSITY.*

Current voltage (I-V) characteristics of a device are the profiles obtained when the current, generated from applying a bias to the device, are plotted against the applied bias. The plot enables the use of Ohm's law to deduce the resistance and resistivity of the device, as well as provide an insight into the performance of the device, especially at saturated current values. In this study the electronic device used is fabricated using cadmium zinc telluride (CdZnTe) crystal. The CdZnTe crystals are used for radiation detection especially in gamma and x-ray radiation, as well as in other medical, astronomical and industrial applications. We compared the I-V curves obtained from CdZnTe crystals that were heated in the furnace. We connected the furnace to the I-V system and received the current voltages from the CdZnTe crystals from room temperature to 500 degrees Celsius in 100-degree increments. We completed four sweeps for each temperate and while doing this we ramped the steps from -10 volts to 10 volts in increments of 0.5 volts and -200 volts to 200 volts in increments of 10 volts. Our results show a pattern of increasing current as temperature increases, up to between 200 and 300 degrees Celsius. As bias increased at 300 Celsius and above, the observed I-V plot displays a stochastic profile. This profile deviates from that predicted by Ohm's law, and we believe that the electrical properties, specifically the resistivity of the device, have been altered at higher temperatures.

EFFECTS OF CNT/MWCNT ON PVDF OPTICAL CHARACTERISTICS. *POWELL RACHEL AND PADMAJA GUGGILLA, ALABAMA A&M UNIVERSITY.*

There are numerous applications for the pyroelectric composite films especially in medical field, military, and environmental applications etc. The main focus of this research is to address the problem of making the flexible films and doping them with CNTs and MWCNTs and

improve their efficiency as optoelectronic devices. This research reports the fabrication technique used in making PVDF and PVDF doped by CNT, PVDF+LiTaO₃, PVDF+LiTaO₃+MWCNT films and their electrical and optical characteristics. Doping with CNT and MWCNT enhanced the optical characteristics of the PVDF films and were acting more like conductors than semiconducting materials. The Fourier Transform Infrared Spectroscopy has been recorded in the range 500 to 4000 cm⁻¹. Raman Spectrum of the films is also obtained.

ON SCHUR'S UNITARY TRIANGULARIZATION THEOREM. WEN YAN, TUSKEGEE UNIVERSITY.

By the well known Schur's triangularization theorem, for any n by n complex matrix A in $M(n)$, there is a unitary matrix U such that U^*AU (also in $M(n)$) is upper triangular. The diagonal entries of U^*AU are eigenvalues of A . The author studies similar results on complex skew symmetric matrices in $so(n)$ and complex matrices in $sp(2n, C)$.

A CONSIDERATION OF THE SOLITON SOLUTION TO THE KORTEWEG-DEVRIES EQUATION AND THE USE OF GREEN'S FUNCTIONS TO SOLVE INHOMOGENEOUS DIFFERENTIAL EQUATIONS WITH VARIANT BOUNDARY CONDITIONS. SAMUEL UBA, MATTHEW EDWARDS, YINSHU WU AND FAYEQUA MAJID, ALABAMA A&M UNIVERSITY.

Theoretical Efforts continue to be made to have readily available solutions to both inhomogeneous linear and non-linear differential equations. To that end, we report here our investigation of Green's functions to obtain solutions to first and second order inhomogeneous equations with specific boundary conditions. Once the Green's function has been determined, a simple integration allows the solution to be obtained. Additionally, the soliton solution to several non-linear differential equations is known to exist. Here, we reconsider the soliton wave for the Korteweg-DeVries equation and illustrate the unchanging shapes of two solitons following a head-on collision.

AN INVERSION ALGORITHM FOR SUBSURFACE SENSING PROBLEM. YIJUN YU, TUSKEGEE UNIVERSITY. NAILONG GUO, BENEDICT COLLEGE.

An inversion algorithm with Bayesian Formulation is considered for subsurface Sensing problem. The algorithm inverts the parameters of a heterogeneity profile based on measured scattering data. The Algorithm is developed based on assumption that there is a mismatch between the measured data and the model employed, with the error represented as a random process. Here the basic Bayesian inversion framework is presented, with example results presented for subsurface-sensing problems.

HAMILTONIAN STRUCTURES ON SPIN(7)-GEOMETRY. KEVIN INGLES, UNIVERSITY OF SOUTH ALABAMA. AJ TODD, N/A.

Hamiltonian structures are those that give the solutions to Hamilton's Equations. In this paper, we aim to characterize these Hamiltonian structures for Spin(7) geometry.

CREATING DIFFRACTION GRATINGS WITH TRANSMISSION HOLOGRAPHY. *JAMES MCKEE* AND *DAVID THOMPSON*, UNIVERSITY OF NORTH ALABAMA.

We used transmission holography to create diffraction gratings to disperse visible light wavelengths. A green SLM laser was used to create a one inch diameter collimated beam at normal incidence to a holographic plate. The transmitted beam was re-directed so that it was transmitted through the plate a second time from the same side as the initial beam, with angle of incidence ranging from 5 to 30 degrees. The resulting holograms consisted of diffraction gratings with line spacing between 400 and 1700 lines/mm. A quadratic fit to measurements of angle of incidence versus the resulting grating's line spacing values allowed us to create diffraction gratings with standard line spacing of 300, 600, and 1200 lines/mm.

A NOVEL THEORETICAL MODEL FOR ATOMS INSPIRED BY COMMUNICATION THEORY. *SERKAN G^ÖLDAL*, *LURONG PAN* AND *MURAT TANIK*, UNIVERSITY OF ALABAMA AT BIRMINGHAM.

In modern physics and chemistry theories, atoms are considered basic building blocks of the material world. Computational modeling for atoms is a useful technique in studying and predicting events in chemical, mechanical, electrical, biological, planetary, and cosmological systems. Due to the complexity and wide scale range of particle systems, current computational modeling approaches including quantum mechanics (QM), density functional theory (DFT), and molecular mechanics (MM) are separately designed to describe systems at different size and precisions, in which atoms are represented quite differently.

More specifically, they are based on completely different physics models and theories with various advantages and disadvantages and no consistency between these models. This reductionist scientific approach has great practical values in investigating particle structures and mechanisms in separated scales, but also faces huge challenges in terms of theoretical perfection, physical accuracy, multi-scale integration, and computational scalability. In this paper, we proposed a novel theoretical physics model to describe the physical phenomena from a completely different perspective inspired by communication theory. We call this model communication dynamics (CD). This model approaches to current theoretical physics from computational modeling perspective with inherent description of integrated space and time. In this work, we proposed a theoretical model for atoms in the periodic table as an example to reveal one of applications of this model. Our model aims to use a uniformly applicable mathematical formula to describe physical realities at different scales, even for particles exhibit particle-wave duality.

PHYSICS AND MATHEMATICS POSTER ABSTRACTS

A PRODUCT PROPERTY FOR DISCRETE TIME LAGUERRE FUNCTIONS. *PHILIP OLIVIER*, UNIVERSITY OF SOUTH ALABAMA.

A "product property" for discrete time Laguerre functions is presented. Several corollaries to this theorem are presented. The product property is applied to convenient computation of convolution sums.

MODERATE TEMPERATURE DIELECTRIC SURFACE AND VOLUME CURRENTS AND LOW-FREQUENCY DIELECTRIC CONSTANT MEASUREMENTS OF PURE AND MULTI-WALLED CARBON NANOTUBES (MWCNT) DOPED AMORPHOUS POLYVINYL ALCOHOL THIN FILMS. *ANGELA REEDY*, MATTHEW EDWARDS, PADMAJA GUGGILLA AND AFEF JANEN, ALABAMA A&M UNIVERSITY. QURATULANN IJAZ, TROY UNIVERSITY.

Previously, we have reported measurements of the temperature-dependent surface resistivity of pure and multi-walled carbon nanotubes doped amorphous Polyvinyl Alcohol (PVA) thin films. In the temperature range from 22 0C to 40 0C with a humidity-controlled environment, we found the surface resistivity to decrease initially but to rise steadily as the temperature continued to increase. Also, electric surface current densities (J_s) were measured on the surface of pure and MWCNT doped PVA thin films. At low voltages, these densities were found to be produced analogously to ohmic conduction. However, unlike ohmic conduction in metals where free electrons exist, some captive electrons are freed to become conduction electrons from increased thermal vibration of constituent atoms in amorphous thin films. Finally, we present conventional volume resistivity measurements in the same temperature range, with the recognition that nano-dopants, microscopic structure, and environmental conditions contributed to the unique physical properties of these material systems.

CALCULATING THE DIMENSIONS OF THE PEAR-SHAPED EARTH'S HEMISPHERES. *ALMUATASIM ALOMARI*, ARJUN TAN AND MARIUS SCHAMSCHULA, ALABAMA A&M UNIVERSITY.

The orbital analysis of artificial earth satellites have revealed the 'pear-shape' of the the earth with the 'stem' of the pear at the north pole. Because of the anti-symmetric nature of this shape, the two hemispheres are unequal in all measures. The dimensions of the two hemispheres are calculated and compared. The southern hemisphere is on average 5.092 m higher than the northern hemisphere. The surface area of the southern hemisphere is 408.534 sq km larger than that of the northern hemisphere. Finally, the volume of the southern hemisphere is 1,304,204 cu km greater than that of the northern hemisphere.

INFRARED MICROSCOPY AND IMAGE ANALYSIS OF CZT. *MELISSA SMITH, BEATRIZ GUTIERREZ-CEREZO, KALEN MUMFORD, ROBERT SMITH II, KRISTINA WILLIAMS, JONATHAN LASSITER AND STEPHEN BABALOLA, ALABAMA A&M UNIVERSITY.*

Cadmium Zinc Telluride (CZT) crystals have the ability to detect high energy radiation such as gamma rays and x-rays, operating at room temperature. These crystals contain tellurium inclusions, which trap electrons. This trapping of electrons decreases the collection efficiency, and resolution of CZT-based radiation detectors. (CZT) is transparent to infrared light, as such, infrared microscopy was used to determine the number and morphology of the tellurium inclusions within the bulk of the crystals. We characterized samples that were annealed at different temperatures, in the range of 100 – 400degC, and were compared to the unannealed samples. Infrared micrographs of the annealed samples were compared to their room temperature baselines. Treatments with higher temperatures showed the appearance of smaller inclusions. This may be attributed to the inclusions breaking down, and diffusing into the bulk of the crystal.

OPTIMIZATION OF PHOTOCATALYTIC AIR DISINFECTION. *SALIMU KUMASI AND PRAKASH SHARMA, TUSKEGEE UNIVERSITY.*

Photocatalytic air disinfection (PAD) systems are researched thoroughly towards increasing their maximum efficiency and rate of disinfection processes. Various parameters such as light irradiation, photocatalytic air filter location, gas purging and sampling etc. were optimized via experimental models and develop a model for inactivation of microbes in a filter fiber media using mathematical and experimental data. The ultimate goal of this task is to ensure that the proposed models are true representations of photocatalytic air disinfection. The models developed in this research will be validated with experimental results from a full-scale instrumentation setup in the laboratory.

Acknowledgements: The authors will like to acknowledge NSF for providing funding to support the work.

NANOMATERIALS DRIVEN ENERGY. *SALIMU KUMASI, PRAKASH SHARMA AND AKSHAYA KUMAR, TUSKEGEE UNIVERSITY.*

We have developed nanofibers, nanotubes, nanoparticles, nanocatalysts nanostructures for clean energy. Energy can neither be created nor be destroyed, but it can be converted from one form to another. Based on this principle, chemical energy such as hydrogen produced from water electrolysis at a much lower voltage using RuO₂ nanoparticles on the Si wafer substrate. The hydrogen is produced from the clean sources such as solar energy and water, it has to be stored by physisorption or chemisorption processes on to the solid state systems.

Acknowledgements: The authors will like to acknowledge NSF for providing funding to support the work.

OXIDATION ENHANCEMENT BY UTILIZING THE SOLAR ENERGY. SALIMU KUMASI, PRAKASH SHARMA AND AKSHAYA KUMAR, TUSKEGEE UNIVERSITY.

For the successful physical adsorption of hydrogen molecule, we have developed novel polyaniline nanostructures via chemical templating and electrospinning. Chemical or complex hydrides involving nano MgH_2 and transition metal nanocatalysts have been synthesized to tailor both the thermodynamics and kinetics of hydrogen (chemi) sorption respectively. Utilization of solar energy (UV-Vis) and a coupling of novel semiconductor oxide nanoparticles have been recently demonstrated with enhancement in oxidation and/or photo-reduction processes for the water/air detoxification and sustainable liquid fuel production respectively. Magnetic nanoparticles such as $ZnFe_2O_4$ have been synthesized and optimized for biomedical applications targeted drug delivery and tumor diagnostic sensing (MRI).

Acknowledgements: The authors will like to acknowledge NSF for providing funding to support the work.

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Photocatalytic air disinfection (PAD) systems are researched thoroughly towards increasing their maximum efficiency and rate of disinfection processes. Various parameters such as light irradiation, photocatalytic air filter location, gas purging and sampling etc. were optimized via experimental models and develop a model for inactivation of microbes in a filter fiber media using mathematical and experimental data. The ultimate goal of this task is to ensure that the proposed models are true representations of photocatalytic air disinfection. The models developed in this research will be validated with experimental results from a full-scale instrumentation setup in the laboratory.

