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Abstracts of Presentations

2021 Annual Meeting

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The following abstracts of oral and poster presentations represent those received by the Abstract Editor. Authors' affiliations are abbreviated as follows:

ASU	Alcorn State University
GSU	Grambling State University
LSU-BR	Louisiana State University, Baton Rouge
LSU-S	Louisiana State University, Shreveport
LTU	Louisiana Tech University
LU-NO	Loyola University, New Orleans
MSU	McNeese State University
Nicholls	Nicholls State University
NU	Niigata University
NSUL	Northwestern State University of Louisiana
SLU	Southeastern Louisiana University
STU	Slovak Technical University
SUAMC	Southern University and A&M College
TU	Tulane University
UGA	University of Georgia
ULL	University of Louisiana, Lafayette
ULM	University of Louisiana, Monroe
USDAFSSRS	United States Department of Agriculture, Forest Service Southern Research Station
USDASRU	United States Department of Agriculture, Sugarcane Research Unit
YAT	Youth Advocacy Team

Division of Agriculture, Forestry, and Wildlife

Amankwah, S., F. Owusu, A.B. Asare-Ansah, D.B. Frimpong, A.N.A. Yeboah, P.M. Loh, J. Oppong, Y. Twumasi, and J.B. Namwamba. SUAMC. **Monitoring the extent of illegal mining (Galamsey) in Ghana.**—Ghana is the second gold producer in Africa with over 130,000 metric tons of gold being produced yearly. Mining in Ghana is an activity that generates income from the various channels of services, mostly operated in the southern part of Ghana. However, illegal mining is the indigenous and illegal means of exploring gold which has been a thorn in the flesh as incumbent government battles for its seizure. Among the damages caused are pits of land containing mercury and other dangerous chemicals which are unhealthy human and living organisms, loss of vegetation and water bodies including the living organisms. This project seeks to monitor the rate of loss of the natural resources such as water bodies, vegetation and to also detect similar areas prone to illegal mining using remote sensing technology.

Asare-Ansah, A.B., D.B. Frimpong, S. Amankwah, A.N.A. Yeboah, P.M. Loh, F. Owusu, J. Oppong, Y. Twumasi, and J. B. Namwamba. SUAMC. **Monitoring aerosol concentrations in the Sahara Desert using Google Earth Engine.**—As part of the Earth's natural phenomenon, dust plumes from Africa's Sahara Desert travels across the Atlantic Ocean every summer with a potential of nourishing plant and ocean life. In June 2020, a giant mass of the desert dust (aerosol) travelled over 5000 miles across the Atlantic Ocean towards Northern America and beyond. This thick blanket of dust suppresses the formation and intensification of tropical cyclones and hurricanes. However, these particles contain lung irritating particles that can trigger respiratory conditions. Currently, the cause to this event remains unclear, with possible hypotheses of whether it is a meteorological anomaly or effects of earth warming degenerating into extreme convectional currents. The objective of the study is to monitor the extent and direction of aerosols in the Sahara Desert using Google Earth Engine. The results will be relevant in understanding the relationship between aerosol concentrations and its impact on human activities.

Bates, B., Q. Fontenot, and G. Lafleur. Nicholls. **Comparing abundance of fauna between terraces and a control marsh in a southeast Louisiana restoration project.**—Coastal land loss near Chauvin has converted cypress swamp into degraded brackish marsh containing shallow open water. In an effort to create restored marsh habitat, terraces were constructed and planted with native vegetation. To test the efficacy of this strategy, we compared flora and fauna abundance over time using a meter quadrat, crab traps, minnow traps, frog pipes, frog call surveys, and bird surveys. We have documented six species of invertebrates, nine species of fish, six species of frogs, four species of reptiles, and 57 species of birds utilizing the terrace habitat. Our preliminary results suggest that terraces can support a similar abundance of animals as control marsh. For instance, in Spring 2020 there was no significant difference in the amount of sheepshead minnow collected at the control marsh, 55 ± 16 (SE), compared to 31 ± 8 at an inner terrace, and 39 ± 15 at an outer terrace.

Bui, D., W. Tangkham, and F. Lemieux. MSU. **Effect of cricket powder on shelf-life of fresh pork quality.**—The objective of this study was to evaluate fresh pork quality from finishing hogs fed diets with and without added cricket powder (CP). Finishing hogs ($n = 8$) were fed for 34 days either 0 CP or 2% CP. Each sample was analyzed for pH, ash, moisture content, color (L^* , a^* , and

b* values), firmness, lipid stability (TBARS), aerobic plate counts, *Escherichia coli*, and Enterobacteriaceae. Results showed that vacuum-packed pork with added 2% CP significantly increased ($p < 0.05$) pH (5.93), moisture content (70.24%), ash (0.75%), firmness (151.33 of penetrometer in 1/10 mm scale), and lipid oxidation (0.66 mg MDA/kg) over an 8-day storage period. Muscle samples from hogs fed diets with 0% CP exhibited higher a* value (10.51) than 2% CP (9.74). *Escherichia coli* and Enterobacteriaceae were not detected. Aerobic plate counts increased ($p < 0.05$) regardless of treatment, but lower counts (Log 2.85 CFU/g) were observed in CP treated hogs.

Crosby, D. and J.B. Namwamba. SUAMC. **Application of college campus urban forestry and background classical music in boosting students' academic life and success.**—Research has shown that stress could impact students' success in college and careers. An understanding of stressors in college students forms a foundation to determine possible therapeutic measures to lower the stresses. It is important to state here that two types of stresses exist, namely negative and positive stresses, respectively. The objective of this study is to evaluate how stress affects the health and academic success of college students. The study also explores the use of urban trees, urban greenery, and background classical instrumental music in mitigating the stress of college students. The study examines three schools, trees, and greenery distribution and coverage density. The study identifies areas for tree establishment. Data and literature from various studies will be used in this study. This study will help the management of schools to appreciate the benefits of urban trees and classical background classical music and hence, invest in campus trees, greenery, and background classical music.

Falodun, D. SUAMC. **Determination of the urban forest ecosystem structure and ecosystem benefits for the city of Baker, Louisiana, using i-Tree Eco Model.**—The objectives of this study were to, assess the urban forest structure, for the city of Baker, Louisiana, estimate the urban forest ecosystem services and the associated economic values. The objectives of the study were met by stratification of the study area based on the land use types. Field data were collected using the i-Tree Eco field data collection protocol and the USGS National Land Cover Database (NLCD) data. This paper presents the results, analysis and procedures used to meet the objectives of the study. gives the city of Baker. The study produced a report that provided a thorough assessment of the value of the urban trees for the city of Baker and hence, justified the need for investment in tree management. This study serves as a guide in management decisions that improve human health and environmental quality.

Frimpong, D.B., A.B. Asare-Ansah, S. Amankwah, A.N.A. Yeboah, P.M. Loh, F. Owusu, J. Oppong, Y. Twumasi, and J.B. Namwamba. SUAMC. **Urbanization and the emergence of slums: Case study of Jamestown, Accra.**—Urbanization is growing rapidly in countries found within the third world which may result in the emergence of slum in these areas. It is therefore necessary to probe into the impacts of urbanization and the emergence of slum in cities. The study probed into the factors behind urbanization in James Town, the land use land cover changes over a thirty-year period and the impacts of slum formation in the area with respondents giving out proposed measures to address slum conditions in the community. Data used for the study were qualitatively and quantitatively gathered using remote sensing techniques and the issuing of interview questions. The analysis from the study showed that though over the years the population of James Town had increased, the population has started decreasing drastically.

Gray, K. and T. Clay. Nicholls. **Bycatch community assemblage during Diamondback Terrapin sampling.**—In June 2020, a long-term mark-recapture study of Diamondback Terrapin (*Malaclemys terrapin*) populations was initiated at Rockefeller Wildlife Refuge (RWR) and Elmer's Island Wildlife Refuge (EWR). Sampling was conducted using three to five single lead modified fyke nets set in tidal channels at both locations. Surveys at RWR and EWR have yet to produce terrapins but have resulted in the incidental bycatch of twelve species. Differences were observed in the number of Alligator Gar (*Atractosteus spatula*), Hardhead Catfish (*Ariopsis felis*), and Blue Crab (*Callinectes sapidus*) between sites. Preliminary data suggest higher bycatch rates at EWR than at RWR, however data bias can be attributed to insufficient survey at RWR due to Hurricane Laura in August, which rendered the site inaccessible for the remainder of the field season. Differences in bycatch community may be a reflection of differences in salinity and channel morphology.

Honan, C. SLU. **Injuries in testudines and how they differ across species, sex, and age.**—Reptiles gain injuries from a wide array of threats ranging from interspecies predation events to intraspecies mating. Injury distributions on heat maps can reveal important information about the hazards individuals' have been exposed to through their lifetime. Testudines make great study species for injury analyses because they are long-lived and recover well from physical injuries, making them a walking map of the danger they have encountered. This study investigated 92 specimens of *Terrapene carolina*, *Trachemys scripta*, and *Pseudemys concinna* from the Southeastern Louisiana Vertebrate Museum. The heat maps created using injury frequency and area coverage proportions allows for a unique comparison of injury not only between different species, but different age and sex classes within a species as well. Injuries taking place in the posterior portion of the shell and amputations are associated with predation with head and anterior injuries result from intraspecies conflicts.

Loh, P.M., S. Amankwah, F. Owusu, A.B. Asare-Ansah, D.B. Frimpong, A.N.A. Yeboah, J. Oppong, Y. Twumasi, and J.B. Namwamba. SUAMC. **Impact of Urban Development on Sustainable Urban Forest Management: A land-cover change assessment in Accra, Ghana.**—Concepts of development are significantly appreciated when they incorporate sustainable factors beneficial to both current and future generations. An increase in the world's population has gradually transformed the natural environment, most of which are evident in urban areas experiencing rapid population growth. Referring to a country like Ghana, rapid urbanization necessitates the need to evaluate forest conservation within most of its urban areas where economic development has taken place at the expense of the vegetation. As population will continually increase, it is anticipated that urban growth and development will further transform the urban areas hence the need to develop useful spatial planning techniques especially in urban areas as far as sustainable urban forest management is concerned. Therefore, it is imperative that this study evaluates the loss of vegetation over the years by employing Geographic Information System and Remote Sensing techniques to analyze the extent of land cover change in Accra.