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ENGINEERING AND COMPUTER SCIENCE PAPER ABSTRACTS

A SIMPLE RELIABILITY MODEL FOR A HUMAN MISSION TO MARS USING MONTE CARLO ANALYSIS. *GAYLE HAGEWOOD* AND *J. WAYNE MCCAIN*, ATHENS STATE UNIVERSITY.

The planet Mars has been the inspiration for mankind's dream of interplanetary human spaceflight for centuries. While inhospitable to human occupation on initial examination, the red planet holds the highest promise of harboring past, present, and future life of any major body in our Solar System. Placing humans on Mars may finally answer the questions of 'are we alone' in the Universe and whether mankind is capable of surviving beyond Earth. After decades of automated orbiters and landers, we are poised to finally make a concerted effort for humans to visit the surface of Mars and return safely to Earth during the next decade. While controversy surrounds the issue of whether to use existing and near-term hardware or develop advanced propulsion and other technologies, one common concern is assessing the probability of crew survival and mission success. The research described here seeks to develop a simplistic model employing a risk network and Monte Carlo simulation that might provide a top-level 'sanity check' of commonly proposed mission profiles to be used in management decision making and mission design/refinement. The model was designed to aid in ranking various mission scenarios and improving the probability of success by understanding reliability drivers. While numerical results are presented, this paper emphasizes the methodology.

A BRIEF RISK ASSESSMENT OF AMELIA EARHART'S ATTEMPTED FLIGHT AROUND THE WORLD. *KEVIN P. KEENAN* AND *J. WAYNE MCCAIN*, ATHENS STATE UNIVERSITY.

This paper presents an analysis of Amelia Earhart's 1937 attempted flight around the world, examining critical factors that contributed to a concatenation of risks resulting in the mysterious loss of Earhart and her navigator, Fred Noonan. Beginning with a brief history of Earhart's life and how it shaped her entry into aviation, it describes her aircraft, the equipment on the aircraft for support, and possible causes and effects of her becoming lost. Three plausible reasons for the tragedy are presented, with pertinent facts in the context of modern-day Risk Management. Finally, the most likely explanation for her loss during the last leg of this historic flight is discussed along with supporting rationale. A brief outline for a Risk Management Plan (RMP) is also put forth, which if implemented, could have saved their lives and rewritten history.

VEHICLE DETECTION USING CONVOLUTIONAL NEURAL NETWORKS FOR SEMANTIC SEGMENTATION AND MULTITASK LEARNING ON A LIMITED DATASET OF MULTISPECTRAL SATELLITE IMAGES. *DAVID ODAIBO*, UNIVERSITY OF ALABAMA AT BIRMINGHAM. *ZHENG ZHANG* AND *MURAT TANIK*, UAB.

With the exponential increase of satellite imagery, it is becoming increasingly necessary to develop methods to automate the analysis of these images. In this paper, we describe a convolutional neural network architecture that can identify 2 classes of vehicles (large vehicles, and small vehicles) in multispectral satellite images. In satellite images, vehicles are

particularly difficult to identify because of the relatively small surface area they cover (just a few pixels) in the overall image. Methods like deep learning require large amounts of data to work well, so this limitation presents a challenge. We show that multitask learning and using a shared representation in a convolutional neural network, results in improved performance in these semantic segmentation tasks when there are limited labeled training samples.

ENGINEERING AND COMPUTER SCIENCE POSTER ABSTRACTS

NUMERICAL MODELING OF HUMAN THIGH FOR IMPROVED TOURNIQUET DESIGN. *LUKE SMITH*, UNIVERSITY OF SOUTH ALABAMA.

In severe battlefield injury, tourniquets are commonly employed to restrict blood flow to limbs incurring severe bleeding. During prolonged application, ischemic and reperfusion tissue damage can occur as cells are starved of oxygen and then overwhelmed as blood flow is restored. An understanding of heat transfer may allow future tourniquet design to mitigate this damage. Tissue loss may be reduced by decreasing the temperature of the affected tissue, thereby extending the time available for tourniquet use. This allows for longer transportation of the wounded as well as a greater chance of tissue recovery. Models of heat transfer can be used to understand and design for the human thermoregulatory system. The Pennes bio-heat transfer equation uses a numerical analysis to understand thermoregulation between bone, muscle, fat, and skin within the human body, treating tissue as concentric geometric layers. Using TAItherm thermal software, we constructed a visual numerical model of these layers based on these equations and observed thermoregulatory change due to transient blood flows. A human thermal model was created as a 3-dimensional mesh consisting of 16 thermal layers with the potential for additional clothing layers. The model followed proportions of a 50th percentile male and blood flow was restricted to the left thigh to mimic the effects of tourniquet application. When subjected to steady-state environments of varying temperature, core tissue temperatures were noticeably reduced from lack of blood flow, compared to the actively regulated control model in the right thigh. This difference increased with environmental temperature, with a difference of several degrees between right and left thigh tissue. By adding additional clothing layers and varying body sizes, this difference in temperature may be further observed and controlled.

OPTIMIZING SYSTEM DESIGN USING SYSTEMC AND VHDL. *TRISTEN HIGGINBOTHAM*, UNIVERSITY OF SOUTH ALABAMA.

SystemC is a system design and implementation language that is modeled after C++. This language builds on the user's familiarity of C++, allowing digital design to take place at a relatively higher level with hardware functionality being expressed by behavioral constructs. This language uses libraries very close to or exactly like ones used when writing in C++. Alternatively, VHDL (VHSIC Hardware Description Language) is a commonly used hardware description language which allows the user to design circuitry more explicitly. VHDL allows a system's behavior or its structure to be described, but it not based on a common object-oriented language like C++. While these languages can be utilized to produce functionally equivalent systems, the complexity of the resulting logic determines the optimal design. We identified and analyzed performance differences between SystemC and VHDL implementations through complexity comparisons and analysis of relative chip consumption. Through this research, we are able to determine in what capacity each language is most optimal, be it length of code or simplicity of their respective products.

MICRO-PRISM BASED MULTI-/HYPER-SPECTRAL IMAGING SYSTEM. DALLAS GUFFEY AND DR. RAVI GOLLAPALLI, UNIVERSITY OF SOUTH ALABAMA.

In this study a micro-prism array (MPA) is studied as a possible component for spectral separation for usage in the build of a multi/hyperspectral imaging system. The benefits of this component over other components and techniques are that the MPA results in a power-free and a small-form-factor component making it more feasible to be mounted in commercially available digital cameras. Commercial software packages, Trace Pro and Autodesk software were used to design the MPA and Light Tools software for simulation of the object scene.

FIELD EMISSION CHARACTERISTICS OF SELECTIVE AND NON-SELECTIVE CARBON NANOTUBES (CNTS) GROWN ON CERAMIC SUBSTRATE FOR HIGH TEMPERATURE APPLICATIONS. BAHYA YAKUPOGLU, AUBURN UNIVERSITY. HULYA KIRKICI, UNIVERSITY OF SOUTH ALABAMA.

Carbon Nanotubes (CNTs) are very diverse nano scale materials of the fullerene structural family and they show excellent electrical, chemical and mechanical properties. In this work, selectively and non-selectively growing randomly oriented multi-walled Carbon Nanotubes (MWCNTs) are fabricated on ceramic substrates and experimental results are discussed. CNTs are synthesized to be used in high temperature applications on the polished side of %99.4 pure ceramic (aluminum oxide) substrate by using thermal Chemical Vapor Deposition (CVD) technique. Thin films of approximately 5 nm thick Iron (Fe) and Tungsten (W) catalyst layers are deposited on the samples using a DC plasma sputtering system. Different pattern sizes are formed for each sample using conventional microfabrication techniques and Scanning Electron Microscope (SEM) images of selective and non-selective CNTs are presented. Field emission characteristics, turn on fields, and Fowler-Nordheim curves are compared in vacuum at varying temperatures. The different pattern size effects on turn on field and effective emission area of CNTs are investigated and presented.

GRAPHENE BASED SPECTRAL AMPLIFICATION FOR INCREASED SENSITIVITY IN GLUCOSE CONTENT MEASUREMENT IN DIABETES PATIENTS. ANTHONY PORTELLA, UNIVERSITY OF SOUTH ALABAMA.

Very accurate measurement of blood glucose levels in diabetes patients is very critical. The current method of needle-based measurement is a painful experience for patients, who require multiple measurements in a day. Recently there has been renewed interest in development of other techniques, such using human saliva for glucose level measurements, thereby eliminating the need for needle-based tests. Recently a prism-fiber configuration has been used to increase the sensitivity of glucose level indicator in human saliva and we propose to use graphene based detector methodology to excite the glucose level indicator for an accurate representation of the glucose level presence in human saliva.

OPTIMIZING SPEED AND SENSITIVITY OF AN LED-BASED HYPERSPECTRAL IMAGING SYSTEM. *PHIWAT KLOMKAEW, SAM MAYES, THOMAS RICH AND SILAS LEAVESLEY, UNIVERSITY OF SOUTH ALABAMA.*

Our lab has worked to develop high-speed hyperspectral imaging systems that scan the fluorescence excitation spectrum for biomedical imaging applications. Hyperspectral imaging can be used in remote sensing, medical imaging, reaction analysis, and other applications. Here, we describe the development of a hyperspectral imaging system that comprised an inverted Nikon Eclipse microscope, sCMOS camera, and a custom light source that utilized a series of high-power LEDs. LED selection was performed to achieve wavelengths of 350-590 nm. To reduce scattering, LEDs with low viewing angles were selected. LEDs were surface-mount soldered and powered by an RCD. We utilized 3D printed mounting brackets to assemble all circuit components. Spectroradiometric calibration was performed using a spectrometer (QE65000, Ocean Optics) and integrating sphere (FOIS-1, Ocean Optics). Optical output and LED driving current were measured over a range of illumination intensities. A normalization algorithm was used to calibrate and optimize the intensity of the light source. The highest illumination power was at 375 nm (3300 mW/cm²), while the lowest illumination power was at 515, 525, and 590 nm (5200 mW/cm²). Comparing the intensities supplied by each LED to the intensities measured at the microscope stage, we found there was a great loss in power output. Future work will focus on using two of the same LEDs to double the power and finding more LED and/or laser diodes and chips around the range. This custom hyperspectral imaging system could be used for the detection of cancer and the identification of biomolecules.

SOCIAL SCIENCES PAPER ABSTRACTS

PARAMEDIC ETHICS V. ORDERS: A CASE STUDY. *MICHAEL ESSARY, R. BRYAN KENNEDY AND SUSAN D. HERRING, ATHENS STATE UNIVERSITY.*

Is it ever acceptable to disobey direct orders and deliberately ignore official procedures? This case focuses on a paramedic team that responded to an emergency call and found a serious accident with several grievously injured victims. Another emergency team was already at the accident scene, but welcomed the assistance of the second team due to the extent of the situation. Hearing that a team was already on site, the district communications center ordered the second team to leave the scene and return to the base station. Recalling their training and oath to serve the injured, the team members made the decision to disregard the order and continued to assist the other paramedics. As a result, the second team was charged with insubordination and was disciplined. The question to be considered in this case is whether medical ethics supersede institutional policy and procedures.

PLACE AND IDENTITY IN THE 2016 TAIWANESE PRESIDENTIAL ELECTION. *DANIEL MCGOWIN, JACKSONVILLE STATE UNIVERSITY.*

The 2016 Taiwanese general election ushered in a new era as the opposition Democratic Progressive Party (DPP) took the presidency and control of the legislative branch from the long-ruling Kuomintang (KMT) party. This marked the first time that the DPP concurrently controlled both branches. However, the victory by DPP presidential candidate Tsai Ing-wen also marked a dramatic shift in the electoral geography of Taiwan.

This paper examines the changing electoral geography of Taiwanese presidential elections. Since the first presidential election, the DPP victories concentrated in the southern part of the country. However, the 2016 election witness DPP victories in areas in the north that typically leaned towards the KMT. While the south is still an important stronghold for the DPP, the victories in the north demonstrate changes in the Taiwanese electorate and suggest that ethnicity, as well as domestic issues, are playing a larger role in Taiwanese elections.

SOCERNOMICS: SALARIES FOR WORLD CUP SOCCER ATHLETES. *MORGAN GARRIS AND BILL WILKES, ATHENS STATE UNIVERSITY.*

This article explores the problems and relationships involved with the pay differential between male and female athletes in US professional soccer at the World Cup level. This investigation contrasts pay and performance of the US Men's Soccer team in the 2014 World Cup as compared to the US Women's Soccer team in the 2015 World Cup. The study focuses on participants of both genders who played on the respective World Cup teams and does not take into account the earnings and opportunities to play professionally in male and female soccer leagues worldwide. Other influences outside the US Soccer Federation, primarily FIFA, are considered when comparing the pay differences. The conclusion of this review indicates that male soccer World Cup players are paid more than their female counterparts. Implications of these findings may suggest changes in the way remuneration is determined

FOREIGN MILITARY SALES LOGISTICS SUPPORT. CHARLES ROBERTS, SUSAN D. HERRING AND R. BRYAN KENNEDY, ATHENS STATE UNIVERSITY.

The purpose of this paper is to briefly describe the United States logistical support program for Foreign Military Sales. Support is generally controlled by the Department of State and administered by the Department of Defense, with the infrastructure delegated to subordinate commands charged with Security Assistance and Foreign Military Sales case management. Due to the reduction of United States defense spending, contractors are increasingly providing logistics support. Increased contracting provides a positive alternative revenue source and serves to preserve production lines for defense contractors. Sub-contracted companies are emerging as significant forces in logistics support as well, with emphasis on foreign military customers. The results of this research indicate that foreign military logistics support will increase through Department of Defense outsourcing, and private industry can anticipate providing an increased level of support.

THE UNRULY ADVOCATE. THOMAS PIEPLOW, R. BRYAN KENNEDY AND SUSAN D. HERRING, ATHENS STATE UNIVERSITY.

This case involves the termination of a long-term employee with an excellent work record who was injured on the job and placed on sick leave and worker's compensation. An anonymous phone tip led to surveillance that showed he was fully able to work despite still receiving benefits. This led to his termination. Following termination, the employee filed a grievance that progressed to arbitration. The issue to be addressed in this case study is not the removal action but problems surrounding the unprofessional attitude taken by the Union advocate toward the arbitrator during the first few minutes of the grievance hearing, including rude and potentially prejudicial comments. This type of situation is rarely experienced at a labor arbitration hearing. Advocates sometimes engage in heated arguments that have to be defused by the arbitrator, but an attack on an arbitrator's honesty and integrity is extremely rare. The question is how address the advocate's negative behavior in an effective manner so the hearing can move forward.

SOCIAL SCIENCES POSTER ABSTRACTS

THE RELATION BETWEEN THE MENTAL CLUTTER SCALE AND SELF-REPORTED EXECUTIVE DYSFUNCTION. SARAH TAYLOR, STEPHEN AITA, BENJAMIN HILL, JAMESON BEACH AND JO HOLCOMBE, UNIVERSITY OF SOUTH ALABAMA.

Objective: This study evaluated the construct validity of the Mental Clutter Scale (MCS) using an established measure of self-reported executive dysfunction in a healthy sample.

Participants and Methods: 150 healthy participants (M age=19.67, SD=3.75; M education=12.35, SD=0.70; 74% female; 56% White, 34.7% African American, 6.7% Asian) completed the MCS and the Barkley Deficits in Executive Functioning Scale (BDEFS) as part of a larger battery. The MCS is a recent 16 item scale that has been used in pain research. Raw scores from the MCS and BDEFS were used for all analyses.

Results: Pearson correlations for scales and subscales of the MCS and BDEFS yielded correlations ranging from .39 to .72 ($p < .001$). Next, multiple regression was used to predict executive dysfunction measured by the BDEFS using the MCS Cognition and Mental Clarity subscales. MCS subscales accounted for significant variance in the BDEFS ($F(2,143)=80.70$, $R^2=.53$, $p<.001$). In the regression model, both MCS subscales (Cognition and Mental Clarity) were significant predictors of self-reported executive deficits ($\hat{\beta}=.30$, $p=.002$; $\hat{\beta}=.47$, $p<.001$, respectively).

Conclusion: MCS performance explained a significant proportion of variance in self-reported executive dysfunction. This new short scale of self-reported, “mental clutter” was observed to function similarly to the BDEFS in a healthy young adult sample, supporting its convergent validity and possible clinical utility for measuring executive impairment.

INCONSISTENCY IN RESPONDING IS ASSOCIATED WITH GREATER SELF-REPORTED EXECUTIVE DYSFUNCTION. JAMESON BEACH, STEPHEN AITA, BENJAMIN HILL, SARAH TAYLOR AND JO HOLCOMBE, UNIVERSITY OF SOUTH ALABAMA.

Background and Objective: Intra-individual variability (IIV) can be conceptualized as an index of consistency. An emerging literature supports IIV as a measure of neuropathology. This study evaluated the association between item level IIV and performance outcome on self-report measures of attention/executive functioning.

Method: 130 university participants (M age=19.44, SD=3.15; M education=12.34, SD=.69, 3.1% White, 36.9% African American, 7.7% Asian; 73.8% female). Exclusion criteria included self-reported psychiatric diagnosis. Participants completed the Barkley Deficits in Executive Functioning Scale (BDEFS) Long Form and Barkley Adult ADHD Rating Scale IV (BAARS) as part of a larger battery of tests. IIV was calculated as the individual’s standard deviation around their own mean. IIV was calculated from raw scores for BDEF and BAARS total score and all subscales.

Results: A series of Spearman's rho correlations were conducted to determine if there was a relationship between IIV (both BDEFS and BAARS) and BDEFS total score. BAARS IIV value and BDEFS total score were significantly correlated $r(128) = .54, p < .01$, demonstrating that lower consistency in reporting on the BAARS was associated with higher reported executive dysfunction on the BDEFS. BDEFS IIV value was also highly correlated with the BDEFS total score $r(128) = .78, p < .01$. In addition, the IIV of all BAARS individual subscales ($r = .21$ to $.49$, all $p < .01$) and IIV of all individual BDEFS subscales ($r = .46$ to $.67$, $p < .01$) were all significant predictors BDEFS total score.

Conclusions: Increasing item level variability was positively associated with self-reported deficits across two different self-report measures of attention/executive dysfunction in a healthy sample of young adults. These results support IIV of self-reported executive symptoms as a potential marker of neuropathology in line with previous research looking at objective measurement of executive functioning.

NEED FOR COGNITION AND ITS RELATION TO SELF-REPORTED EXECUTIVE DYSFUNCTION. *STEPHEN AITA, BENJAMIN HILL, SARAH TAYLOR, JAMESON BEACH AND JO HOLCOMBE, UNIVERSITY OF SOUTH ALABAMA.*

Objective: The purpose of the present study was to examine the relation between Need for Cognition, a personality trait of how much a person enjoys effortful mentation, and self-reported executive dysfunction.

Method: Participants were healthy college students ($N=130$; M age= 19.45 , $SD=3.16$; M education= 12.34 , $SD=0.69$; 73.8% female; 53.1% White, 36.9% African American, 7.7% Asian). Participants completed the Need for Cognition (NFC) short scale and Barkley Deficits in Executive Function Scale (BDEFS) as part of a larger battery. BDEFS total and subscale scores were used.

Results: Pearson correlations revealed significant negative relations between NFC and BDEFS total and subscales, $r = -.28$ to $-.42$ ($p < .01$). The BDEFS subscales were entered into a multiple regression to predict NFC. This model explained 20.2% of the variance in NFC ($R^2=.202$, $F(5,124) = 6.28$, $p<.001$). Only the BDEFS Self-Organization and Problem Solving subscales significantly predicted NFC ($\beta \leq -.35$, $p=.008$) with the other BDEFS subscales not significantly predicting NFC.

Conclusions: The personality trait NFC was significantly related to all domains measured by the BDEFS. Greater NFC was associated with less self-reported executive deficits but only self-organization and problem solving significantly predicted NFC. These findings fit into a positive neuropsychology framework where enjoyment of thinking may be linked to robust executive abilities.

**PERCEPTIONS OF THE USE OF DIFFERENTIATED INSTRUCTION.
DANA WILCHCOMBE, ALABAMA A&M UNIVERSITY.**

The purpose of this study was to investigate how college faculty at a local university perceives the use of differentiated instructional practices in their courses. Faculties were interviewed about their knowledge, practice and perception of differentiated instruction. The findings indicate that college faculty perceptions of differentiated included the use of small group instruction, assessment, and a variety of strategies. Professors implemented differentiated instruction through the use of small group discussions, student responding to the teacher, teacher questioning, teacher interaction with individuals and anchoring lessons and materials with students before and during lessons to help students' development and maintain prior knowledge of learning material.

RETROSPECTIVE EVALUATION OF A TEACHER'S TRAINING PROGRAM. YANLING MA AND YUANTAO SUN, AUBURN UNIVERSITY.

Despite the significance of teacher's training, surprisingly the effects of teachers' training are not always shown to be beneficial for student outcomes (e.g., Kennedy, 1998; Corcoran, 1995). One possible reason could be attributed to the pervasiveness of single-shot, one-day, low-intensity training which lacks continuity and accountability. Different from U.S. teachers who seldom receive intensive, content-focused professional trainings in math/science courses (e.g., Birman et al., 2007), the teachers in China are required to attend mandated, sustained workshops frequently. As part of an international study aimed to address the challenging issue of adolescents' math/science achievements, this current study tests the effectiveness of teachers' training on classroom managements skills, emotion management skills, teacher-student communication skills, and teacher-parent communication skills. The sample contains 135 teachers from more than 10 elementary schools and middles schools in China. Participants were asked to fill a retrospective pre-post questionnaire to measure program impacts after attending a four-day training. Participants had an average age of 39 years; the majority were female (66%); in terms of school type, 10% were pre-school teachers, 32% were elementary teachers, 50% were middle school teachers, and 8% were high school teachers. On average, all teachers had 17 years of experience. The preliminary indicated that the majority of teachers (92%) are motivated to attend future training. The two most favorite training contents are teaching skill in their major (26%) and class management skill (23%). The result also indicated that participants benefited from all dimensions from the training program. Future studies should test whether and how other factor weakening or strengthening the training effects. Although this study is limited by the lack of true test and control condition, true pre- and post-test data collection, it is novel to evaluate teachers' training effects using Chinese sample.

UNDERSTANDING THE PSYCHOSOCIAL FACTORS THAT INFLUENCE. JALEAH RUTLEDGE AND ADETOYOSI OBIKOYA, TUSKEGEE UNIVERSITY.

Some of the earliest studies on retention focus on repairing student's inability to graduate (Shushok&Hulme, 2006). Because of this, much research exists on ways to increase persistence in students without examining the psychological processes that underlie low retention rates. For minority ethnic groups specifically, retention rates are significantly lower

than other ethnic groups. Initially, Historically Black Colleges and Universities (HBCU) were created to facilitate the successful education of African-Americans. In spite of this, retention rates at HBCU's are continuously decreasing and have risen to the forefront of concerns in higher education (Richards & Awokoya, 2012).

This paper will provide a brief review of the literature on the history of retention of undergraduate African-American students, and at HBCU's as well as the factors that are typically related to undergraduate retention. This will also involve an examination of the psychological processes that could influence undergraduate retention rates. This study will use the attribution theory, a theory that proposes one makes attempts to understand behavior by attributing certain beliefs, feelings, and intentions. This study will examine measures of the attribution theory such as locus of control on retention among college students at a small, historically black university.

The study will utilize a mixed method research design consisting of qualitative and quantitative data in the form of focus groups and surveys. We expect a better understanding of what and how psychosocial factors influence retention for undergraduate African-American students. With this information we hope to contribute to the existing literature on undergraduate African-American student retention at HBCU's and ultimately provides recommendations to improve retention rates at HBCU's.

VALIDATION OF AN ANTI-WHITE PREJUDICE SCALE IN A RURAL AREA. KELLY PIVIK, CLINTON WILLIAMS, HAKIMA AMERG, ALEXIS HARRIS, VICTORIA HARRIS AND JARIUS REMBERT, UNIVERSITY OF WEST ALABAMA.

Most of the research, and many of the theories, regarding racial prejudice examines how Whites are prejudiced against other races. Only limited research has examined racism against Whites (anti-White racism) (e.g. Brigham, 1993; Johnson & Lecci, 2003). As a result, few measures have been developed that measure anti-White attitudes. Some of the anti-White measures suffer from incomplete validation because of their limited use. The current study attempted to further validate the Johnson-Lecci Anti-White Scale (Johnson & Lecci, 2003, 2006). The original sample included student and community members from an urban, predominately black university (85% Black; L. Lecci, personal communication, September 15, 2015). The present study assessed scale validity using students and community members from a rural area (Black student population approx. 40%). Similarities and differences in the samples, as well as implications for the usefulness of the scale, are discussed.

RACIAL PERCEPTIONS OF CAR LOCKING BEHAVIORS. MARY RIVERS, KELLY PIVIK AND LAMIA HERNANDEZ, UNIVERSITY OF WEST ALABAMA.

The current study examined how observations of pedestrians of different races and sexes influenced participants' perceptions about the car locking behaviors of a driver. Previous research has found that behaviors are monitored closely during interracial interactions because of a fear of another using stereotypes (Alexander et. al, 2012). In a 2 (pedestrian race: black vs. white) X 2 (pedestrian sex: male vs. female) design (driver was held constant across all conditions), we hypothesized that male pedestrians would be viewed as more threatening than females, and black pedestrians would be viewed as more threatening than white pedestrians.

We further hypothesized that the race and sex of the pedestrian would influence participants' perceptions of the motivation behind the driver's car locking behavior. Facial expressions of emotions were recorded while participants watched the video using the Facial Action Coding System (FACS; Ekman & Friesen, 1978) to examine differences in responses to the video. Hypotheses were partially supported. Participants' perceptions differed from those thought to be held by the driver. For example, participants rated white males as more likely to break into the vehicle than black males, but no differences were found in perceptions of the driver's attitudes. Contrary to prediction, no differences were found between males regarding perceived threat or suspicion. No difference was found between conditions regarding perceived motivation behind the driver locking the car. Most responses were related to either safety of personal belongings or habit. Implications and future directions will be discussed.

TROY COMMUNITY OPINIONS PROJECT: AN EXERCISE IN APPLIED SOCIOLOGY. CHRISTOPHER BRADLEY AND SELENA MCEWEN, TROY UNIVERSITY. TAYLOR NOWLIN, TROY UNIVERSITY.

The mayor of the city of Troy is dedicated to improving the quality of education, the quality of the economy, and the quality of life for the citizens of Troy. In order to successfully achieve these goals, it is important for the mayor to have accurate and up-to-date information concerning the opinions of the residents of Troy. Troy is a warm and friendly community nestled in the heart of lower Alabama; approximately one-third of the town's residents are college students who attend Troy University, and around one in every ten residents are age 65 or older. The current project gathered opinions via a series of focus groups from three key demographics of the Troy community: college students, senior citizens, and adult residents of Troy. Results suggest that residents are satisfied with the job being done by the mayor, that residents enjoy an excellent quality of life, and that residents believe that Troy is a safe and prosperous community.