Namwamba, J.B., Y. Twumasi, R. Okwemba, B. Osimbo, J. Oppong, and C. Akinrinwoye. SUAMC. **Using Google Earth/ArcGIS for temporal modeling of urban tree benefits, urban heat islands, land cover and flora inventory in East Baton Rouge.**—The decrease in urban forest area has led to rise of urban heat islands (UHI) intensities. increase of greenhouse gases as sequestered carbon in trees is released to the atmosphere. The objectives of this study are to

demonstrate methods of carrying out a spatial analysis using jpeg or mpeg images captured from Google Earth imagery and model estimates for temporal and spatial forest benefits. ArcGIS software's spatial analyst will be used to classify Google Earth imagery of the study area. Flora composition will be based on classes from imagery from known sample area, with highest species composition. The classes from the sample of area will be applied in classifying the study area. Linear algebra will be used to model the entire study area. The method developed here will save the stake holders on time and risks associated with field data collection.

Owusu, F., A.B. Asare-Ansah, D.B. Frimpong, S. Amankwah, A.N.A. Yeboah, P.M. Loh, J. Oppong, Y. Twumasi, and J.B. Namwamba. SUAMC. **Assessing the impact of climate change on the yield of pepper production in Louisiana.**—Pepper is a popular vegetable and spice that has been used in cooking over the years. It is common to find pepper crops in many home gardens, especially in Louisiana. Some varieties planted on Louisiana soils include: Bell pepper, Jalapeno, Habanero and Tabasco. Climate change causes temperature rise, changes precipitation patterns and potentially reduces global food production. The objective of this study is to assess the impact of climate change on the yields of pepper harvested on Louisiana and investigate the best farming methods practiced by pepper farmers throughout production. Some pepper farmers will be sampled and interviewed using structured questionnaire. Statistical data on the yields of pepper over a period of ten years will be collected from the LSU AgCenter and USDA-NASS. Analysis of the data will be carried out using SPSS. From the outcomes of the analysis, common drivers for change and recommendations will be established.

Pipkin, A., W. Tangkham, and F. Lemieux. MSU. **Effect of three probiotic strains: *Saccharomyces cerevisiae*, *Lactobacillus acidophilus*, and *Pediococcus acidilactici* on the properties of quinoa yogurt.**—Yogurt is a fermented dairy product associated with many health benefits due to the specific lactic acid bacteria strains. The objective of this study was to investigate three different lactic acids producing bacteria on the properties of quinoa yogurt. Three treatments: 1) *Saccharomyces cerevisiae* (SC); 2) *Lactobacillus acidophilus* (LA) and 3) *Pediococcus acidilactici* (PA) were inoculated and prepared for making quinoa yogurts at 42°C and stored in the refrigerator (3°C). All cultured samples were examined for pH, water activity (A_w), moisture content, color (L^* , a^* , b^*), viscosity, ash content, and lactic acid bacteria counts. Quinoa yogurt cultured with SC had the lowest pH at 4.32 and L^* lightness value at 69.58. In addition, SC provided higher counts of lactic acid bacteria (2.77 log CFU/g) than sample cultured with PA and LA. Therefore, SC can be used as an optimal alternative probiotic strain to reduce the fermentation time of yogurt processing.

Sallmann, D., S. David, and B. Piazza. Nicholls. **A comparison of floodplain restoration sites on the Mississippi River with a focus on gars (*Lepisosteidae*).**—Connectivity of large rivers with their floodplains can benefit riverine fishes by providing access to food and additional habitat. Species may also use floodplains for spawning and nursery refuge for juvenile fishes. However, due to anthropogenic modifications such as dams and levees, floodplain habitats are often disconnected from their associated rivers, potentially limiting ecosystem function. To address this issue in the Lower Mississippi River Basin, the Louisiana Department of Wildlife and Fisheries, the Nature Conservancy, and partners have initiated projects to improve connectivity between the Lower Mississippi River and its floodplains. Species diversity and abundance among fish communities at these sites will be monitored and compared before and after floodplain

connectivity is reestablished. The presence of top predators at multiple life stages, such as Alligator Gar (*Atractosteus spatula*), will also be used as indicators of restoration success. We expect fish diversity and abundance to increase after restoration efforts are completed.

Sullivan, B., H. Munro, and K. Gandhi. USDAFSSRS/UGA. **What makes a tree smell good to a pine beetle?**—The most significant pest of pines in the South, the southern pine beetle, chooses host trees to attack by responding to the combination of a pheromone produced by the beetles and odors arising from the host itself. We investigated the composition of the odors released by pine resin to identify compounds possibly involved in host selection. Our study involved screening resin volatiles for stimulants of beetle antenna followed by behavioral bioassays of olfactory stimulants in the field. We identified three compounds produced abundantly by the host pines that apparently mediate beetle attraction. The results may have utility in selecting trees for pine beetle resistance and in improving monitoring lures for this pest.

Twumasi, Y., E. Merem, J.B. Namwamba, R. Okwemba, J. Wesley, J. Opong, C. Akinrinwoye, and K. LaCour-Conant. SUAMC. **The assessment of dairy production and milk use: The case Africa using GIS.**—Milk production and intake in many countries in the African continent is very essential in the daily lives of communities. Dairy is not only at the center of community welfare from North to Southern portions of Africa, but it remains a vital component of economic viability in terms of employment and income generation and nutritional intake in many of the countries. Yet over the last several years, milk production among the countries continues to be besieged by multiplicity of challenges that are both regional, global, local in nature and somewhat compounded by current policy in the continent regarding marketing access to foreign producers. This paper assesses milk production trends in the continent of Africa using mix scale techniques of Geographic Information Systems (GIS) and descriptive statistics to capture this issue spatially.

Vuong, O., W. Tangkham, and F. Lemieux. MSU. **Effects of dark rye, cricket, and pea powders on the properties of 3D-printed novel mulberry canjeero.**—Canjeero (Lahoh) is a fermented sorghum flatbread originating from Somalia. Novel plant and insect-based foods are sources of high quality, efficient and sustainable alternative protein. The properties of novel mulberry canjeero were evaluated with dark rye (DRP), pea (PP) and cricket (CP) powders when prepared traditionally and 3D printing. Four treatments: 1) 20.3% commercial Krusteaz flour, 2) 20.3% DRP, 3) 15.3% DRP + 5% CP and 4) 15.3% DRP + 5% PP were assessed. Canjeero with 15.3% DRP + 5% CP had the highest fiber (4.88%), increased the counts of yeast (log 3.26 CFU/g) and *Lactobacillus* spp. (log 2.11 CFU/g). Adding 20.3% DRP was desirable for taste (6.25) and mouthfeel (6.33). Samples with 15.3% DRP + 5% PP had higher protein (17.6%) and pH value (6.16). These results suggest that dark rye, pea and cricket powders can be utilized as an alternative high-quality protein source to the traditional canjeero product.

Division of Biological Sciences

Botany Section

Foster, C. and J. Willis. Nicholls. **The effects of freshwater inundation depth and duration on the growth response and recovery of four marsh foundational species.**—Sediment diversions are one of the large-scale tools planned for restoring Louisiana's deteriorated coastal marshes, but subsequent prolonged inundation may stress vegetation in outfall areas. A large mesocosm study was initiated at the Nicholls State University Farm to examine the effects of sediment diversion relevant inundation depths and durations on the growth response and subsequent recovery of four marsh vegetation species: *Spartina alterniflora*, *Spartina patens*, *Sagittaria lancifolia*, and *Typha latifolia*. Experimental units experienced three inundation depths (0, 20, and 40 cm) and four inundation durations (2, 4, 8, and 12 weeks) before being returned to control conditions (water depth 10 cm below the soil surface). Control treatments with a constant water depth 10 cm below the soil surface are maintained for comparison. Preliminary data analysis revealed similar rates of net CO₂ assimilation across treatments at week 16, suggesting recovery of photosynthetic activity at the conclusion of experimental inundation treatments.

Lambiotte, A. and J. Willis. Nicholls. **Effects of diversion-relevant salinity and hydrologic regimes on foundational marsh species (*Spartina alterniflora*, *Spartina patens*, *Typha latifolia*).**—Louisiana's coastal wetlands are experiencing an extreme rate of loss. River sediment diversions, one of the major techniques proposed to restore Louisiana's degraded deltaic wetlands, are intended to reestablish an intermittent connection between the Mississippi River and surrounding wetlands. Operation of river sediment diversions would enable controlled, periodic flooding to occur in degraded wetlands, during which fresh water, nutrients, and sediment would be delivered. The effective use of such large-scale restoration techniques requires an appropriate knowledge of vegetation and soil biogeochemical responses to these altered hydrologic conditions. For this study, sods of three foundational marsh species (*Spartina patens*, *Spartina alterniflora*, *Typha latifolia*) are being exposed to inundation depths, durations, and salinities consistent with likely sediment diversion scenarios in a mesocosm setting. Resulting alterations to above- and belowground processes and soil biogeochemistry are currently being assessed to understand the likely responses of foundational marsh species to sediment diversions and their sustainability.

Nair, P.M. GSU. **Responses of *Arabidopsis thaliana* seedlings exposed to engineered metal and metal oxide nanoparticles.**—Engineered metal and metal oxide nanoparticles have been widely used in several applications and may lead to their increased exposure to plants in the environment. The increased presence and unique physico-chemical properties of engineered nanoparticles may cause toxic effects to various plants. Therefore, understanding the impacts of engineered nanoparticles on plants, the basic components of the ecosystem and also the source of food for living organisms, is crucial for the evaluation of potential environmental risks on food safety. Nanoparticles are not only directly toxic to plants, but also cause indirect toxicities by damaging the roots, by altering the genes related to growth and uptake of nutrients by plants and also the nutrient composition in plants. The mechanistic basis of both nanoparticle toxicity may be often distinct from that of metal ions released from them. The presentation includes the results of our

previous studies to understand the toxic effects and mechanisms of toxicity of metal and metal oxide nanoparticles on *Arabidopsis thaliana* under controlled laboratory conditions.

Woods, A. and J. Willis. Nicholls. **Interaction of wetland vegetation with microplastics in surface waters.**—Microplastic contamination is pervasive throughout the environment, particularly in aquatic ecosystems. Wetlands are frequently employed to address surface water pollution, but understanding is limited regarding how wetland systems may interact with microplastics. Mesocosm studies were implemented at the Nicholls State University Farm facility to elucidate these interactions. Significant retention of microplastics by *Panicum hemitomon* was observed in both 43-250 μ m and 250-500 μ m size classes at dosages ~250,000 particles m⁻³ and ~170,000 particles m⁻³, respectively. The mechanism for this retention is likely biofilm processes on submerged plant tissues. Importantly, no impacts to *P. hemitomon* survival or growth responses were found. A second study assessing photosynthetic process impacts of surface water microplastic concentrations up to 770,000 particles m⁻³ detected no reduction in either net CO₂ assimilation or stomatal conductance for any of the species assessed. Although further research is necessary, these results point to the potential efficacy of wetland vegetation in the amelioration of microplastics in surface water.

Environmental Sciences Section

Akinrinwoye, C., Y. Twumasi, J. B. Namwamba, J. Oppong, B. Osimbo, and R. Okwemba. SUAMC. **An analysis of climate and land cover changes Baton Rouge, Louisiana.**—Global and climate changes have been significantly influenced by human activities. Global temperatures are expected to cause broad environmental changes including glacial retreat, and rise of sea levels, etc. Ecosystems and human health could also be impacted. Baton Rouge has many industries that release effluents into air and water, thus polluting the environment, which could impact climate and human health. The objectives of this study are to develop temporal models for Baton Rouge’s climatic and land cover data. GIS and Climate data from data bases will be used and analysis carried out by using statistical and ArcGIS software, respectively. The study is expected to yield information that could be useful in serving as a guide for researchers, Baton Rouge community and Louisiana state on the action to take to mitigate the impacts of the environmental changes.

Cortez, J. and R. Boopathy. Nicholls. **Biodegradation of triclosan by bacteria isolated from the Thibodaux sewage treatment plant.**—Triclosan (5-chloro-2-(2,4-dichlorophenoxy)phenol) is an antimicrobial agent that is present in many antibacterial detergents and surgical cleaning treatment products. This antimicrobial compound is usually discharged from households and collected at the local sewage treatment plant. Because triclosan inhibits fatty acid biosynthesis, it will affect the microbial population that perform waste degradation. In this study, we focus on bacteria in the anaerobic digestion process. Anaerobic digester sludge samples were collected from the sewage treatment plant in Thibodaux, LA. Bacteria were grown under various electron acceptor conditions, and the best enrichment in terms of growth and triclosan degradation were monitored. Bacteria were monitored under similar conditions in methanol. Bacteria that can degrade triclosan were isolated and identified. The triclosan biodegradation process was studied using liquid chromatography/mass spectrometry method.

Dasgupta, P. and D. Roy. SLU/ASU. **An analysis of occupational exposures and lung related diseases in Louisiana.**—Introduction: Occupational chemical exposure in petrochemical, construction, plumbing, manufacturing industries can lead to acute and chronic conditions such as asbestosis, silicosis, COPD, asthma, lung cancer and even mesothelioma. Louisiana has a comparatively high fatality rate (66.6 in 100,000 people) than the USA national average (58.7 in 100,000 people) for lung cancer and other lung related disorders. Our study is aimed to track the route of occupational exposure of asbestos or other lung related carcinogens in Louisiana which would help in exposure mitigation. Methods: Statistical data were compiled from CDC’s WONDER database (1999-2017), Louisiana Department of Health Report Card, Louisiana cancer registry, Covid-19 figures compiled from Louisiana Departments of Health. Results: Higher prevalence of asbestosis, lung related diseases and COVID-19 infection rate re-reported in surrounding parishes of the Mississippi River, Baton Rouge, and down to the Mississippi Delta, entering the Gulf of Mexico which is the well-known “Cancer Alley” of Louisiana.

Gary, L., K. Fitzmorris, R. Reimers, and S. Sherchan. T.U. **Rapidly evolving WBE (Wastewater-Based Epidemiology) for COVID-19.**—The Waterborne Infectious Disease Outbreak Control Working Group, a component of the Water Environment Foundation (WEF, Alexandria, VA), has reviewed the advantages of using Wastewater-Based Epidemiology (WBE) to monitor the presence

of COVID-19 RNA in community wastewater systems. Initial findings of the study are presented, featuring a proposed new link in the present WEF/CDC/ National Wastewater Surveillance System (NWSS). The new link is termed and composed of “Knowledge Translators.” Essential role and function of the Knowledge Translators are to interpret and present timely WBE data analysis to awaiting public health officials, thus accelerating and enhancing their decision making to secure and protect public health.

Mire, M. and E. Zou. Nicholls. **Effects in vitro of 20-hydroxyecdysone and chrysene on hepatopancreatic expression of a CYP4 gene in the blue crab, *Callinectes sapidus*.**—Marine organisms subjected to petroleum production contamination in the Gulf of Mexico need a biomarker for polycyclic aromatic hydrocarbon (PAH) pollution. *Callinectes sapidus* cytochrome P450 (CYP) system was explored using degenerate primers. A partial hepatopancreatic CYP4 cDNA sequence of 412 bp with 136 amino acid reading frame was acquired. CYP enzymes metabolize endogenous chemicals and xenobiotics; cultured hepatopancreas responsiveness to 20-hydroxyecdysone (20E) and chrysene was determined. CYP4 gene expression decreased with increasing 20E concentrations; 10 and 100 nM 20E significantly increased CYP4 mRNA while 1 μ M resulted in absence of upregulation. This pattern is consistent with findings that peak CYP activity occurs in postmolt and intermolt when hemolymph ecdysteroid titers are depressed. Increasing chrysene concentrations led to decreasing CYP4 mRNA amounts. Chrysene at 0.2, 2, and 20 μ M all significantly suppressed CYP4 expression. Overall, the acquired CYP4 gene appears involved in ecdysteroid regulation and not suitable as a contamination biomarker.

Namwamba, J.B., K. Abdollahi, Y. Twumasi, B. Osimbo, R. Okwemba, C. Olufunke, and J. Oppong. SUAMC. **Spatial and temporal non causal correlational modeling for atmospheric data and its application in estimating ambient air-cooling benefits by urban trees in urban environments in United States.**—Scientists have been researching on ecologically friendly approaches to mitigate urban heat. The study area is viewed as a being in a control volume on an open thermodynamic system, allowing flow of energy and fluid through it. The objectives of this study are to develop models for predicting temperature based on field and weather station data, and determination of urban tree cooling benefits. Atmospheric data will be monitored and measured at field and weather stations, respectively. Statistical software and ArcGIS will be used in modeling and land cover classification, respectively. Land cover classification of Google Earth Pro imagery will be utilized in generalization of modeled data. The study area will be treated as being composed of an open thermodynamic system with multiple control volumes, and tree cooling benefits computed. The study will introduce a novel approach of estimating the cooling benefits of trees.

Naquin, E., J.P. Daigle, and R. Boopathy. Nicholls. **Presence of multi-drug resistant pathogens and antibiotic resistance genes in waterways and seafood populations of rural Southeast Louisiana, USA.**—The spread of antibiotic resistance is a growing global concern in recent years. Improper usage and disposal of antibiotics by consumers, hospitals, and industries has furthered the emergence of antibiotic resistance in the waterways of Southeast Louisiana, namely Bayou Lafourche and Bayou Terrebonne, a main source of drinking water impacting over 70,000 individuals that live along its banks. In this study, water samples were collected as well as samples from various species of freshwater fish and shellfish—common seafood caught in the area—and the occurrence of antibiotic-resistant bacteria was monitored. The results of this study show the

presence of multi-drug resistant bacteria exhibiting resistance to all antibiotics tested. Furthermore, the tet(S) and tet(41) genes, genes for tetracycline drug resistance, qnrB56, a gene for fluoroquinolone resistance, aac(6')-Ic, a gene for aminoglycoside resistance, and the oqxB gene, a gene for olaquinox resistance, were identified.

Oppong, J., Y. Twumasi, J.B. Namwamba, R. Okwemba, and C. Akinrinwoye. SUAMC. **Disaster management and risk reduction in slum communities in Accra, Ghana.**—Accra is experiencing rapid urbanization. Urban sprawl which is associated with rapid urbanization is the major cause of slum formation in Accra. Despite the social and economic benefits associated, urban sprawl's impacts on the environment and the residents' quality of life are frightening. The lack of local and regional government intervention in slum settlements affect disaster management and risk reduction respectively when disasters arise, hence affecting the quality of life of slum residents in the nation's capital. This paper addresses current risks faced by slum communities, and the potential risks associated with poor planning in these areas. It also seeks to understand disaster management in slum communities, programs and policies existing to reduce the risks and vulnerabilities of slum dwellers in Accra. The multiple-case study approach will be utilized in this study. The paper will provide Accra's developers and slum residents and government critical information to lower slum disaster risks.

Oppong, J., Y. Twumasi, J.B. Namwamba, R. Okwemba, and C. Akinrinwoye. SUAMC. **Environmental justice concerns in mining communities in Ghana: The case of Kenyasi in the Ahafo region.**—Extraction of precious minerals could boost the economies of countries endowed with the resources. Hence, the discovery of a precious mineral resource is expected to be a vehicle for the attainment of social and economic developments in areas that have the mines and their corresponding countries. The mining activities have been the reason for environmental degradation and disaster in the area. This paper seeks to identify and understand the environmental justice concerns in Kenyasi, a mining community in the Ahafo region of Ghana. Understanding the environmental injustices experienced by mining communities is essential since continual exploitation of the resources pose great danger to the environment and human life. This study will employ the exploratory case study approach to examine the communities' environmental justice concerns, especially Kenyasi. The outcomes of the study will sensitize stake holders about the plight of mining area communities and reduction of environmental costs.