A PRELIMINARY INVESTIGATION OF THE IMPACT OF URBANIZATION ON ANIMAL ASSEMBLAGES IN MOBILE COUNTY. LAUREN WHEAT, ASHLEY TATHUM, ADAM STERN, TAKIA SMITH AND STEPHANIE JETT, UNIVERSITY OF SOUTH ALABAMA.

The current project is part of a larger research program studying the impact of urbanization on the distribution, behaviors, and cognitive abilities of species acting as scavengers along an urban to rural gradient in Mobile County, Alabama. We utilized trail cameras and bait stations placed in locations varying in level of urbanization to observe what species of animals are active in what parts of the gradient. Our work is rooted in establishing a theoretical framework that takes concepts first introduced by famed ethologist Niko Tinbergen in the sixties and connects it with comparative evolutionary psychology (CEP). This framework incorporates species' ecology (e.g. environmental pressures), phylogenetic (evolutionary) histories, and ontological pressures (e.g. developmental contexts), which is a unique perspective within CEP. Being that ecology is a dynamic system that can have a rapid impact on a species' behavioral and cognitive toolkits, research looking at the impact of urbanization - a major, increasing pressure - becomes of heightened importance for conservation and adaptation, allowing for the impact of human encroachment to be mitigated and minimized. The broad hypothesis of the research is that differences will be seen in the diversity of species active at the sites as a

consequence of urbanization. More rural sites could produce a higher level of diversity due a decrease in human population pressures and a greater availability of space to feed, reproduce, etc. In contrast, several species of large mammalian predators have been reported anecdotally and in local media as encroaching into more urban areas due to the abundant availability of human-generated food waste. These reports are suggestive of some species being better able to adapt to the pressures of urbanization than others. We hypothesize that species who act as scavengers may be those species who possess the behavioral and cognitive flexibility to adapt to such pressures. Preliminary findings will be discussed in terms of animal assemblages observed at the bait sites along the gradient.

RACIAL AND GENDER DISPARITIES IN LENDING PRACTICES IN ALABAMA. *ASHI AGBOGUN, ASHI AGBOGUN, NTAM BAHARANYI, YANLING MA, NII TACKIE AND ROBERT ZABAWA, TUSKEGEE UNIVERSITY.*

Although previous studies have continued to shed light on lending practices, research using Alabama and with its persistently poor counties is limited. In addition, the financial bias (e.g., unfair credit scoring) has been well studied over time. However, attention has just been paid to research addressing the non-financial bias (e.g., social factors). Therefore, the purpose of this study is to give a holistic picture of non-financial bias by testing the racial and gender disparities in lending practices (i.e., loan approved/denial and interest rate paid) in Alabama. The sample was obtained from the 2012/2013 Home Mortgage Disclosure Act (HMDA) data and includes 434,358 loan applications. Preliminary analyses showed that, the minority group with highest approved loans percentage is Asian Americans with 53.6 percent in direct contrast with African Americans with a mere 39.5 percent approval, which corresponds to the highest percentage of denied loans at 60.5 percent. Even so, White Americans have the highest approved status at 54 percent, correspondingly, the lowest denial percentage at 46 percent. Male applicants also had a significant advantage in approval ratings with 53 percent approval versus 47 percent approval for female applicants. The study also found differences in interest rate paid (i.e., high, medium, and low) by approved borrowers. Results indicated that all races had their highest percentage of approved loans with the lowest interest rate spread. At the medium interest rates category, Whites had 33.8 percent while minorities had 28.3 percent. Minorities with approved loans had 16.2 percent of their loans approved with the highest bracket interest rates with just 10 percent of Whites in this group. Furthermore, logistic model will be used to test the role of gender and race directly and interactively on loan approved/denial.

DOG DAYS: UNIVERSITY ANIMAL PROGRAMS AND STUDENTS' MENTAL HEALTH. *TRENTON ADAMS, CATHERINE CLARK, VICTORIA CROWELL, KOLLEEN DUFFY, MARGARET GREEN, SELENA MCEWEN AND ALLISON WRAPE, TROY UNIVERSITY.*

Due to a high demand for mental health services, many colleges now offer students access to dogs and other animals as a way to help relieve stress and anxiety. This poster reviews the literature on the effectiveness of such programs and of animal-assisted therapy. The authors attended Troy University's annual "Puppies on the Quad" day. We will describe our experiences at the event and offer suggestions on how to start similar programs on other college campuses.

ANTHROPOLOGY PAPER ABSTRACTS

CURRENT CULTURAL RESOURCES RESEARCH USACE MOBILE DISTRICT. *MATTHEW GRUNEWALD* AND *MICHAEL FEDOROFF*, USACE MOBILE DISTRICT. *ALEXANDRIA SMITH*, USACE MOBILE DISTRICT.

The United States Army Corps of Engineers Mobile District is currently involved in archaeological research and compliance throughout its area of responsibility in Alabama, Georgia, Mississippi, and Florida. As part of its stewardship of cultural resources on project lands the Mobile District is ensuring the protection of numerous archaeological sites through compliance with the Archaeological Resources Protection Act. In addition, archaeologists at the Mobile District review military, construction, regulatory, and civil works projects to ensure actions are in compliance with the National Historic Preservation Act. This presentation provides an overview of our robust program.

THE POTENTIAL FOR ARCHAEOLOGY AT ANTEBELLUM SLAVE HOUSES IN ALABAMA'S BLACK BELT. *NATALIE MOONEY*, UNIVERSITY OF WEST ALABAMA.

The Black Belt Slave Housing Survey is an attempt to understand the history and anthropology of the slaves who lived in the Black Belt region of Alabama. Their ancestors make up the largest population demographic of the area, where the archaeology of African Americans has been largely overlooked. This survey focuses on the houses where slaves and their descendants lived to aid our understanding of the daily lives of these subjugated people. Globally, house styles reflect environmental adaptations, cultural values, and class structure. However, the amount of agency available to slaves to shape their private living quarters and home lives is largely unknown. Since the first set of surveys in 2010, UWA students have surveyed a total of 16 different houses across 5 Black Belt counties. Using archaeological, architectural, and archival methods to document these slave houses, we have so far demonstrated that most houses were only repurposed by the freedmen who continued to live there after Emancipation. This ongoing survey is helping us develop an archaeological research design for the investigation and comparison of slave house sites across the region.

OLDOWAN STONE TOOLS AND HOMININ COGNITION: WHAT CAN STONE AGE TECHNOLOGY TELL US ABOUT CONTEMPORARY LEARNING? *BRITTNEY HIGHLAND* AND *PHILIP CARR*, UNIVERSITY OF SOUTH ALABAMA.

Oldowan Stone Tools and Hominin Cognition: What Can Stone Age Technology Tell Us About Contemporary Learning?

Oldowan stone tools are the first semblances of technology in the story of human evolution available for archaeological study. The invention of the stone tool is considered a major milestone in the human story, because of its far reaching effects on the adaptation of the genus *Homo* in regards to cognition and learning. These technological abilities will drive the members of the genus *Homo* to become some of the most adaptable creatures on the planet.

Understanding the evolution of human cognition and pedagogy is invaluable to understanding the emergence of modern human society. Through a series of collaborative experiments, this research will begin to uncover the ways the first hominins learned, shared, and communicated their knowledge surrounding the Oldowan tool industry. These experiments will include contemporary stone knappers sharing the techniques involved in Oldowan production with novice knappers within set pedagogical parameters. These experiments are meant to model possible ways that Oldowan tools may have been produced and understood by early members of the genus Homo. This research intends to uncover how pedagogy has evolved, and create a dialogue on the ways teaching may adapt for the future. This research is ongoing, and preliminary findings will be presented and discussed.

AN INVESTIGATION OF A WALL TRENCH STRUCTURE AT THE THRASH SITE. *JESSICA HELMS*, TROY UNIVERSITY.

The purpose of this paper is to investigate a possible Gulf Formational Period rectangular wall-trench structure discovered during an archaeological excavation of the Thrash site (1PK71) along the Pea River in Southeast Alabama. Though wall-trench structures are typically associated with Mississippian residential structures, archaeological evidence suggests this particular structure could date to much earlier. This discussion will examine the artifact assemblages found on the floor of the proposed structure as well as other features, such as cooking pits found within proximity of the structure in order to give it context within the Thrash site and the Gulf Formational period.

GULF FORMATIONAL LITHIC TOOLS FOUND AT THE THRASH SITE. *RACHEL DALY*, TROY UNIVERSITY.

This paper will analyze the large variety of lithic artifacts present at the Thrash site (1PK71) and place them within the larger context of the region during the Gulf Formational period. Examples of the tools found include a number of point types, modified flakes, specialized core tools, nutting stones, and knives. The sources of the different stone materials are consistent with local and regional quarries with marginal exotic sources present. Contemporaneous artifacts found in relation to the stone tools indicate a relationship with the Poverty Point Culture at the end of the Late Archaic Period. A deep analysis of these stone tools gives valuable insight to how the people functioned on a day-to-day basis during this period of cultural transition.

POTTERY AT THE THRASH SITE. *ELIZABETH GARRETT*, TROY UNIVERSITY.

1PK71, or the Thrash site, is a Gulf Formational site located near the Pea River close to the Pike-Barbour county line. The Thrash site has a diverse range of pottery from the Southeastern United States. The pottery ranges from fiber-tempered, sand-tempered, Dunlap cord-wrapped dowel impressed, punctated, and complicated stamped. The variety of the pottery at Thrash is unique and by studying them, we can look at the cultural influences that affected the inhabitants of the Thrash site.

THE THRASH SITE: AN INTRODUCTION TO A GULF FORMATIONAL SITE IN PIKE COUNTY, ALABAMA. *JASON MANN*, TROY UNIVERSITY.

Excavations at the Thrash Site (1Pk71) began in the summer of 2013, and have continued as a regular summer archaeological field school of Troy University. Over the course of four summer field seasons student excavations have revealed the site to be related to the Poverty Point culture and the transitional period from the Late Archaic to the Early Woodland Stage. Large pits, potential structures, fiber and sand tempered pottery, soapstone vessels, cooking pits, evidence for uncommon cooking methods, and a wide variety of lithic tools have been recovered. This presentation will serve as an introduction the Thrash Site and its importance to the understanding of the prehistoric in the middle coastal plain of Alabama.

CITIZEN SCIENCE WATER QUALITY MONITORING IN NORTHEAST ALABAMA. *STEPHEN TSIKALAS*, JACKSONVILLE STATE UNIVERSITY.

The Jacksonville River Monitors (JRM) is part of Alabama Water Watch (AWW), a citizen volunteer water quality monitoring program with the aim of improving Alabama's water quality and water policy. Adding to the growing body of citizen science literature, this research poses the following questions: (1) how does AWW play a role in Alabama citizen science, (2) what environmental impact does the JRM have in the region, (3) what measures are taken to ensure data quality and organization longevity? Alabama Water Watch (AWW) was established in 1992 as a citizen volunteer water quality monitoring program. This program has established a network of volunteers across the state of Alabama and has catalogued thousands of water sample data state-wide. Analysis of the number and distribution of trained volunteers by the JRM between 2013 and 2016 reveals they have trained over 30 chemistry and 15 bacteriological water monitors. The majority of these volunteers reside in northeast Alabama. The JRM has sampled stream segments in Jacksonville, AL on a monthly basis for 3 consecutive years. Their data indicate overall healthy stream chemistry, but frequent fluctuations in *Escherichia coli* (*E. coli*). The sampling methods and water testing materials are all standardized and approved by the Environmental Protection Agency (EPA) to help ensure quality data. AWW also publishes manuals that all volunteers are required to use in the field. Active members of the JRM were informally interviewed to gather information on long-term goals. The JRM is seeking ways to sustain itself into the future. A common problem with citizen science groups is that they tend to fizzle out over time. Being housed at Jacksonville State University provides a constant pool of young scientifically and environmentally minded students to participate in the JRM. The legacy of AWW and need for a training location in northeast Alabama has also aided the JRM in recruiting members from the community. Finally, maintaining two to three committed members in leadership positions has proven essential.

UTILIZING GIS TO GAIN A BETTER UNDERSTANDING OF NATIVE FEATURES IN NORTHEAST ALABAMA: MORTON HILL, CALHOUN CO., ALA. (SITE-1CA671). *JACOB BRAMLETT*, MARK JONES, HARRY

HOLSTEIN AND JOE MORGAN, JACKSONVILLE STATE UNIVERSITY.

Utilizing GIS to gain a better understanding of Native features in Northeast Alabama: Morton Hill, Calhoun Co., Ala. (site-1CA671)

Jacob Bramlett, Department of Physical and Earth Sciences, Jacksonville State University, Jacksonville, Al 36265

Alabama plays host to many archaic sites, leftover imprints of the Native populations that once inhabited the area. Features have been found all across the state, in great variety, including burial mounds, stones walls, animal effigies, rock caches and countless artifacts. This research has focused on the stone structure complex of archaeological site 1CA671, found in Calhoun County's Morton Hill, lying in the foothills of the Appalachian Mountain range. The site has significant amounts of stone walls and effigies. Located on top of a steep incline of approximately 2000 ft ASL, the site does not appear to be practical for agricultural purposes. The question of why the previous inhabitants of the area would have put forth so great an effort in building these stone structures at such an inhospitable location arises. The purpose of our research is to gain a better understanding of the culture of the Natives, how this site was used, and what it provided for the previous populations. Utilizing ArcMap10.2.2 GIS and a tremble unit to map this site has offered a fresh view of the past by helping us create an overhead look for possible symmetry and uses of the area. Based on our observations and with the assistance of resident Archaeologist, Dr. Harry Holstein, we have theorized the possibility of the site in question being used as a spiritual location for the religious practices of the Natives.

STEATITE FRAGMENTS OF THE THRASH SITE. RAY JEFcoat, TROY UNIVERSITY.

The Thrash Site is a Gulf Formational site located in southeast Alabama next to the Pea River in Pike County. The site produced steatite vessel fragments alongside sand tempered pottery sherds, fiber tempered pottery sherds, and poverty point objects. These artifacts found alongside the steatite vessel fragments are consistent with the transition to clay pottery and other Gulf Formational sites.

THE BENEFITS OF PRACTICING MARITIME ARCHAEOLOGY WITHIN ALABAMA. ROBERT ELMORE, TROY UNIVERSITY.

Like many states in the southeastern United States, Alabama is full of a large number of archaeological sites, both historic and prehistoric. While a vast majority of these sites and their resources are found on land, a number of cultural materials are currently submerged in rivers, lakes, ponds, and other bodies of water. This presentation will look at the benefits there could be for the state of Alabama if it were to invest more time and energy towards recovering these materials through maritime archaeology. A brief definition of maritime archaeology will be discussed, followed by laws and cases involving submerged cultural resources. The paper will close with the potential knowledge that may be uncovered from the investment, as well as the jobs and potential economic development that may occur throughout the state.

**ARCHAEOLOGICAL INVESTIGATIONS OF NATIVE AMERICAN
STONE STRUCTURE PRAYER SEATS LOCATED ATOP
CHOCOLOCCO MOUNTAIN, CALHOUN COUNTY, ALABAMA.
*HARRY HOLSTEIN, JACKSONVILLE STATE UNIVERSITY.***

Along the rugged stony crest of Choccolocco Mountain within the property of the Mountain Longleaf National Wildlife Refuge in northeastern Alabama, Jacksonville State University (JSU) archaeologist have recorded and investigated what they believe to be several loose stone U-shaped wall sacred Native American prayer seat sites. Based upon stone structure morphology, spatial placement, ethnographic stone prayer seat descriptions from several western Native American tribes and southeastern Creek and Cherokee mythology, seven stone structure archaeological sites recorded by JSU contained one or more Native American prayer seats. This paper will discuss the evidence supporting this conclusion.

ANTHROPOLOGY POSTER ABSTRACTS

THE ORGANIZATION OF EARLY ARCHAIC TECHNOLOGY IN SOUTHWEST ALABAMA: AN AGGREGATE ANALYSIS OF 1WN106. JAMES NORRIS AND PHILIP CARR, UNIVERSITY OF SOUTH ALABAMA.

The Seed Tick Site (1WN106) is multi-component based on stone tool types with a range of 10,000 - 1,200 B.P. This study provides the first detailed analysis of the Early Archaic, a poorly understood time period in the region, and employs an organization of technology model. The entire collection had to be organized, a site map produced, and the Early Archaic components isolated. This analysis included an examination of the stone tools from a cultural-historical and technological basis, as well as a detailed analysis of flake debris through aggregate and individual flake analysis. These analyses are ongoing, to date results indicate people occupying the site brought a stone toolkit that included non-local Tallahatta Sandstone and chert. These curated tools were used at the site, resharpened, and discarded there. Those discarded tools were replaced by ones newly made using local raw materials, Ferruginous Sandstone and quartz, to manufacture expedient as well as curated tools. Additional analyses will be aimed at testing hypotheses regarding the mobility strategy employed by the site's residents.

EL NIÑO SOUTHERN OSCILLATION AND TORNADO FREQUENCY IN ALABAMA. TIFFANY DEBOER AND STEPHEN TSIKALAS, JACKSONVILLE STATE UNIVERSITY.

Tornadoes in Alabama have gained more attention since the devastating April 27th, 2011 outbreak. There has also been an increase in research suggesting greater frequency of tornadoes in a region east of Tornado Alley, named Dixie Alley. Dixie Alley is comprised mainly of the southeastern states, including Alabama. Several studies have addressed the impact of the 2011 tornado outbreak. Extensive research on Alabama tornadoes has also been conducted by the National Weather Service (NWS) office in Birmingham, AL with a database stretching back to 1794. One area not well addressed, however, is the potential influences of El Niño Southern Oscillation (ENSO) on tornado frequency throughout the state. Analysis of NWS data revealed La Niña years with the greatest mean frequency of tornadoes, followed by El Niño years and then neutral years. In addition, years with exceptional tornado frequency tended towards La Niña years.

STEM EDUCATION PAPER ABSTRACTS

COMBINING AN AUTHENTIC RESEARCH EXPERIENCE WITH DISCUSSION OF THE PRIMARY LITERATURE IN AN UNDERGRADUATE MICROBIOLOGY COURSE. *SINEAD NI CHADHAIN*, UNIVERSITY OF SOUTH ALABAMA.

At many institutions, biology majors' only exposure to the field of microbiology occurs in a single elective course. At University of South Alabama this course fulfills many roles, serving as an introduction to the field, preparation for advanced coursework, and a prerequisite for many graduate or professional programs. In addition, the course is designated a writing intensive course where students are supposed to develop competency in scientific communication. Historically the writing component was addressed by assigning a research paper. However, many students lacked the skills necessary to understand the sources they cited in their papers. The laboratory curriculum was also fairly standard with exercises where students learned aseptic technique, bacterial identification, etc. while working with known cultures provided by the instructor. I wanted to incorporate an inquiry-based research project into our course that would address both the writing component of the course and incorporate authentic research into the curriculum. I combined blog based discussions of research papers describing the isolation and characterization of naphthalene degrading bacteria with student research in the laboratory component of the course. Research papers were posted in sections on a class blog and students were required to post a minimum of two comments on each section and write a paper summary once the discussion closed. At the same time each student isolated their own naphthalene degrading bacterium from a soil or water sample through serial dilution and plating on minimal medium with naphthalene as sole carbon and energy source. The presence of an aromatic dioxygenase was confirmed by incubation with indole and production of indigo. Standard staining techniques were performed to confirm that pure cultures were obtained before biochemical testing and amplification and sequencing of the 16S rRNA gene, construction of phylogenetic trees, and screening of the cultures by PCR for aromatic dioxygenase genes. The semester concluded with a poster session where students presented their research projects to the biology department community. Overall, students isolated 30 naphthalene degrading bacteria with 28 students successfully maintaining their isolates in pure culture until the end of the semester. DNA sequence analysis revealed that the isolates belonging primarily to the *Acinetobacter* and *Bacillus* genera. The genomes of two selected isolates will be sequenced and studied in a follow up research intensive course in Experimental Bacterial Genomics.

STEM OUTREACH OPPORTUNITIES FOR THE AUGUST 2017 TOTAL SOLAR ECLIPSE. *MEL BLAKE*, UNIVERSITY OF NORTH ALABAMA.

Few events are as impressive as a total solar eclipse. From any given location it can be several decades between such events, and they offer a unique opportunity for teaching about the sun, moon earth system and astronomy in general. On August 21st, 2017 a total solar eclipse will take place that will be visible from much of the continental United States, from Seattle to South Carolina. From Alabama it will be a partial solar eclipse, but it will still be an impressive celestial event. I will share ideas about possible STEM outreach activities that can be done to encourage people to view the eclipse and teach about the importance of such events in history.

A RELATIONSHIP BETWEEN HAMMING DISTANCE AND 8-QUEENS PROBLEM: A STEM EXERCISE. *SERKAN GULDAL, ZEKAI DEMIREZEN, MICHAEL LIMPSCOMB AND MURAT TANIK,* UNIVERSITY OF ALABAMA AT BIRMINGHAM.

This paper we introduce an activity designed for STEM students. We have a program at UAB Electrical and Computer Engineering department to reach out local high schools for engineering training. As such we design and develop various activities for our STEM classes. In this activity we cover Hamming Distance and its use in information theory and we cover N-Queens problem and its use in computer science. To make the activity interesting we connect these two problems. In our inquiry, we displayed all 92 8-queen solutions on a cube and calculated hamming distances between solutions. We observed that there are 33 distinct Hamming distance.

STEM EDUCATION POSTER ABSTRACTS

TRAINING THE NEXT GENERATION: AN ANALYSIS AND COMPARISON OF CURRICULA IN INSTRUMENTAL MUSIC EDUCATION. *DESTIN HINKEL*, UNIVERSITY OF SOUTH ALABAMA.

Overview

Music education curricula usually have a common division of ensemble types in the fall and spring of the academic year. In instrumental music, this division occurs with primarily marching band in the fall and indoor ensembles in the spring. Unfortunately, marching band puts more of an emphasis on repetition and automatization than genuine musical development, and music students are generally not introduced to a comprehensive music education until midway through the year. This study sought to identify exactly the strengths and weaknesses of a curriculum that is structured in this manner.

Methods

A survey was sent to 484 band directors in the state of Alabama with quantitative questions regarding the focus of their curricula, as well as other questions meant to acquire a general idea of their teaching techniques and how they differed between different types of ensembles. The band directors were also given an open ended option to each question so that they could justify or further explain their answers. Primary sources on music education were also consulted to evaluate the psychology of those learning music along with the philosophies and methodologies of those who teach music. Interestingly, the qualitative and quantitative data was not consistent across the board. For example, band directors who indicated on the chart that they focused their entire programs towards concert band wrote paragraphs about how marching band took up far too much of their time.

Results

Concluded from the study was this idea that students in many musical programs across Alabama and other parts of the United States are not receiving a comprehensive music education. Instead, they are taught music through repetition and autonomy encourage primarily from the marching band. Although the current curriculum focuses much more on marching band, there is no evidence that says educational moments are not present for all types of ensembles, the methodologies used will have to change drastically so that educators are able to both educate students musically in the fall and put on a quality marching band performance. Although much planning goes into the selection of repertoire for the concert band in the spring, the planning of the competitive marching band begins almost immediately after the previous season has ended with the selection of show music and a drill designer. The idea that so much thought is spent on an ensemble that teaches music through repetition gives the impression that a musically stimulating concert band is not the center of all ensembles in the instrumental music program.

INTEGRATING RESEARCH-BASED TEACHING IN SECONDARY AND UNDERGRADUATE SCIENCE COURSES. *NIKKI PATEL AND UDUAK AFANGIDEH, FAULKNER UNIVERSITY.*

Integrating Research-Based Teaching in Secondary and Undergraduate Science Courses

Nikki K. Patel, Department of Education Faulkner University, Montgomery Alabama and Uduak Afangideh Department of Natural and Physical Sciences, Faulkner University, Montgomery Alabama

Science teachers across Alabama hope to inspire students to pursue future education and career opportunities in the science, technology, engineering, and mathematics (STEM) fields. Current research studies suggest that students are losing interest in science as they progress from middle school through undergraduate levels of education. In a global society, students in the U.S. are falling behind in math and science. As educators, it is important to first identify and confirm the source of the decline and make effective changes to our pedagogy to prepare our students to be competitive candidates for future opportunities in the STEM fields. This research study surveyed a group of 10th-12th grade students at a rural, low-income school in Alabama. and found that over 80% of students reported having a notion of self-confidence in their ability to do well in science, but less than 30% of students believed they would be able to use and apply their knowledge outside of school. Survey questions included the instructional activities primarily used throughout the course, and how often those activities were used to facilitate learning and understanding of science concepts. Results indicated the interest of students in science was adversely affected by mode of instruction and inadequate laboratory instructional periods. It appears that in order to immediately address the academic concerns leading to the decline of student interest in science, as well as other STEM subjects, educators must find innovative ways of capturing their students' interest, relate content in a meaningful way and encourage students to confidently make their own connections and discoveries through inquiry. It is proposed that the preliminary data collected in this study be used as a model for future research to enable identification of the reasons for the decline of student interest in science, as well as other STEM subjects so that appropriate steps could be taken to address those issues.

KEYWORDS: STEM, research integration, secondary, undergraduate, inquiry-based learning

EFFECTIVENESS OF STUDY HABITS IN UNDERGRADUATE INTRODUCTORY BIOLOGY. *HEATHER SPROWL AND HEATHER TINSLEY, UNIVERSITY OF MONTEVALLO.*

Study habits are variable, and their success often depends on a particular student's learning style as well as the type of course for which the student is studying. Understanding which study habits are most effective for improving student performance is important to help students succeed in college. This is particularly true in gateway courses, courses that are foundational for a major, high enrollment, and high risk in terms of student performance. Our study wishes to determine which study habits are most effective for student performance in BIO 105 Introductory Biology I, a gateway course at University of Montevallo. Over the span of two semesters, we administered a survey of study habits and test taking strategies after each semester exam to students enrolled in BIO 105. Analysis of these surveys revealed that, while a

few study habits and test taking strategies differed between A/B students and D/F students, the combination of strategies used may be a better determinant of student success.