Oppong, J., Y. Twumasi, J.B. Namwamba, R. Okwemba, and C. Olufunke. SUAMC. **Growth management as a tool for waste management in the Accra metropolitan area in Ghana.**—Issues associated with waste management due to increasing waste production by growing populations have been on the rise due to gaps in management practices, inadequate funding, and poor attitudes towards waste management in Accra's metropolitan area. The objectives of this study are to demonstrate the application of growth management and balanced growth for improvement and enhancement of urban waste management and public health respectively, which also protects the environment. Exploratory case study approach will be utilized to examine the application of the concept of growth management in helping enhance waste management, for areas where developments are priorities. Information from selected cases and waste management stakeholders will be used in this study. This research will help highlight the gaps in policies and programs hindering waste management and guide local and regional authorities in improving public health and environmental states.

Siska, P. and M. Kudlac. LSU-S/STU. **Spatial coincidence model for matching the spatial distribution of cancer and the natural rock radioactivity.**—The overall rate of cancer incidents has been slightly decreasing during last couple of decades. However, the cancer is still one of the deadliest diseases on this planet. There are numerous factors that contribute to the incidents of cancer. In this research we evaluated influence of natural environment in the form of rock radioactivity to the occurrence of cancer. In order to address this issue from a spatial perspective, a spatial coincidence model has been proposed in this research to compare the spatial patterns of natural rock radioactivity and the incidents of cancer. The major contributing factors of rock radioactivity in the environment are isotopes of ^{40}K , ^{238}U , ^{235}U and ^{232}Th . The spatial patterns of cancer mortality and rock radioactivity were revealed using kriging interpolation methods, and a coincidence model has been produced using Geographic Information Systems to compare the spatial distribution of total cancer mortality rates as well as natural rock radioactivity. results are then presented as a joint probability distribution map that portrays the different levels of coincidence between both sources of spatial information. A perfect match between the spatial distribution of cancer and rock radioactivity would only be possible if natural rock radioactivity were the only factor explaining the variability of cancer in the studied area. There are other factors such as genetics, smoking, nutrition, etc. that have not been accounted for in this analysis. Nevertheless, this model explains about 30% of variation in the cancer mortality in the studied area and contributes to the understanding of spatial coincidence between cancer mortality and natural rock radioactivity.

Microbiology Section

Hebert, M. and C. Struchtemeyer. MSU. **Monitoring the prevalence of methicillin resistant *Staphylococcus aureus* on common surfaces in a university biology building.**—Hospital-acquired methicillin resistant *Staphylococcus aureus* (HA-MRSA) has been a major cause of nosocomial infection since its discovery in 1961. However, more recently there has been an alarming increase in the number of infections caused by community-acquired methicillin resistant *Staphylococcus aureus* (CA-MRSA) in otherwise healthy individuals outside of healthcare settings. The aim of this study was to monitor the prevalence of MRSA on common surfaces in a university biology building. Samples were collected throughout the building and plated on CHROMagar MRSA medium. MRSA was isolated from 83% of samples collected from bathroom surfaces including paper towel dispensers, urinal flush valves, and toilet seats. Of the 95 desks swabbed from high traffic classrooms, 42 produced a positive for MRSA. Approximately 50% of the samples collected from door handles contained MRSA isolates. The results of this study demonstrate that MRSA is frequently present on everyday surfaces that students come in contact with.

Naquin, E., C. Oubre, H. Soorya, and R. Boopathy. Nicholls. **Effect of the sulfonamide class of antibiotics on a bacterial consortium isolated from an anaerobic digester of a rural sewage treatment plant.**—Antibiotic resistance is a significant global health problem growing worldwide. This issue arises from the frequent misuse of antibiotics, such as over-prescriptions of antibiotics and improper disposal. A sample of sludge was taken from an active anaerobic digester at the sewage treatment plant in Thibodaux, Louisiana. To measure the effect of trimethoprim and sulfamethoxazole on carbon and nitrogen removal in the bacterial consortium, 100 mL bottles of basic mineral salt (BMS) medium was made with various TMP and SMX concentrations, separately. After testing the consortium, a pure culture was isolated and identified by 16sRNA analysis. The pure culture showed a positive result for the *sul1* gene, in which the antibiotic resistance mechanism is an enzymatic modification. This bacterium also displayed an ability to survive on sulfamethoxazole as the sole source of carbon. Moreover, this study further shows how anaerobic digesters can be an ideal habitat for antibiotic resistant bacteria.

Smith, D., L. Ma, J. Brunson, A. Gautreaux, G. Bruno, A. Bolton, A. Trosclair, B. DeOre, and H. Pitre. NSUL. **Survey of *Aeromonas* prevalence within the Natchitoches waterways.**—*Aeromonas* species are gram-negative, hemolysin positive, facultative anaerobes common to aquatic ecosystems. These bacteria have caused millions in damages for commercial fishing operations worldwide (mostly catfish farms), with increasing cases of tetracycline resistance among some species. Therefore, our team set out to survey the prevalence of *Aeromonas* sp. within the Natchitoches waterways. We collected both surface and subsurface water samples for spread plating onto ADA plates, followed by identifying isolated colonies using MALDI-TOF. Our data showed *Aeromonas jandaei* and *Aeromonas veronii* as the most prevalent *Aeromonas* species isolated in the total sampling population. Sam Sibley lake showed significant numbers of *Aeromonas*, especially *Aeromonas jandaei*, from surface samplings. With both species being confirmed fish pathogens, these findings suggest a potential risk for a local *Aeromonas* outbreak in both recreational and commercial fishing operations.

Toups, C., E. Naquin, C. Oubre, and R. Boopathy. Nicholls. **Presence of antibiotic resistant bacteria and antibiotic resistant genes in the migratory birds of Louisiana.**—Since the dawn of the commercialization of antibiotics, antibiotic resistant bacteria (ARB's) and antibiotic resistance genes (ARG's) have been a rapidly growing problem. As international travel is popularized, these ARB's and ARG's are able to move to new places using humans as a vector in a somewhat anthropogenic way. However, these potentially harmful bacteria and ARGs could be spreading in another way less reliant on human involvement. The Nicholls State University Biotechnology lab has been studying the increasing presence of ARBS' and ARG's in local waterways for a number of years now. These ARB's and ARG's have been correlated to the consumer, commercial, and hospital related improper disposal of antibiotics and their presence in the waters of Southeast Louisiana is well studied. Also present in these waterways are several species of migratory birds which use Louisiana either as a stopover point or endpoint for migration along the Mississippi Flyaway route. It is possible that these migratory birds could serve as a vector for the aforementioned ARB's and ARG's, allowing these antibiotic resistant bacteria and genes to travel all along the migratory route, from the southern coast of the United States to central Canada and everywhere in between. In this study, fecal and cloacal bacterial samples were taken from Louisiana migratory birds. These samples were enriched in TSB and streaked onto TSA to collect isolates. These isolates were then tested for the presence of ARB's and ARG's using the Kirby Bauer Assay and PCR techniques respectively. The results showed the presence of several ARB in the bird fecal samples.

Molecular and Biomedical Biology Section

Bassa, B.V. and R.M. Uppu. SUAMC. **The unique SARS-CoV-2 variant of Louisiana.**—While surveying genomic databases for SARS-CoV-2 mutations at different geographical locations, we have found that five specific mutations have appeared at greater than 87% frequency in the U.S. state of Louisiana, indicating that the same variant has carried all the five mutations. This makes the SARS-CoV-2 variant prevalent in Louisiana (Louisiana variant) to be a unique and reproductively the best fit one as most of the other U.S. variants carry only two mutations relative to the original Wuhan strain. We comparatively analyzed the Louisiana variant, and the variants prevalent at other geographical COVID-19 epicenters to ascertain our conclusion.

Boateng, S. T., T. Roy, S. B. Mbeumi, R.N. Chamcheu, A. L. Walker, J. Fotie, and J. C. Chamcheu. ULM. **Synthesis and biological evaluation of a small library of antimalarial-derivatives identify novel potent anticancer compounds.**—Skin cancers is the most common cancers in the U.S., reported to affect one-fifth of Americans in their lifetime, with an annual financial burden of \$8.1 billion. In a continuous quest to expand the management options with safe, bioavailable and more potent agents, a small library of antimalarial derivatives synthesized via C-N/C-C coupling, direct aromatic ring substitution, or a modified Skraup–Doebner von Miller reactions were screened in-vitro against melanoma(SkMel-28/A375) and non-melanoma skin cancer cell-lines(SCC-12/A431). Biological evaluation identified potent hit compounds showing low-micromolar anticancer activities with IC50 values; $3.1 \pm 0.68 \mu\text{M}$ (SCC-12), $5.0 \pm 0.80 \mu\text{M}$ (A431), $5.3 \pm 0.88 \mu\text{M}$ (SkMel-28), and $6.2 \pm 1.05 \mu\text{M}$ (A375), and over two-fold affinity for skin carcinomas versus normal cells. In-silico analysis of these hits identified skin-cancer dysregulated targets; PI3K/Akt/mTOR, MAPK, Rho-1/2 and PARP-1/2 with significantly improved pharmacodynamics and pharmacokinetic profile. Taken together, our data presents and highlights promising novel compounds with inherent anti-cancer characteristics with an accent on skin cancers, warranting further development.

Bradford, A. and T. C. Woods. TU. **Loss of insulin-like growth factor 1 receptor in vascular smooth muscle cells promotes increased mirna-221 and -222 in type 2 diabetes.**—Type 2 diabetes mellitus, a disease that includes hyperglycemia, hyperinsulinemia, and insulin resistance, is associated with a 2 to 4 times higher risk of a heart attack or stroke This increased risk of heart attacks and strokes results from an accelerated development of atherosclerotic plaques. During atherosclerotic plaque development, vascular smooth muscle cells proliferate and migrate leading to a thickening of intima of the arterial walls. Our data demonstrates that arteries from diabetic subjects exhibit a loss of the insulin-like growth factor receptor (IGFR-1) and an increase in the number of insulin receptor homodimers. We hypothesize that the loss of IGFR-1 promotes activation of the IR/miR-221/-222 pathway that in turn promotes the loss of p27KIP1 and increased cell proliferation and migration. We are testing this by measuring miR-221/222 and p27Kip1 in vascular smooth muscle cells from mice with and without IGFR-1 stimulated with physiological insulin.

Cart, J.B. and J. Newman. LTU. **The Role of Notch1 and Notch 3 in Adult Stem Cell Osteogenic Differentiation.**—Human adipose-derived stem cells (hASCs) have significant therapeutic potential due to their multipotency, immune modulation, and ability to self-renew. We aim to

further understand how hASCs can be used to treat degenerative bone diseases by studying the mechanisms that regulate osteogenesis. One way to enhance our understanding of differentiation is through the examination of the Notch signaling pathway. This pathway is known to regulate cell state and multipotency in hASCs. Two Notch receptors believed to play a significant role in regulating osteogenic differentiation are Notch1 and Notch3. We will characterize Notch1 and 3 expression during osteogenesis to evaluate the effect that an siRNA-mediated knockdown of each receptor has on osteogenesis. By studying changes in osteogenic marker expression following a knockdown, we will be able to determine how each receptor individually affects the osteogenic potential of hASCs and identify potential novel therapeutic targets to treat bone damage and loss.

Hutson, H., K. Willis, C.D. Nwokwu, M. Maynard, and G. G. Nestorova. LTU. **Photon versus proton neurotoxicity: Impact on mitochondrial function and 8-OHdG base-excision repair mechanism in human astrocytes.**—Proton and photon radiation treatments have a neurotoxic effect on both mitochondrial activity and DNA repair in human astrocytes. In this study, astrocytes were treated with either proton or photon (0.5 Gy and 3 Gy) radiation and toxicity levels were assessed. Mitochondrial function and mass were assessed with imaging of fluorescent MitoTracker™ Orange CM-H2TMRos and MitoTracker™ Green FM dyes. RT-qPCR was used to evaluate the mRNA expression level of OGG1, a protein involved in the DNA excision repair pathway. Finally, ELISA was used to measure the excision rate of 8-OHdG, a common biomarker of oxidative stress. It was found that radiation treatment leads to an increase in mitochondrial mass and levels of reactive oxygen species. Decreased expression of OGG1 as well as a reduced rate of 8-OHdG excision was observed, indicating that radiation exposure causes impairment of DNA repair capabilities and mitochondrial function in human astrocytes in a dose-dependent manner.

Mumphrey, J., T. Teach, and J. Newman. LTU. **Notch and Mediator work together to direct hASC self-renewal.**—Stem cells offer tremendous potential in research and medicine because they can both differentiate or self-renew. Our research focuses on MED12 and its relationship with Notch signaling in self-renewing human adipose-derived stem cells. We hypothesize that MED12 has a critical role in regulating transcription, and directly effects the Notch signaling pathway and therefore cell fate commitment. We monitored the expression and activity of MED12, Notch1, and Notch3 to determine the impact that MED12 knockdown has on Notch1 and Notch3 expression and activity. We have observed that that the knockdown of MED12 in hASCs has no effect on the expression and activity of Notch1 but does reduce the expression and activity of Notch3. This indicates a unique role for MED12 in regulating cell state, leading us one step closer to realizing the clinical potential of these cells.

Nwokwu, C.D., S.M.I. Bari, H. Hutson, and G. Nestorova. LTU. **ExoPRIME: solid-phase immunoisolation and genetic analysis of pure intact exosome populations.**—Circulating exosomes have become useful biomarkers for precise and noninvasive diagnosis and disease monitoring. However, sample purity is a drawback for current liquid-phase methods for exosome isolation. We report a selective solid-phase technology to isolate pure exosome populations. Microneedles (300µm×30mm) functionalized with exosome-specific anti-CD63 antibodies were incubated in conditioned astrocyte medium (CAM) and enriched astrocyte-derived exosome suspension (EXO), and their capture efficiency assessed via Fluorocet assay. Our results indicated a significant increase in exosomes captured by microprobes incubated for 16h at 40C in EXO (~23×10⁶ exosomes/probe) vis-à-vis 2h at 40C (~10-fold) and 16h at 220C (~2-fold). The

microprobe's exosome loading capacity decreased when incubated in CAM, indicating that longer incubation at lower temperatures in enriched exosome suspension favors more efficient exosome capture. The designed probe was amenable to exosomal protein and RNA extraction, in amounts sufficient for downstream analyses. Future works will focus on its integration into a lab-on-a-chip platform.

Rinderle, C. and J. Newman. LTU. **The role of MED12 in adipogenesis.**—Obesity is a growing problem, with over 40% of the total US population suffering from the disease. Obesity is diagnosed when an individual has excess fat accumulation, and therefore, increased adipogenesis or formatting of fat cells. We are using human adipose-derived stem cells (hASCs) to study adipogenesis in order to determine the role of the Mediator complex subunit MED12 in promoting cell-type specific gene expression. siRNA-mediated knockdowns of MED12 suggest that MED12 plays a role in the initiation of adipogenesis. qRT-PCR and staining of hASCs, as well as reduced expression of early adipogenic markers like PPAR- γ , confirm this hypothesis, as there is less adipogenesis occurring in hASCs when MED12 is knocked down early during differentiation when compared to knockdowns performed later in differentiation. Through understanding MED12's role in controlling cell type-specific gene expression, researchers aim to understand how to control adipose tissue formation in hopes of ending the obesity epidemic.

Roy, T., S.T. Boateng, S.B. Mbeumi, R.C.N. Chamcheu, A.L. Walker, K. G. Kousoulas, S. Murru, and J. C. Chamcheu. ULM. **Synthesis and identification of new kinase inhibitors with anti-skin cancer activities via data-driven evaluation of fisetin analogs.**—Melanoma and non-melanoma skin cancers (NMSCs) are increasingly diagnosed in the US and available treatment are associated with numerous hurdles including resistance, poor bioavailability and scar formation. A library of fisetin-analogs with different substituents were synthesized using microwave-assisted one pot reaction, and spectroscopically and biologically characterized. We identified three most active compounds; F9, F17 and F20 against both human melanoma (A375) and NMSC(A431) cells, versus minimal effects on normal cells. Kinase activity assay revealed they are potent single and/or multi-kinase inhibitors of cyclin-dependent-kinase-2(CDK2), receptor tyrosine kinases(c-KITs), and mammalian-targets-of-rapamycin(mTOR) cancer targets. Moreover, they modulated downstream targets effectors expression including phospho-Akt, -p90RSK, -rS6K, -Stat3, and -ERK1/2 and induce apoptosis, evident by activation of caspases-3/8, Bax/Bcl-2, PARP in skin-cancer cells. Additionally, bioinformatics analyses predicted superiority of these potent analogs in cell penetration, solubility, oral and intestinal absorption parameters versus fisetin. Overall, our data identify promising novel bioactive anti-skin cancer compounds needing further development.

Sparkman, J., E. Meaney, S. Venigalla, J. Straub, and J. Newman. LTU. **The influence of MED12 knockdown on adipogenesis.**—Obesity is characterized by the excess accumulation of fat and adipose tissue, driven by adipogenesis. We utilize human adipose derived stem cells (hASCs) isolated from adult fat tissue to study adipogenesis. We are interested in understanding the function of MED12 in adipogenesis and determining its role in initiating cell type specific gene expression. MED12 is a subunit of the Mediator complex kinase module that is critical in regulating cell-type specific gene expression. We have determined a decrease in MED12 leads to a decrease in adipogenesis as shown by the decrease in staining of lipid vesicles and the decrease in expression of adipogenic factors, CEPBa2, SREBP1c, and PPAR γ . This supports that MED12 does indeed play an important role in adipogenesis. We will continue to examine at what point during

adipogenesis MED12 is most critical so that MED12 may be used as a therapeutic target to control adipogenesis and treat obesity in the future.

Zoology Section

Alterman, A. and T. Clay. Nicholls. **Baseline population information and habitat usage of box turtles (*Terrapene carolina*) within the chenier forest on Grand Isle, Louisiana.**—Chenier forests are hardwood communities associated with coastal Louisiana. These ecosystems have experienced drastic reductions in size because of anthropogenic activities. Within Louisiana's Deltaic Plain, the last remaining chenier forest is on Grand Isle, and is ~16 hectares, 10% of its original size. To better understand resident species and their reliance on this ecosystem, a mark-recapture study was initiated with the resident box turtle population. Population and habitat data was obtained via surveys from June-October 2020. Significant differences were observed among population size classes ($P < 0.01$), and habitat aspects between adult and juvenile turtles ($P = 0.05$). Currently, box turtles are understudied in Louisiana, despite turtle populations facing declines globally. Research efforts currently underway on the box turtle population within Grand Isles chenier forests will aid in our understanding of this understudied species, and future conservation efforts regarding this unique ecosystem.

Beachy, C. SLU. **How plethodontid lunglessness informs a perspective on ancestral state reconstruction for life cycle evolution.**—Plethodontid diversity in life cycle modes far exceeds that of any other group of amphibian. Life cycle diversity includes metamorphosis, direct-development and paedomorphosis. Why has the plethodontid complex life cycle been the only one in all the Animalia to produce both of the derived life cycles? It has recently been suggested that the ancestral life cycle in plethodontids was direct-development. This suggestion contrasts with a more traditional hypothesis that the ancestral plethodontid has a life cycle that included a post-hatching metamorphosis. I discuss how the most important feature of plethodontids, i.e., lunglessness, informs a view of life cycle evolution. Lunglessness is a feature that enables persistence in flowing water, and this suggests that the ancestral life cycle is one that includes larvae. This can enable a view that maintains an older philosophical perspective to be used to understand plethodontid biology, i.e., outgroup comparison to establish an ancestral condition.

Beck, T. and J. Whitaker. Nicholls. **Response of the eastern oyster, *Crassostrea virginica*, to temperature and salinity changes.**—Eastern oysters, *Crassostrea virginica*, are influenced by environmental factors, such as salinity and temperature. However, a comprehensive thermal study has not been completed. To address this knowledge gap, 9 juvenile (20 - 30 mm shell height, SH) and 5 adult (45 - 60 mm SH) eastern oysters were used. To examine differential behavior at 10 ppt, oysters were subjected to temperature treatments from 5 °C - 35 °C in 5 °C increments over a 3-hour period. Observational data indicate a significant increase in feces biodeposits ($P = 0.04$) and valve openings ($P = 0.03$) with increased temperature. To determine the critical thermal maximum (CTmax) at 10 ppt and 15 ppt, water temperature was steadily increased until the oysters did not respond to agitation. The 10 ppt mean temperature was significantly lower ($P = 0.03$). A comprehensive understanding of thermal tolerances will aid in the management of this ecologically and economically valuable species.