COURSEWARE ENGAGEMENT IN STEM AND NON-STEM DISCIPLINES. *ROBERT FAULK, LAURA POWELL AND CHARLES BROWN, UNIVERSITY OF SOUTH ALABAMA.*

General Psychology (PSY 120) receives high enrollment by students majoring in virtually all disciplines. Few studies have compared the academic effort and study strategies invested in general education distribution requirements exhibited by students majoring in STEM and non-STEM disciplines. In General Psychology, students are assigned to read an e-book that has been designed to track the number of hours students spend reading and engaging the courseware material over the course of the semester. Not surprisingly, our preliminary research has shown that learning outcomes (final grades) are associated with courseware engagement. In general, the more time students spend utilizing the courseware materials, the higher their grade. However, variation in engagement efforts across disciplines has not been examined. According to Chen (2013), while attrition rates in STEM majors are high, non-STEM attrition rates are even higher in some areas. It is possible that those students populating STEM disciplines are able to assimilate the content of the general education curriculum with less effort than their non-STEM peers. Academically, they may simply be more efficient and gifted students. Alternatively, it is possible that STEM disciplines are populated by students who are obsessed with the quest for perfection and exhibit elevated investment in all of their courses. To address these questions, we collected institutional demographic data from 1,936 students enrolled in General Psychology and linked declared major with courseware engagement time and course grade. Results showed no significant difference in engagement between STEM and non-STEM students; however, results did show a significant difference in grade between STEM and non-STEM students, with STEM students receiving higher grades in General Psychology on average.

ENVIRONMENTAL AND EARTH SCIENCE PAPER ABSTRACTS

TRACKING INDUSTRIAL METALS AND CONTAMINATION IN THE CHATTAHOOCHEE RIVER: POTENTIAL POINT AND NON-POINT SOURCE POLLUTION TO THE APALACHICOLA BLUEWAY. *EMILY POWELL, JOE MORGAN AND EMILY POWELL, JACKSONVILLE STATE UNIVERSITY.*

This is a preliminary study to assay the concentrations and proximate locations of point source pollution for heavy metal content in sediment samples in the Chattahoochee River Basin. As a follow up to the Gulf of Mexico and Deep Water Horizons oil spill research we discovered increased levels of heavy metal concentrations in the Apalachicola Bay region. We determined that due to gulf currents and directional flows of the Gulf of Mexico these higher than normal concentrations were not likely to have resulted from the oil spill. Our investigation was designed to determine the level of concentrations along rivers and tributaries leading into the bay area. The two major waterways feeding into the bay region are the Chattahoochee River, traversing the State of Georgia from north to south in the west and the Flint River. These waterways converge at Lake Seminole at the Florida-Georgia border emptying into the Apalachicola Bay through the Apalachicola River. Looking primarily at the Chattahoochee River due to higher density of populations and density of industry we took samples of sediment and water at strategic locations from Atlanta to Lake Seminole. Using these samples we analyzed them for heavy metal concentrations for Aluminum, Chromium, Lead, Nickel and Vanadium using sediment analysis more completely describe in our methods section. Using the analysis from an independent laboratory in Northern Alabama, using analysis of variance we have found statistically significant variation in metal content and variations in our sample sites. We are narrowing our focus to specific areas.

ENVIRONMENTAL AND EARTH SCIENCE POSTER ABSTRACTS

PREDICTING SOIL MOISTURE IN NORTH ALABAMA USING AN ARTIFICIAL NEURAL NETWORK. *DARIUS KEITH*, ALABAMA A&M UNIVERSITY.

Soil Moisture information and research is important to producers in the agricultural industry. Currently, large amounts of water resources are depleted due to lack of accurate data. Ground and satellite data was used to train an Artificial Neural Network (ANN) using the Backpropagation method. In contrast traditional methods of gathering soil moisture have been time consuming and physically strenuous on farm workers. Our research will focus upon cost efficient methods of collecting soil moisture data using an ANN. Our study was conducted in Huntsville, Alabama which is geographically located in the Tennessee Valley. The parameters of our research study were based on temperature, rainfall, radiation, bulk density, and a water retention curve. The objective is to predict soil moisture using satellite remote sensing data. Our model for this study was done with a fully functional neural network capable of predicting soil moisture data with a rms of 4 % accuracy.

INVESTIGATION OF ADSORPTIVE MATERIALS FOR USE IN REMEDIATING CRUDE OIL SPILLS. *KENNETH LIVERMORE*, CHRISTOPHER BATES, ALFRED NICHOLS AND DAVID STEFFY, JACKSONVILLE STATE UNIVERSITY. *ASHLEE MILAM*, JACKSONVILLE STATE UNIVERSITY.

Oil spill material released by the 2010 Deepwater Horizon accident contaminated a majority of Alabama coastline. Efforts undertaken to prevent this material from washing ashore were largely unsuccessful. Adsorptive materials (fiberglass, vermiculite, Styrofoam and three different polymeric adsorbents) were investigated for use in the remediation of oil slicks and sheens before they could wash ashore. Desired characteristics in materials included affinity for oil, flotation, high surface area to mass ratio, lack of toxicity, disposability and low cost. Weighed amounts of test materials were added to a 24 cm x 24 cm x 5 cm plastic dish containing 300 mL of salt water and 40 mL crude oil. The mixture was placed on a multi-purpose rotator at low speed for one hour. The test material was removed from the salt water/oil mixture, allowed to drain for two minutes, and the mass of the material plus the bound oil was measured. Commercially available SpillTech Oil-Only Meltblown Pads served as a benchmark for these experiments. When tested, this material gave a ratio of grams of adsorbed oil per gram of adsorbent value of 9.3. The best performing test material, Styrofoam granules, had a grams of oil adsorbed per gram of adsorbent ratio of 12.1. In addition, Styrofoam meets the other desired characteristics for a remediation agent

HEALTH SCIENCES PAPER ABSTRACTS

ILEAL INTERPOSITION SURGERY CANNOT PREVENT THE ONSET OF TYPE 2 DIABETES IN RATS. *PING ZHAO*, UNIVERSITY OF NORTH ALABAMA. *APRIL STRADER*, SOUTHERN ILLINOIS UNIVERSITY CARBONDALE.

Background: Bariatric surgeries are effective in resolving type 2 diabetes independent of body weight loss. We have used ileal interposition (IT) surgery, a special type of bariatric surgeries, to study the role of the lower intestine in metabolic improvement. The surgery effectively improved glucose tolerance after the rats were treated by low-dose streptozotocin (STZ). However, no one knows if the surgery could have the similar effect if it gets done before STZ treatment.

Methods: Fourteen male Long-Evans rats received either sham or IT surgery first and then treated with STZ (35 mg/kg) eleven weeks after the surgeries. Body weight was measured as well as food intake, body composition and glucose tolerance before and after the surgeries.

Results: IT surgery improved glucose tolerance before STZ treatment. However, IT surgery did not delay the onset of diabetes as glucose tolerance was not improved four weeks after STZ treatment. No significant difference was found in either body weight or body composition during the whole experiment period.

Conclusion: IT surgery effectively can improve glucose tolerance in euglycemic rats without STZ treatment; but IT surgery cannot not prevent the onset of diabetes caused by low-dose streptozotocin (STZ).

MAJOR DISEASE MORTALITY RATES IN ALABAMA WATERSHEDS. *RONALD HUNSINGER* AND *SUZANNE OBERHOLSTER*, SAMFORD UNIVERSITY.

Alabama is noted for its abundance of lakes and waterways. Accusations have been made concerning human health problems due to various toxic pollutants discharged into these waterways. This study used the Alabama Department of Public Health (ADPH) data bank for disease mortality rates (years 2010 through 2013) for counties in the watersheds of Alabama Lakes and/or Rivers. Five major diseases were used as health indicators in these watersheds: cancer, Alzheimer's disease (AD), heart disease, stroke, and diabetes. Rates were statistically compared to the state- and waterway cohort county- rates for each disease. Of the five health indicators examined, results showed that the mortality rates for cancer were higher in the Weiss Lake watershed, which essentially encompasses only Cherokee County. Alzheimer's disease (AD) mortality rates were also significantly higher in the Weiss Lake watershed. Fish advisories for PCBs in fish are present in Weiss Lake. While AD mortality rates were somewhat elevated in the Wheeler Lake area (upper Tennessee River in Northwest Alabama watershed), this was due to the excessively high mortality rates of the disease in only one county of this watershed, Lauderdale. AD mortality rates in this county were the highest in the state. Animal studies have shown neurodegeneration following perfluorooctanoic acid (PFOA) exposure. However, Lauderdale County is considerably downstream and separated by two dams from a disputed point source of perfluorooctanoic acid (PFOA)/perfluorooctyl sulfonate (PFOS) discharge, which is in Lawrence County. Other considerations that might be linked to high AD mortality rates in Lauderdale County area are a history of coal ash contamination,

containing heavy metals, and an aluminum plant was once operational in the county. Neighboring Colbert County, home for the coal ash plant and directly across the Tennessee River from Lauderdale County, showed only a slight, but insignificant, increase in AD mortality rates, as compared to other watershed areas and to state rates. Other counties in the Wheeler Lake area showed no significant increase in the disease mortalities examined in this study. Further analysis of ADPH data banks, show that the rates of AD mortality tended to be higher than the state rate in other watersheds, except for Lake Martin, which coincidentally, does not carry any fish advisories. ADPH fish advisories are present in most of these waterways due to mercury and, in the case of Weiss Lake, due to PCBs. Surprisingly, AD mortality rates were also notably higher in the lower southeastern counties of the state, a region without any significant rivers and watersheds. Thus, it is not clear why AD mortality rates were elevated in these areas, although small creeks and tributaries there do carry fish advisories due to mercury contamination. In conclusion, this study showed that no definite geographical causal effect exists between PFOA/PFOS and AD mortality rates. The role of Hg and PCB contamination in contributing to AD in the study areas is possible. Non-pollution factors that might contribute to higher AD mortality rates in the lake areas of Alabama could possibly include such things as a demographic predisposition for retired individuals to settle and age. Indeed, Russ et al. (2014) in a meta-study, show that rurality (living in, or more specifically growing up in, rural areas) in and of itself is positively correlated with AD mortality.

SCHOOL-BASED INTERPROFESSIONAL ASTHMA SELF-MANAGEMENT PROGRAM FOR MIDDLE SCHOOL STUDENTS: A FEASIBILITY TRIAL. DONNA COPELAND, DONNA COPELAND, TIM OP'T HOLT, KRISTINA MILLER, KIM NORRIS AND RHONDA LUCAS, UNIVERSITY OF SOUTH ALABAMA. ELLEN BUCKNER, SAMFORD UNIVERSITY.

Asthma is the most common chronic disease in children and is a major cause of morbidity loss of school days, and increased hospitalizations resulting in increased healthcare expenditures. As a result, a new model for healthcare provision and education needs to be developed. The utilization of a common communication among adolescents, parents, primary providers and school nurses using a web-portal and common Asthma Action Plan has been shown to reduce symptoms, improve control, reduce school absences, and reduce unnecessary costs. Therefore, an inter-professional team consisting of faculty, nursing students (NS), respiratory therapy (RT), and computer science (CS) students implemented a pilot asthma self-management program in a medically underserved area. NS and RT students provided asthma assessments, one-to-one coaching, and group education over five sessions, using Power Breathing for Teens, curriculum. CS students collaborated with NS/RT to develop web-based e-portal and android app Two groups of middle school students with significant asthma participated in the study. After completion of the program asthma symptoms decreased, control increased, and self-efficacy and asthma responsibility increased over the intervention period.

The study examined asthma control, self-efficacy, and asthma self-management responsibility. Further significance of the project was defined in terms of interdisciplinary collaboration skills, the feasibility of implementing a school-based program in the community, and integration of technology. These elements propose a new model for providing asthma education. A model of adaptation integrates the multiple factors in the development of the adolescent's self-

management. This multi-dimensional approach has promise for improving health in the middle-school aged medically-underserved population.

COMPUTED TOMOGRAPHY CONTRAST INJECTIONS. *DONNA CLEVELAND, UNIVERSITY OF SOUTH ALABAMA.*

Intravenous contrast agents are used in computed tomography for several reasons. The initial vascular opacification can be used for anatomic localization; distinguishing vessels from a mass; and determining vascular displacement or invasion by a tumor. Specific vascular diseases such as aneurysms, stenosis, loss of vascular integrity or extravasation of the contrast medium may also be assessed from the initial contrast injection. To some extent, urinary tract function may be assessed. Tumors and normal parenchyma do not contrast enhance to the same extent or at the same time. This differential enhancement can be used to maximize lesion detectability. The timing of the CT scans and the contrast injection protocols must be chosen carefully. Sometimes a lesion will be hypovascular compared to normal tissue, and in some cases a lesion may be hypervascular to the surrounding tissue in a certain phase of enhancement. It is important to know in which phase a CT should be performed depending on the pathology you are looking for.

The degree of contrast medium enhancement is the result of a combination of complex factors including the rate, amount, concentration of contrast material administered; the speed of injection; the timing of the scans; cardiac output; extravascular redistribution; and renal filtration and excretion of contrast material. A drip infusion of IV contrast medium usually does not result in ideal enhancement because of inconsistent flow rates and too slow a rise of plasma iodine concentration. This method has largely been replaced by bolus injections from a mechanical injector. Mechanical injectors are mandatory for use of injection rates as high as 5 or 6ml/s and to obtain a sustained, reproducible level of contrast medium enhancement. The major disadvantage of a power injector is the slight risk of extravasation of contrast material into the soft tissues. It is therefore imperative that the patient be able to alert the technologist immediately if a local burning sensation occurs so that the injection can be stopped, preventing tissue damage. The injector is loaded with 100 to 180 ml of 60% contrast medium, with injection rates varying from 1 to 6 ml/s depending on the specific indication. Different delay times are used to match scanning

with the arrival of contrast medium to the appropriate vessels and organs. With the use of spiral or helical volumetric scanning a large region such as the liver (typically 30 cm or more) can easily be examined in several seconds.