Brock, T. and C. Beachy. SLU. **Maturation and metamorphosis in Patch-nosed Salamanders.**—Patch-nosed Salamanders (*Urspelerpes brucei*) are rare, miniaturized lungless salamanders endemic to the Appalachian foothills of extreme northeastern Georgia and northwestern South

Carolina. This taxon is highly data deficient due to its limited range and overall scarcity, raising much conservation concern. In the hopes of informing future conservation work, I will be presenting new preliminary data on sexual maturation and timing of metamorphosis in *Urspelerpes*. Maturation begins immediately preceding metamorphosis in approximately the second year of life.

Crookston C. and C. Beachy, SLU. **Geographic variation in skeletal development of the Southern Two-lined Salamander.**—Many of the members within Plethodontidae undergo metamorphosis which involves drastic changes in body form from aquatic larvae to terrestrial adult. The environment in which a larva develops has an impact on the rate of growth and general morphology of the body. In this study the development of the bones in larval *Eurycea cirrigera* is measured using a developmental series to determine if geographic variation linked to stream habitat parameters affects the ossification of particular structures and/or overall level of ossification of the skeleton. This paper serves to increase our understanding of the relationships between environmental conditions and development.

Maldonado, B. SLU. **Life history aspects of the Three-lined Salamander.**—The Three-lined Salamander (*Eurycea guttolineata*) is found in forested wetlands, streams, and seepages throughout the southeastern United States. Despite a wide distribution, the life history of *Eurycea guttolineata* is poorly described. The most heavily studied populations occur in North Carolina. Life history characteristics of salamanders can vary widely across populations and geographic range. To fully understand the life history of *Eurycea guttolineata*, it is necessary to conduct detailed studies throughout its range. My study will take place in southeast Louisiana. By sampling monthly throughout a year and collecting life stage, sex, and size data, I will describe life history aspects of *Eurycea guttolineata* in the southwest extent of its range. My study will both expand on the current understanding of life history of *Eurycea guttolineata* and provide baseline data that can inform management, conservation, and ecosystem function in a rapidly changing landscape.

Rivera, J. and B. Crother. SLU. **Using geometric morphometrics to evaluate the diversity within the genus *Siren*.**—Sirenids are enigmatic in their biology and behavior. These eel-like salamanders are morphologically unique, with slender bodies and absent lower extremities. Species in the genus *Siren* all maintain this body plan, with some slight variation in phenotype and body length. Additionally, these species sometimes have sympatric distributions. These attributes can present a challenge in differentiating among these species. Previously, molecular and morphological data have been used in phylogenetic reconstruction, inferring the evolutionary relationships within this group. This study employs a novel approach in comparing sirens found in different regions throughout the southeastern United States. Using geometric morphometric analyses, I have quantified variation in morphology among different species within the genus *Siren*, as well as conspecific populations of *Siren intermedia*. Analyses have been specifically conducted using head morphology. The acquired shape data will be compared with the currently recognized phylogenetic tree of the genus *Siren*.

Samples, C. SLU. **The impacts of wild boar (*Sus scrofa*) on vertebrate communities of wet longleaf pine ecosystems.**—Longleaf pine ecosystems are considered to be biodiversity hotspots for flora and fauna alike. Historically, these habitats dominated the southern United States but now only 3 percent remain. Anthropogenic disturbances such as forest clearing for livestock grazing

and lumber, and quelling of necessary wildfires have played a role in the reduction in longleaf pine habitat. In recent years, more dedicated efforts have been enacted to protect and restore this characteristic habitat and have shown significant signs of success; however, there are factors that can undermine our progress. Wild boar (*Sus scrofa*) are a highly invasive species that wreak havoc on wildlife and human infrastructure alike due to the species generalist nature. To further quantify the impacts of wild pigs, this study will measure the abundances and diversity of species on managed wildlife habitats in the southeastern US that do and do not contain pigs to reveal patterns and influences.

Division of Physical Sciences

Chemistry Section

Anyanwu, A., N. Dissanayake, K. Boggavarapu, and V. Thalangamaarachchige. MSU. **Ionic liquids as cellulose solvents.**—Cellulose is the most abundant biopolymer on the earth. Throughout human history, cellulose was used mainly in the paper and textile industry. Due to the insolubility of cellulose, it was cumbersome to find proper ways to extend its applications into sustainable energy. Ionic liquids (ILs) are a special class of solvents with unique properties, which can dissolve cellulose effectively. Ionic liquids today are being used as a gateway for pioneering a mainstream “green chemistry” approach within medicinal, agricultural, and industrial frontiers. Our current research focuses on designing novel ionic liquids, studying the effects of substituents, and improving the capacity to dissolve cellulose. The end goal is to generate biomaterials that can be utilized in biomedical and pharmaceutical applications. Synthesis of ILs and initial results in dissolution studies will be discussed.

Bergeron, D., D. Wayment, P. White, Jr, and D. Spaunhorst. Nicholls/USDASRU. **Dissipation of clomazone and pendimethalin in Southeastern Louisiana sugarcane soils.**—Some sugarcane (*Saccharum* sp.) growers report that a widely-used herbicide, pendimethalin, is less effective at controlling itchgrass (*Rottboellia chochinchinensis*), possibly through accelerated dissipation from repeated applications. Others have started to use another herbicide, clomazone, in conjunction with pendimethalin to increase the efficacy. However, little is known about the dissipation of these two herbicides, especially when applied together, in diverse sugarcane soils in Louisiana. Thus, the objective of the research was to measure the dissipation of pendimethalin and clomazone in soils with high itchgrass pressure and one less-affected by itchgrass. Soil samples from each field were fortified (4 µg/g-1 ww) with clomazone and pendimethalin and monitored over the course of 101 days under laboratory conditions. Herbicide levels were determined by extracting the herbicide from soil with acetonitrile, and analysis by high performance liquid chromatography (HPLC). Clomazone is persistent, with a half-life of 59 d or higher. Pendimethalin dissipates more rapidly, with half-life ranging from 7d-59d.

Clifton, K. and S. Murru. SLU. **Electro-chemical cyclization of hydroxychalcones for the synthesis of flavonoids.**—Flavonoids have a broad distribution in the plant kingdom and they display diverse biological and pharmacological properties. Epidemiological studies suggest that the regular consumption of flavonoids protects humans against diseases associated with oxidative stress such as Alzheimer’s disease, arteriosclerosis, cancer, and ageing. Therefore, development of methods for the synthesis of flavonoids has high significance in synthetic organic chemistry. With our on-going interest in flavonoid compounds and electroorganic chemistry, we have developed an electrochemical cyclization approach for the synthesis of flavanones from the corresponding 2’-hydroxychalcones. We optimized the reaction conditions by screening variety of solvents and electrolytes. Reactions monitored by TLC and products characterized using GC-MS and NMR spectroscopy. We will present the advantages of electrochemical synthesis, optimization process and mechanistic aspects of the reaction.

Davis, J. and S. Sommerfeld. SLU. **Lifetimes of aromatic and non-aromatic alkaline earth trimer dianions.**—Alkaline earth trimer dianions such as Be_3^{2-} and Mg_3^{2-} lie higher in energy than their respective monoanions and are therefore unstable to electron autodetachment. Consequently, all electronic states of the dianion possess short lifetimes and are referred to as metastable or resonance states. Here we study short-lived states of Be_3^{2-} and Mg_3^{2-} with the regularized analytic continuation (RAC) approach combined with a wide variety of ab initio methods. For both trimer dianion four resonance states are identified that correspond to different occupation patterns of the two excess electrons in the two lowest p- σ and p- π orbitals. The two closed shell states can be interpreted as σ and π aromatic, and we investigate whether aromaticity influences the stability or lifetime of the dianions. Additionally, model solvation of the two dianions in their (p- π)₂ states by six and 12 water molecules is considered.

Emami, F., M. Agbo, A. Thomas, S. Reliford, B. Peco, S. Giglio, and B. Bauers. SLU. **Mathematical modeling of pyrophosphate sensing by a supramolecular assembly.**—Real-time PCR has become a crucial tool in many fields of molecular diagnostics, and many methods have been developed to monitor PCR as the reaction proceeds. The objective of this study is to examine sensing molecules such as the assemblies of ZnII–DPA-attached phenylboronic acid (1.Zn) and catechol-type dyes like alizarin red S (ARS) for non-intercalator type real-time monitoring of PCR using mathematical modeling and experimental observation. The central hypothesis, which was formulated based on preliminary data, is that the 1.Zn–ARS sensor is selective towards pyrophosphate (PPi), the byproduct of DNA amplification, over the other phosphates. Different analytical evidence displayed existence multiple intertwined equilibria for the self-assembled 1.Zn-dyes sensors, yet the molecular mechanisms that underlie the phosphate sensing processes are not well understood. The long-term goal is to understand the molecular details of such very complicated self-assembly combinations that are not only limited to these examples through mathematical modeling.

Fierro, J., V. Thalangamaarachchige, N. Dissanayake, and K. Boggavarapu. MSU. **Organocatalysis using imidazole-based ionic liquids.**—Ionic liquids (ILs) are efficient solvents used in chemical synthesis and are known for their distinctive characteristics such as negligible vapor pressure, non-volatility, and high thermal stability. Research shows that Imidazole-based ILs are used as pre-catalysts for N-heterocyclic carbene (NHC) catalyzed reactions, whereby the catalyst is obtained by deprotonation. When Imidazole-based ILs are treated with anions such as acetate, an equilibrium is achieved, and they subsequently generate carbenes in situ. The focus of this study is to generate a series of novel imidazole ILs inducing structural changes such as aromatic substitution, alkylation, and counter-anion variations of the NHCs. These NHCs are then used as catalysts in benzoin condensation reactions while evaluating the solubility and temperature of these reactions. The goal is to target the most efficient IL in the synthesis of α -Hydroxyketones (benzoin derivatives). These compounds are used in the pharmaceutical industry as anti-bacterial, anti-inflammatory agents, and anti-depressants.