With a single bolus injection of contrast medium, the pattern of vascular enhancement during the first circulation and the pattern of vascular and tissue enhancement during recirculation can be studied. This paper focuses on images that display the different phases of enhancement, the timing of CT scanning that capture those phases, and a few scanning protocols that are important for a successful diagnostic CT scan using contrast enhancement.

HEALTH SCIENCES POSTER ABSTRACTS

SPEECH RECOGNITION ERRORS: IMPLICATIONS FOR AGING. RACHEL SHORT AND KIMBERLY SMITH, UNIVERSITY OF SOUTH ALABAMA.

In natural environments, listeners are faced with having to understand speech in a variety of listening conditions. Listeners are often able to understand speech with accuracy in interrupted or steady-state background noise by exploiting useful glimpses of the auditory information, but still make recognition errors (Cooke, 2003). Previous findings suggest unimpaired younger listeners are more successful at speech recognition in interrupted conditions compared to steady-state noise (Dubno, Horwitz, & Ahlstrom, 2002). Therefore, this study evaluated the extent to which degraded spoken information in sentences is recognized by age-normal hearing older listeners in interrupted and steady-state noise. Nine older listeners repeated sentences that were presented in interrupted noise at three proportions of preservation, 33%, 50%, 66%, and steady-state noise (SSN). Responses were transcribed, and the number and type of errors for key words in the sentences were scored for each condition. For total, whole and part word errors in the interrupted noise condition, proportion of signal preservation was critical. Fewer errors were made when the signal was more preserved (66%) compared to less preserved (33%). For whole word errors, in both noise conditions, listeners made significantly more omission errors than substitution errors, and significantly more substitution errors than addition errors. For part word errors, in both noise conditions, listeners made significantly more substitution errors than either omission or addition errors. We also compared the interrupted 33% and SSN conditions directly, as performance on these two conditions was similar. No differences emerged between the two noise conditions for total, whole, or part word errors. These findings imply that older listeners resolve speech signals similarly across noise conditions. Differences in cognitive or perceptual processing in older listeners may explain these findings compared to younger listeners.

1. Cooke, M. (2003). Glimpsing speech. *Journal of Phonetics*, 31(3), 579-584.
2. Dubno, J. R., Horwitz, A. R., & Ahlstrom, J. B. (2002). Benefit of modulated maskers for speech recognition by younger and older adults with normal hearing. *The Journal of the Acoustical Society of America*, 111(6), 2897-2907.

HOMELESSNESS: ATTITUDES OF NURSING STUDENTS. MEGHAN SERGEANT, UNIVERSITY OF SOUTH ALABAMA.

The purpose of this study is to assess nursing students' attitudes toward the homeless and the impact that clinical experience of working with the homeless has on the nursing students' attitudes. Homeless individuals are hesitant to seek health care from professionals, yet health is one of the biggest problems in this population. The attitude health care professionals have manifests in the way they care for patients. In order to better care for the homeless, health care students can be taught to uphold the dignity of each and every patient. The undergraduate nursing students participate in an interprofessional education collaborative (IPEC) rotation. Some of the nursing students along with students of other health care professions work with the homeless in a student run free day clinic. The nursing students participating at this clinic were surveyed before and after having clinical experience at the student run free clinic. The nursing students participating at the other IPEC rotation sites were also surveyed in order to compare

results with the group working at the student run free clinic. Data has been collected; however, results are pending.

CHARACTERIZATION OF EXTRACELLULAR RNA IN THE LUNG. RAJENDRA RAVI, VALERIA KING, MARK GILLESPIE AND GLEN BORCHERT, UNIVERSITY OF SOUTH ALABAMA.

Until recently, all types of ribonucleic acid (RNA) were thought to exist only within the cell. Excitingly, evidence now indicates that RNA can at times be secreted outside of the cell within extracellular vesicles (EVs). This RNA called extracellular RNA (exRNA) has been shown to play a role in aiding intercellular communication and regulating cellular processes. In a clinical setting, exRNA has the potential to either serve as a biomarker indicating the presence of a disease or as a targeted tool used to treat a disease. Our project marks the first time that exRNA has been isolated at University of South Alabama. Our study aims to characterize the exRNA composition found in bronchoalveolar lavage fluid (BALF) from the lungs of rats and how the exRNA composition found in BALF varies based on stressors. BALF from three experimental groups was used: 1) control 2) the effect of a high pressure environment and 3) the effect of *Pseudomonas* bacteria. In our study, exRNA was successfully isolated from all three samples of BALF with the addition of buffers and series centrifugation. Excitingly, we recently performed next generation sequencing of our exRNA and obtained over 15 million high quality reads for each of our samples providing us an unprecedented view of their transcriptomic profiles. Importantly, this work represents the first ever characterization of BALF exRNA compositions, and our culminating analyses are now beginning to define what types of RNAs are released by cells in the lungs, how the exRNAs released vary with stressors, and novel roles for exRNAs in immune responses of the respiratory system.

ESTABLISHING THE RELATIONSHIP BETWEEN MILD KYPHOSIS AND SELF-EFFICACY IN COLLEGE STUDENTS. JOHN SHELLEY-TREMBLAY, OMAR MULLA, CORAL GUBLER, LARRY GURCHIEK AND SARAH SCHRENK, UNIVERSITY OF SOUTH ALABAMA.

Mild hyperkyphosis, an abnormal forward curvature in the thoracic spine, is a common progressive deformity of the spine that affects up to 50% of older adults. Hyperkyphosis can lead to significant deterioration in health status, physical mobility, and quality of life (Katzman et al., 2016). While this disorder has been shown to contribute significantly to poor psychosocial functioning in the older adults, only one study has previously examined the link between Hyperkyphosis and psychological well-being, particularly self-efficacy. The current study measured levels of self efficacy, self esteem, anhedonia, muscular fitness, and postural stability in six (6) college students. Four of the students exhibited mild hyperkyphosis at baseline, and two were included as age-matched controls. Students are currently enrolled in 10 weeks of physical training at University of South Alabama Student Recreation Center. In young people, the Kyphosis is often referred to as „Äúlaptop neck,„Äù and is becoming an increasing problem for American students. Results from the baseline examination reveal that individuals with Kyphosis do not vary on physical fitness or BMI, but do exhibit higher levels of psychological tension and anxiety, and lower levels of self-efficacy. These results indicate that mild Kyphosis may be a risk factor for psychological illness and interfere with development of positive coping strategies in college students.

THE TRANSITION: DISEASE KNOWLEDGE AND TRANSITION READINESS. JOHNSON EBONY, UNIVERSITY OF SOUTH ALABAMA.

This study investigates disease knowledge and transition readiness in pediatric sickle cell patients. *Transition of Chronically Ill Youth to Adult Health Care: Experience of Youth With Hemoglobinopathy, by Byrant, Young, Cesario & Binder, also looked at the actual transition experience of sickle cell youth patients. The results of the study showed that the participants showed fear, anxiety, and concern about switching to an adult care provider, and they also had feeling of being pushed into this transition process. Like the example, this study also looks into the actual transition process. It focuses on the problematic areas of the transition process in the pediatric sickle cell patient. This study will be a chart review on archival data retrieved from previously completed transition readiness assessment forms. These forms were administered to the pediatric patients in the USA Pediatric to Adult Care Transition (PACT) Program. This assessment form is the official form of the Six Core Elements of Health Care Transition created by National Center of Health Care Transition. The main goal of this study is to organize this data and look at the lowest scored content such as medication knowledge, disease knowledge or life skills. The pending results will be used to develop an education packet catering to these specific problem areas. Afterwards, these packets will be given to the USA Pediatric Sickle Cell Clinic to utilize in future transition programs.

FUSION IMAGING IN ENDOMYOCARDIAL BIOPSY. JASON OMAN AND HANNA JOHNSON, UNIVERSITY OF SOUTH ALABAMA.

An endomyocardial biopsy (EMB) is a diagnostic procedure during which a small piece of the patient's heart muscle is removed and taken for laboratory testing. EMB is done through a catheter that is threaded into the heart (traditionally using flourosopic guidance), after which, four to six biopsies are taken from the right ventricle.

The purpose of our study is to show that the use of high-resolution cardiac-magnetic resonance imaging (high-res C-MRI) paired with conventional flouroscopy is advantageous both for the patient and the procedural staff.

The main drawback of standard flouroscopy is the inability to differentiate between the chordae tendineae and papillary muscles of the heart and other soft tissue structures in the area. That is, without a clear visualization there is a risk of damage to the above-mentioned muscles in the process of catheterization.

Unlike flouroscopy, high-res C-MRI provides better differentiation between soft tissues, resulting in a safer procedure for the patient.

In our research, we studied literature related to flourosopically guided EMB, C-MRI, and fusion imaging guided EMB. We also reviewed MRI cardiac studies, and, even though there is a need for further clinical research in this area to be conducted and published, we believe that the use of emergent fusion imaging techniques to overlay high-res C-MRI studies with live flouroscopy during the EMB is an improved and safer way to conduct endomyocardial biopsies.

SELF-EFFICACY AND SELF-MANAGEMENT OF CHILDREN TRANSITIONING TO INSULIN PUMPS. ANESHA LEE, UNIVERSITY OF SOUTH ALABAMA.

Type 1 Diabetes is a disease that requires children to become responsible for managing their health at a young age, or sooner than their peers would. These children are required to learn how to monitor what they eat, check their blood glucose multiple times a day, administer insulin, and manage episodes of hypoglycemia or hyperglycemia. These children have the option of obtaining a continuous insulin pump that may aid in the overall management of their diabetes. With this pump, the children have the ability to administer insulin at a more precise rate, which is designed to help maintain blood glucose at a consistent level. The purpose of my project is to include children ages 8-16 and evaluate the psychosocial impact that transitioning to an insulin pump has, to evaluate the adaptations made in the self-management skills, to evaluate the positive and negative implications associated with being diagnosed with type 1 diabetes, and to evaluate the perceptions of having type 1 diabetes. My hypothesis is that children who transition to a continuous insulin pump will have an increase in self-efficacy and overall self-management skills of their diabetes and have a positive change in perception of diabetes. My results are currently pending. To obtain the results, I will administer three pre- and post-questionnaires before and 2-3 months after the implementation of the insulin pump. These surveys include a 10-item questionnaire assessing baseline diabetes education, a 16-item free-text questionnaire, and a 23-item self-efficacy questionnaire. I will then compare the results of the pre- and post-questionnaires to assess the progress of the implementation of the insulin pump. During the 2-3 month time frame, I will also have follow up phone calls, not to exceed 5 times for no more than 30 minutes, with the children to assess their progress.

**BIOETHICS AND HISTORY AND
PHILOSOPHY OF SCIENCE
PAPER ABSTRACTS**

PERIODIC TABLE OF DESIGN: ELEMENTS AND PRINCIPLES. *BRIAN LAHAIE*, UNIVERSITY OF GEORGIA. *CLARK LUNDELL*, AUBURN UNIVERSITY.

Most Scientists are familiar with the Periodic Table of Elements. Theoretically every material in the world is chemically derived from these 118 elements. The placement of these elements into a series of rows columns and related "groupings" gives the scientist further insight into the properties of these elements and their relationship to one another.

The applied design disciplines use a simpler, yet equally powerful collection of elements and principles to describe, evaluate and create our built environment. This paper will compare these theoretical constructs and emphasize the historical context in which these theories were developed. Examples of the application of design elements and principles across the fine and applied art disciplines will be highlighted.

CREATION. *CLARK LUNDELL*, AUBURN UNIVERSITY.

We exist in a challenging environment. The ability to adapt behavior to accommodate these challenges supports survival and procreation of our species. Culture is the collective accumulation of adaptations over time. What are the circumstances and processes by which we purposely create beyond the current accepted boundaries of our culture?

BIOTECHNOLOGY AND HUMANKIND'S NEED FOR LONG-RANGE GOALS. *JAMES T BRADLEY*, AUBURN UNIVERSITY.

Modern technologies including CRISPR, synthetic biology, robotics and artificial intelligence, germ-line genetic enhancement, embryo selection and neuroenhancement offer diverse, irrevocable trajectories for Homo sapiens and the biosphere. Whether humanity will choose to use reason, knowledge, and consensus to select some and reject other trajectories is an ethical issue. A half century ago, physicist and futurist, Gerald Feinberg, argued that humankind has an urgent need to search for and select long-range goals. Feinberg's argument was based on observed advances in molecular biology and computer science. He believed that developments in these fields presaged irretrievable changes to human nature itself. Feinberg called the search for and identification of long-range goals The Prometheus Project, also the title of his 1969 book (Doubleday & Company). Getting started on the Project was urgent in 1969 because its duration was estimated at 25-50 years. Today a Prometheus Project remains uninitiated and undiscussed. We are now on the cusp of immutable changes to life as warned of nearly 50 years ago. A global summit, a revamp of public education curricula, and promotion of a global ethics appropriate for thriving with 21st C biotechnologies are proposed as preludes to a Prometheus Project.

CHANGING THE DEFINITIONS FOR THE KILOGRAM AND THE CHEMICAL MOLE. *MICHAEL MOELLER*, UNIVERSITY OF NORTH ALABAMA.