Junk, T., D. Smith, D. Alexis, and F. Fronczek. ULL. **Synthesis of novel heterocyclic organotellurium heterocycles and their properties.**—Te, N-containing heterocycles have a pronounced tendency to self-assemble to supramolecular frameworks ranging from molecular wires to ribbons and rings. In the past, this work centered around 1,3-telluradiazoles, which are highly sensitive to hydrolysis. We have prepared a series of novel compounds including 2-substituted benzo-1,3-

tellurazoles, 2H-1,4-benzotellurazin-3(4H)-ones, 10H-pyrazino[2,3-b][1,4]benzotellurazine derivatives and [1,4]ditellura[2,3-b:5,6-b']dipyrazine to further study the properties of such compounds, which are highly stable to light and moisture. Structural characterization by X-ray crystallography indicates that compounds, which contain additional amine moieties tend to form hydrogen bonded dimers in solid form while those lacking them form supramolecular ribbons or chains.

Lasater, A. and D. Rivera. NSUL. **Nickel sulfide as a biosensory material.**—Quantum dots (QD's) are semiconducting nanomaterials measuring less than 20 nm in any direction. While QD's have potential applications in many areas, such as photocatalysis and drug delivery, they have gained much interest in the field of biosensors. Nickel sulfides are researched in hydrolyzation catalysis, magnetic storage, toughening window glass, and as biosensors. This project intends to develop nickel sulfide nanostructures in a novel and cost-effective way and explore their potential as biosensing platforms. Our method involves a microwave-assisted reaction from nickel and sulfide precursors as starting materials. We use UV-Vis absorbance measurements have been carried out for the identification of NiS. Our preliminary results show notable absorbance peaks at 410, 455, and 735 nm. Although further characterization to determine size and morphology, as well as confirm the presence of Ni-S bonds, the preliminary data suggests that this method generates NiS nanostructures as a primary product.

Lo, M., S. Murru, H. Vo, A. Dahal, S. Singh, and S. Jois. ULM. **Synthesis and anticancer activity evaluation of 1,3-diarylpyrazol-5-ones as potential anticancer agents.**—Cancer is one of the most difficult ailments in the world and slowly cancer surpassing cardiovascular disease as the leading cause of death. The emerging molecular targets and signal pathways enable the development of novel strategies for the rational design of new anticancer agents. Nitrogen heterocyclic compounds are an integral part of a huge number of natural and synthetic compounds that play important roles in the biological systems. Along those lines, a series of substituted pyrazolone and phthalazinone compounds have been synthesized using microwave reaction conditions and evaluated their in vitro antiproliferative activity against a set of non-small cell lung cancer cell lines. Among all the tested compounds, 1,3-diarylpyrazolones with halo substituents showed the best activity against NSCLC, with 10-fold higher inhibition compared to positive control Celecoxib. In addition to the synthesis and antiproliferative activity, the data from cell cycle analysis, kinase profiling and western blot assay will be presented.

Peco, B., A. McCullough, S. Primeaux, and P. Chanda. SLU. **Boron-mediated syn- and anti-selective aldol reactions of N,N-dialkylphenylacetamides.**—Boron-mediated stereoselective aldol reactions of carbonyl compounds such as ketones and esters are well explored. However, those reactions of carboxylic acid amides are rarely reported. We have used dialkylboron triflate (R₂BOTf) in the presence of a trialkylamine (R₃N) to enolize N,N-dialkylphenylacetamides followed by reaction of boron enolates with various aldehydes as electrophiles. The study of the effects of various factors such as bulk of a boron reagent, solvent used, reaction temperature, and steric of alkyl groups of tertiary amides on diastereoselectivity provided the optimum conditions to get syn- or anti aldols. We will discuss the reaction optimization and the scope of both syn- and anti-selective aldol reactions of N,N-dialkylphenylacetamides.

Qamar, R., D. Barnes, Z. Mckean, L. Griffin-Scudari, and C. Petho. SLU. **Characterization and purification of *P. falciparum* hypoxanthine-guanine-xanthine phosphoribosyltransferase (HGXPRT) from recombinant *E. coli*.**—The human malaria parasite, *Plasmodium falciparum*, is responsible for most of the million annual deaths from malaria. The underlying causes of this disease can be better researched by isolating the proteins and enzymes that it uses for synthesis of purine nucleotides. This parasite is developing a drug resistance to medicines commonly used for treatment, and scientists believe that the enzyme (HGXPRT) can be used to develop new treatments. Our research goal is to sustainably produce and purify HGXPRT and to express it and assess its kinetics in the presence of substrates. A vector expressing *Plasmodium* HGXPRT has been acquired, and the enzyme has been successfully expressed and extracted. With readily available enzymes a host of potential inhibitors can be compared, the activity of the enzymes can be compared to enzymes from different species, and they can be mutated to characterize the impact of gene mutations on enzyme kinetics.

Rattanachai, B. and D. Rivera. NSUL. **Microwave-assisted synthesis and characterization of CuS nanostructures: towards the development of a luminescence-based biosensing material.**—Quantum dots (QDs) are semiconductor nanoparticles that exhibit unique optical and electronic properties. QDs have grown in importance in the optical and medical field due to their small size and versatility. Size ranging from 1.5 to 10 nanometers, QDs are suitable to travel anywhere in the body, making them fit for a multitude of biomedical applications including but not limited to, medical imaging, drug delivery, and biosensors. Copper sulfide QDs have gained popularity among researchers due to their high stability, low toxicity, and other unique properties. This project intends to develop copper sulfide nanostructures and explore its potential as a biosensing platform. CuS nanostructures are synthesized using a microwave-assisted pathway. The resulting material was studied using UV-Vis, FTIR and luminescence spectroscopy. Unique absorption bands around 400 and 700 nm were observed for CuS nanostructures. Further characterization is needed to determine relative size and morphology of the CuS quantum dots.

Smith, C., V. Thalangamaarachchige, K. Boggavarapu, and N. Dissanayake. MSU. **Dissolution of biomass with ionic liquids.**—Biomass is primarily comprised of cellulose and lignin. Both are polymeric and are insoluble in most well-known organic solvents. During research, Ionic Liquids (ILs) were used to efficaciously dissolve these compounds. The products were formed by using 1-methylimidazole as precursor. Some of the IL's synthesized during research include 3-methyl-1-phenylimidazolium bromide and 1-benzyl-3-methylimidazolium bromide. Ionic liquids are effective non-coordinating mediums that can dissolve both organic and inorganic solutes. Additionally, their negligible vapor pressures make them advantageous for dissociation of biomass; they are a desirable alternative to volatile organic compounds (VOCs). Ionic Liquids have high tolerance for temperatures, are non-flammable, and non-volatile. They are also cheap to manufacture, and the process is sustainable. The synthesized Ionic Liquids are at temperatures below 100C, making them easy to store as Room Temperature Ionic Liquids (RTILs). The process of synthesizing these ionic liquids and the dissolution of both cellulose and lignin will be discussed.

Vaughan, H. and S. Meissner. MSU. **GC-MS analysis of e-cigarettes and vapes: Unexpected in situ formed by-products and their proposed chemical mechanisms and methods to minimize toxicant formation in e-cigarettes.**—E-cigarettes and the corresponding e-liquids are exploding

in popularity throughout the world. Despite their popularity, very little consideration has been given to understanding e-liquids. A growing great deal of negative publicity of the past 5 years has arisen due to perceived negative health effects. Our group uses GC-MS and NMR to investigate the chemical components of e-liquids. Our initial hypothesis was that volatilized vapors contain chemical compounds not present in the neat e-liquid. We expected that the high wattage settings of the heating elements, coils, might be altering the chemical composition of the e-liquids through thermal degradation. Instead, we found some interesting compounds present in the e-liquids (acetals from aldehydes and propylene glycol), that have led us to an examination of the possible organic reaction mechanisms occurring in the interesting e-liquids between the carrier solvents and the flavorants. In short, chemical reactions have occurred in the e-liquids to produce new, unintended and unexpected by-products. Drawing upon an understanding of organic reaction mechanisms, we hope to understand how to control and prevent, unwanted reactions in e-liquids.

Vo, H., S. Murru, M. Lo, A. Dahal, and S. Jois. ULM. **Microwave assisted synthesis of five and six membered nitrogen heterocyclic compounds and their biological evaluation.**—Significant number of synthetic and natural organic compounds are heterocyclic in nature and are predominant among all types of pharmaceuticals, agrochemicals and veterinary products. This high significance of heterocycles is mainly because of their ability to involve in an extraordinarily wide range of reaction types. Depending upon pH of the medium, they may behave as acids or bases, forming anions or cations, act as electrophilic and/or nucleophilic. Among all, nitrogen heterocyclic compounds such as pyrazoles, isoxazoles, phthalazines play important roles in the biological systems and are found to be effective pharmacophores in some of the biologically active molecules. Pyrazoles and isoxazoles exhibits extraordinary reactivity patterns and they can be fine-tuned to achieve desired electronic and steric effects. Because of their importance, it is crucial to develop methods that are faster, efficient, and are cost effective. This underlines the purpose of our current research: developing faster and cleaner methods for making biologically relevant nitrogen heterocyclic compounds with different substituent patterns. Accordingly, we have developed microwave assisted organic synthesis (MAOS) methods for the synthesis of a series of pyrazoles, isoxazoles, pyrazolones and phthalazinones. Pyrazoles and isoxazoles are synthesized from the corresponding dicarbonyl compounds and arylhydrazines, whereas the isoxazoles are synthesized from dicarbonyl compounds and hydroxylamines. Phthalazinones are synthesized from the 2-benzoylbenzoic acid and arylhydrazines. All the synthesized compounds were characterized by IR, ¹H NMR, ¹³C NMR, and GC-MS analysis and evaluated for in vitro anticancer activity. Synthetic methods, structural characterization and biological activity data from cytotoxicity assay will be presented in the poster.