Of the seven base units in the International System of Units (SI) that define physical quantities, the kilogram and, by extension, the mole are the only units still bound to a man-made physical object. Since 1879, the kilogram has been defined as the mass of a platinum-iridium alloy cylinder kept inside a hermetically sealed room in Paris. This definition leads to a host of problems, not the least of which is that in attempting to keep its mass constant, „ÄúLe Grand K,Äù is only made available for comparison once every forty years. Ideally, the kilogram and the mole should have a universal basis stemming from fundamental, invariant, physical quantities found in nature, and able to be precisely reproduced by laboratories around the world. There are now two competing proposals for accomplishing this. The one proposal calls for making Avogadro’s constant, N_A , an exact number. An invariant mass, then, would be based upon the mass of one mole of C-12 atoms. An alternative proposal calls for making Plank’s constant an exact number. Mass, then, would be rooted in measurements made with a highly precise but rather esoteric device known as a watt balance. The Bureau International de Poid et Mesures (BIPM) intends to have the issue settled and the new definitions in place by 2018.

PETER RABBIT MEETS THE DEADLY MYXOMATOSIS VIRUS WHICH HINTS AT THE RED QUEEN HYPOTHESIS. *KENNETH NUSBAUM*, AUBURN UNIVERSITY.

The first effective biologic control of an invasive species was Myxomatosis virus introduced into Australian rabbits, after 40 years of dithering, in the early 1950s. The declining kill rate of each release indicated, among other factors, that the virus rapidly "modified itself." Its modification demonstrated the "Red Queen" Hypothesis, to wit: Infectious agents must modify as their hosts become resistant or face extinction. Red Queen behavior explains antibiotic resistance in bacteria, changes in viral pathogenesis, and highly evolved host-parasite

Minutes of the Spring Executive Committee Meeting, February 22, 2017

Meeting was called to order at 7:43 p.m. by Akshaya Kumar and the minutes from the fall 2016 Executive Committee Meeting were approved. [Minutes on the Academy Website]

Attendees:

Larry Krannich

Akshaya Kumar

Mathew Edwards

Jack Shelley-Tremblay

Matthew Edwards

Malia Fincher

Ellen Buckner

Ketia Shumaker

David Nelson

Ken Marion

Mike Moeller

Bettina Riley

Nixon Mwebi

Brian Lahaie

Clark Lundell

Jane Nall

Donna Cleveland

Bryan Kennedy

Susan Herring

Mel Blake

J. Wayne McCain

Morgan Ponder

Brian Burnes

Brian Toone

Drew Hataway

Ketia Shumaker

Cameron Gren

Akshaya Kumar

Mark Jones

Adriane Ludwick

Drew Hataway moved to approve minutes. Ketia Shumaker seconded. Minutes were approved.

1. Akshaya Kumar addressed our list of outstanding action items:
 - a. Brian Toone reported that we need more activity on the Facebook Page. May establish a Twitter account.
 - b. Brian Toone reported that he and Jack Shelley-Tremblay have looked into indexing the journal, assessing the effectiveness of the journal, and how it is published. There are requirements for indexing that the journal must meet. Brian is incorporating these requirements into the operations manual for the AAS. DOAJ – Directory of Open Access Journals is the indexing site under consideration. Other sites have prohibitive criteria in terms of impact factor and number of readers. Jack Shelley-Tremblay reported on new options available to publish the journal through the Wordpress platform used for the website. There was discussion of whether the journal needs to be physically printed at all. Mel Blake raised a question about whether libraries need a physical copy. Larry Krannich reported that roughly 32 libraries have subscription, which Brian Toone estimates might be printed for approximately \$150 per issue. Ellen Buckner suggested that providing the option of paying for a hard copy would be an option. Drew Hataway questioned whether we should solicit input from the broader membership before a vote. Drew Hataway moved that we offer the electronic journal to all members and allow members to elect to pay more for a print subscription. Libraries will continue to receive paper copies. John McCall seconded. The motion passed.
 - c. Change of name for the bioethics committee. The name will not be changed.
 - d. Fundraising for student research awards. Drew Hataway moved that the AAS waive the page charges for publishing papers in the journal by undergraduate and graduate student award winners after peer review. John McCall seconded. The motion passed.
 - i. Student research award proposals for this year were all funded, providing evidence that fundraising for these awards is not currently necessary.
 - ii. Jack Shelley-Tremblay suggested that the Development committee solicit donations from former award winners and beneficiaries of the AAS via a donation link on the website and on the dues page.
 - iii. The Long Range Planning Committee is recommending that the Development Committee be dissolved. The Development Committee consists of all past presidents, but they do not have development experience. Matthew Edwards suggested that this may be a necessary committee. The Mason Scholarship event did not generate much success with fundraising. Jack Shelley-Tremblay suggested that we identify causes that may move people to donate (for example, evolution in textbooks, climate change, student research, etc.). Adriane Ludwick suggested that the committee identify 5 issues of interest to add to the website and the dues page. John McCall suggested that the Development Committee be reduced to recent past presidents. Larry Krannich suggested that the AAS needs professional help. John McCall will assist Larry Krannich to rethink the role of the Development Committee. Jack Shelley-Tremblay suggested that the Development and Public Relations committees be merged.
 - e. Prepare an argument to remove the anti-evolution disclaimer from state science textbooks. No action has been taken and this item is being removed from the action item list.
 - f. Approve and respond to the formal offer of Samford University's College of Health Sciences to host the 2018 Annual Meeting. Ketia Shumaker moved to approve. Ken Marion seconded. The movement was approved.
 - g. Identify a mechanism to assess the success of the journal in the next one to two years. This Ad-Hoc Steering Committee is to develop a mission statement and objectives for the journal. Their discussion will address associate editors, online JAAS publication, and Journal Indexing. This effort is ongoing. Will report more in Fall 2017

- h. Creation of an AAS mini-grant program to fund small initiatives for STEM outreach. Mel Blake and the STEM education group would like to create a small grant program to fund outreach (in the range of \$300 per grant) available to all science fields. The program would be paid for by selling a calendar showing research by scientists from the AAS. Each calendar page would have a QR code that would take you to the page of the scientist. Jack Shelley-Tremblay seconded. Ketia Shumaker asked for more details about the calendar. Jack Shelley-Tremblay suggested that we could host a slideshow of these kinds of pictures and small research narratives on the website. The motion passed. The award will be managed by the STEM section.

Ketia Shumaker moved to create a silent auction as a fundraiser at the annual meeting each year, starting in 2018. The fundraising target will be identified by the Development Committee each year. Drew Hataway seconded. The motion passed. Ketia Shumaker will identify a group to work on a silent auction for the 2018 AAS meeting.

- i. Recommendations from Long Range Planning Committee regarding certain committees. The committee has identified certain committees that have not reported on activities consistently or that lack membership. They propose adding the resolutions committee as a standing committee. Malia Fincher moved, John McCall Seconded. The motion passed. The membership committee has no participating members. Ellen Buckner pointed out that some committees have historically reported only once a year. She also suggested that some person should take on the role of coordinating membership networking with the section chairs. She advocates for retaining the membership committee, and reformulate the charge to the committee. Jane Nall suggested that we recruit more student members. Jack Shelley-Tremblay added that the website can host web conferences. Malia Fincher suggested that we eliminate the committee and rely on section chairs and individuals to coordinate recruitment. Nixon Mwebi suggested that we need more periodic updates about the academy, so that each member is better able to represent the AAS and recruit. John McCall suggested that Development and PR committees need to be involved with recruitment, as well. Jack Shelley-Tremblay suggested that the scope and mission of the membership committee be reconsidered but that the committee be retained. Drew Hataway suggested that we don't have sufficient membership to support the number of committees that we currently sustain. Brian Toone suggested that the president elect assume membership leadership duties. Drew Hataway moved to dissolve the membership committee. Malia Fincher questioned whether the second vice president attempts to find nominees for each of these committees each year. Larry Krannich indicated that they do. Mel Blake asked how nominees are sought. Larry Krannich explained that the second vice president is chair of the nominating committee, which includes all section chairs. Jack Shelley-Tremblay suggested that we could use the website to generate surveys to the membership as a whole to facilitate the nomination process. Nixon Mwebi suggested that we need a contact person in each institution of higher education in Alabama to facilitate nomination. Discussion about whether the AAS has active members at each institution. John McCall suggested that a contact person at each institution could coordinate with the development committee each year. Jack Shelley-Tremblay suggested that we move the charge, duties, and responsibilities of the membership committee to the development committee and have the first vice president chair that committee. Adriane Ludwick moved that we consider this issue at the fall 2017 executive committee meeting. Jane Nall seconded. The motion passed.
- j. Nominations. More nominations will be sought during the meeting.
- k. Ellen Buckner pointed out the AMSTY and Science in motion programs are in danger of losing funding. These are internationally recognized programs. Lee Meadows is on the relevant committee. A resolution is being drafted to encourage continued funding. Jack Shelley-Tremblay will put the resolution on the website for the membership to sign. David Nelson moved to support continued funding for these programs. Jane Nall seconded. The motion passed. Text 507-609-3322 and put your zip code in the message to receive a text with info about all of your state and federal representatives.

- l. Resolutions. Resolution to thank the University of South Alabama for hosting the AAS meeting 2017 and the local arrangements committee. Malia Fincher moved, John McCall seconded. The resolution passed. Resolution to thank Mr. Steve Ricks for his service with the AMSTY program. Malia Fincher moved, Drew Hataway seconded. The resolution passed. Resolution of thanks to Dr. Safaa al Hamdani for his service as the editor of the AAS Journal. Malia Fincher moved, Drew Hataway seconded. The resolution passed.
- m. The officers reports were considered. B10 needs a correction – In the first paragraph Jacksonville State University hosted state science Olympiad (not UWA).
- n. The committee reports were considered.
- o. Mike Moeller pointed out that two applications for the Mason scholarship came in after the report was submitted, so they will be making an award this year.
- p. Motion to adjourn by Drew Hataway. Seconded by Malia Fincher.

Action Items Spring 2017 Executive Committee Meeting

Action Item	Person Responsible	Due Date	Update Spring 2017
Create Facebook and Twitter presence for the AAS	Brian Toone	Soon	Need to solicit more likes for Facebook page. May establish a Twitter account.
Potential Indexing for the Journal.	Brian Toone and Jack Shelley-Tremblay	Spring 2017	Efforts are under way to ensure that the journal meets the standards required for indexing by the DOAJ.
Consider a name change request for bioethics section. Section does not want a change.	Section X	Spring 2017	No name change is desired by the section.
Discuss fundraising for student research awards	Brian Burnes	Spring 2017	Not needed
Prepare an argument to remove the anti-evolution disclaimer from state science textbooks	Committee on Science and Public Policy	Spring 2017	No action.
Approve and respond to the formal offer of Samford University's College of Health Sciences to host the 2018 Annual Meeting	Exec. Committee	Spring 2017	Approved.
Identify a mechanism to assess the success of the journal in the next one to two years. This Ad-Hoc Steering Committee is to develop a mission statement and objectives for the journal.	Drew Hataway, Ellen Buckner, Cameron Gren, Jack Shelley-Tremblay, Jim Bradley, Akshaya Kumar, Adriane Ludwick	Spring 2017	Ongoing. Will report more in Fall 2017
Ad-Hoc Committee for Electronic Media to consider Bylaw Concerning Associate editors, online JAAS publication, and Journal Indexing.	Brian Toone, John Shelley-Tremblay, and JAAS Editors	Spring 2017	Ongoing. Will report more in Fall 2017

Creation of an AAS mini-grant program to fund small initiatives for STEM outreach (See B-12,VII report)	Exec. Committee	Spring 2017	Two motions passed. The STEM section will develop a calendar fundraiser to support the mini grant program for outreach. Ketia Shumaker will identify a group to work on a silent auction for the 2018 AAS meeting.
Recommendations from Long Range Planning Committee regarding certain committees (See C-5 report)	Exec. Committee	Spring 2017	To be considered in Fall 2017 Exec Committee Meeting.
Recommendations from the Archives Committee (See C-11 report)	Exec. Committee	Spring 2017	
Reappointments (Nominations Committee, See C-16 report)	Exec. Committee	Spring 2017	More nominations are being sought

Action Items
Fall 2017 Executive Committee Meeting

Action Item	Person Responsible	Due Date
Reconsider the role of the Development Committee	Larry Krannich and John McCall	Fall 2017
Identify a mechanism to assess the success of the journal in the next one to two years. This Ad-Hoc Steering Committee is to develop a mission statement and objectives for the journal. Will address Association online JAAS publication, and	Drew Hataway, Ellen Buckner, Cameron Gren, Jack Shelley-Tremblay, Jim	Fall 2017

Alabama Academy of Science Journal

Scope of the Journal:

The Alabama Academy of Science publishes significant, innovative research of interest to a wide audience of scientists in all areas. Papers should have a broad appeal, and particularly welcome will be studies that break new ground or advance our scientific understanding.

Information for the Authors:

- Manuscript layout should follow the specific guidelines of the journal.
- The authors are encouraged to contact the editor (E-mail: brtoone@samford.edu) prior to paper submission to obtain the guidelines for the author.
- At least one author must be a member of the *Alabama Academy of Science* (except for Special Papers).
- The author(s) should provide the names and addresses of at least two potential reviewers.
- Assemble the manuscript in the following order: Title Page, Abstract Page, Text, Brief acknowledgments (if needed), Literature Cited, Figure Legends, Tables, Figures.

Review Procedure and Policy:

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