Walls III, T, M.Y. Diaz, and P. Chanda. SLU. **Diastereoselective synthesis of syn- or anti-β-hydroxy-α-substituted phenyl carboxylic acid esters.**—Aldols, 2,3-diaryl-3-hydroxypropanoates, derived from substituted phenylacetates are privileged motifs and commonly found in many bioactive compounds. 1,2,3-triazole analogs of 2,3-diaryl-3-hydroxypropanoates, which are prepared from p-bromophenylacetates, exhibit higher enzyme inhibition activity and selectivity than the corresponding compounds derived from unsubstituted phenylacetates. In the synthesis of 1,2,3-triazole analogs, an approximately equal mixture of syn- and anti-diastereomers was prepared by using LDA-mediated aldol reactions of substituted phenylacetates. However, only one isomer, either syn- or anti-aldol, was found to be useful in preparing a potent inhibitor of the aromatase enzyme complex (CYP 450 19A1). This requires a convenient synthetic method to

obtain either the pure syn- or anti-2,3-diaryl-3-hydroxypropanoates from substituted phenyl-acetates. We will discuss the boron-mediated complementary syn- and anti-selective synthesis of β -hydroxy- α -substituted phenyl carboxylic acid esters.

Xavior, A. J., V. Thalangamaarachchige, K. Boggavarapu, and N. Dissanayake. MSU. **Chitin extraction using ionic liquids.**—Chitin is found in the exoskeleton of invertebrates such as crawfish and shrimp that are native to Louisiana. There are many ways to extract chitin from an organism's exoskeleton; however, the structural integrity is of concern when choosing extraction methods. One of the best methods discovered to extract chitin while maintaining integrity is using ionic liquids. During the study, novel ionic liquids (ILs) are synthesized to extract chitin. Extracted chitin is converted into chitosan via deacetylation. Chitosan has immense antibacterial properties as well as coagulant properties. Chitin can be useful for medicinal, pharmaceutical, agricultural, and even industrial purposes. Hence, the extraction of chitin using ionic liquids is important for providing such amenities while maintaining the quality of all the products. Synthetic methods and extraction protocols will be discussed.

Computer Science Section

Abdussalam, I., M. Salam, and Y. Banadaki. SUAMC. **A perspective of machine learning in wireless sensor networks.**—Wireless sensor network (WSN) is composed of many tiny smart sensors that are geographically distributed in a place of interest. These sensors are capable of sensing, computing, and communicating capabilities. These sensors form ad hoc or self-organizing networks by communicating and coordinating individually with neighboring sensors. Machine learning (ML) techniques especially unsupervised learning techniques play an important role in determining the performance of wireless sensor networks. In this research, we will discuss the perspectives of many applications of machine learning algorithms in wireless sensor networks such as segregation of faulty sensor from the normal sensors, anomaly detection, dynamic routing mechanism, deciding the optimal number of sensors in a given area, data aggregation and energy-efficient routing of sensor data, energy-harvesting by forecasting the amount of energy to be harvested within a particular time slot. There are many other promising applications of ML in the field of WSN that will be discussed.

Avgin, H. and M. Salam. SUAMC. **GPS spoofing attack detection in drone using machine learning.**—The use of drones in civil life has become widespread in recent years. This spread brought problems with it. The biggest of these problems is GPS spoofing attacks. These attacks can be seen in the form of an incorrect reading of the speed, time, and location information of the drone or the deviation of the mission given to the drone. Machine Learning algorithms are growing and getting better every year. Most classic tests can detect large amounts of attacks in the current time. However, these techniques are not sufficient for safety, as their types change and become stronger frequently. In this study, we will use the public UAV Attack dataset. We offer machine learning techniques to detect GPS Fraud attacks on 6 different drones. We believe that our success in detecting attacks against UAVs by using machine learning techniques we have developed to detect GPS Fraud attacks on a UAV will be over 95%.

Bhandari, U., C. Zhang, M. R. Rafi, J. Lei, C. Zeng, S. Guo, and S. Yang. SUAMC/LSU-BR. **Hardness prediction of refractory high-entropy alloys by machine learning with experimental validation.**—Refractory high-entropy alloys (RHEAs) are an advanced class of materials that have received great attention from the material scientists and researchers regarding their potential application in aerospace, nuclear, and energy industries. Hardness is an essential property in the design of RHEAs. This study shows how neural network (NN) model can be used to predict the hardness of RHEAs. We predicted the hardness of several alloys, including the novel $\text{Co}_0.1\text{Cr}_3\text{Mo}_{11.9}\text{Nb}_{20}\text{Re}_{15}\text{Ta}_{30}\text{W}_{20}$ using the NN model. The hardness predicted from the NN model was consistent with the available experimental results. The prediction of $\text{Co}_0.1\text{Cr}_3\text{Mo}_{11.9}\text{Nb}_{20}\text{Re}_{15}\text{Ta}_{30}\text{W}_{20}$ was verified by experimentally synthesizing and investigating its microstructure properties and hardness. The microstructure study shows a single BCC phase existing in $\text{Co}_0.1\text{Cr}_3\text{Mo}_{11.9}\text{Nb}_{20}\text{Re}_{15}\text{Ta}_{30}\text{W}_{20}$. The predicted hardness of $\text{Co}_0.1\text{Cr}_3\text{Mo}_{11.9}\text{Nb}_{20}\text{Re}_{15}\text{Ta}_{30}\text{W}_{20}$ by NN model was 686 Hv which agrees with the experiment. This model provides an alternative route to determine the Vickers hardness of RHEAs.

Brooks, J., and Y. Banadaki. SUAMC. **Differentiating potentially malicious darknet traffic from benign network traffic using machine learning.**—This paper uses a systematic approach

to assess the capability of machine learning algorithms to be employed for analyzing, testing, and evaluating network traffic. A Darknet is a subnet of the Deep Web that consists of unused internet address space where there are no legitimate, active servers or hosts, therefore traffic originating from there is deemed potentially malicious. Tracing communications remains a challenge because the dark web is a decentralized network that is accessed through anonymous proxy networks such as the Tor browser. However, the network traffic from our dataset can be used to predict whether traffic is from the Tor browser. This paper presents a binary-classifying approach to distinguishing darknet traffic from benign traffic by analyzing the flow of network packets using machine learning algorithms. The machine learning model differentiates darknet traffic from benign traffic and flags any traffic that comes from an IP address within the Tor browser as potentially malicious activity. Our dataset provides us with various features containing information about the traffic: source & destination ports/IP's, protocols, flow durations, forward/backward packets data, etc., to distinguish malicious darknet traffic from regular benign activities. The capability of machine learning classifiers is evaluated considering their accuracy, precision, recall, and F-score, confusion matrices, ROC curves, and feature importance.

Francis, M., E. Francois, and P. Sreekumari. GSU. **Towards an extensive data analysis of COVID-19 cases and deaths in the United States.**—The United States currently has the highest number of reported coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) cases and deaths in the world. Recent analysis revealed that the COVID-19 pandemic has disproportionately affected racial and ethnic minority groups with high rates of cases and deaths, especially African American and Latinos communities. The purpose of this project is to analyze the current trend of COVID-19 cases and deaths in the United States. The focus of this project is three-fold. The first objective is to analyze COVID-19 cases and deaths from all age groups by race and ethnicity. The second objective is to analyze the effect of COVID-19 in terms of sex and the third objective is to briefly discuss the underlying conditions that affect COVID-19 on racial and ethnic minorities. An extensive data analysis was performed by utilizing the publicly available data from the COVID-19 Tracking Project and the Centers for Disease Control and Prevention (CDC). The results present the current trend of COVID-19 pandemic and the underlying medical conditions associated with the increased risk of COVID-19 cases and deaths in the United States.

Ghaemimood, S., R. Joubert, Y. Banadaki. SUAMC. **Application of text-mining and image processing techniques on developing big geological and hydrological data sets.**—A novel implementation of a text-mining technique for a civil engineering application is investigated. To do so, an image processing and optical character recognition method is applied to a large handwritten geotechnical dataset to extract well log information. First, the newly developed Python-based model cropped the desired excerpt from the spreadsheets. The grabbed data is then automatically converted into ASCII files in the following step to be ultimately used by a comprehensive groundwater model for the Southeastern US region. Various Python libraries such as PIL, Open CV, and Google Cloud Libraries are implemented in the developed model. The proposed method was proved to be highly promising for efficient management of the unused scientific data in the form of scanned handwritten documents. The approach presented in this paper significantly reduces data manipulation time and accelerates the big data preparation to train an accurate and comprehensive machine learning model.

Jaiyesimi, L. and Y. Reddy. GSU. **Identify malicious programming or weakness in web design.**—The goal of the project is to learn and understand how javascript is written, used and applied in the world of technology. Throughout this project I was able to learn about the syntax of JavaScript as well as Hyper Text Markup Language (HTML) and Cascading Style Sheets (CSS). I was able to create multiple folders containing code in brackets text editor. As a result, I made a website sample which contains images, text and automatic graphics. JavaScript can be used to create many complex features on web pages such as animated and interactive graphics. JavaScript can be used to create many complex features on web pages such as animated and interactive graphics. It is also a versatile programming language that can be used by hackers to collect user information. The second reason I pursued this topic is to get a better understanding of how scripting is done so I can identify malicious programming or weakness in web design. I believe an overall understanding of JavaScript will help me to create web pages and have the knowledge to be aware of any security flaws or breaches. Overall, the result of the project was a website created from JavaScript, HTML and CSS which contains text, graphics and timed animations. As a result of this project, I have gained a better understanding of scripting and its many uses.

Mullamuri, B., D. Davis, and Y. Banadaki. SUAMC. **Quantum programming languages – An Overview.**—Quantum programming languages (QPL) are the means of communicating and executing ideas on quantum computers. They are essential to programming quantum computers physically available. They can also be utilized to develop new and advanced quantum algorithms that can only be executed on future quantum devices. These languages are used to handle physical quantum devices, teach quantum computing principles, verify quantum algorithms, and estimate the costs associated with the execution of these algorithms on future quantum hardware. They are mainly beneficial for research and development professionals working on quantum devices and quantum computation. Here, we overview the various advanced quantum computing languages.

Posey, N., and B. Baniya. GSU. **Virtual reality simulation application Break Free.**—My theory was to create a self-explorative visually tranquil space that alleviates the overwhelmed individuals, through my cross functional virtual reality game “Break Free”. This simulation was invented to help people manage stress, reduce anxiety, and cultivate their peace of mind. My prototype shows the graphic development and design aspects of a wispy rainforest adventure, with calming wind sounds, and flowing water in the background. To complete the scenic forest with audio insight and first-person animation I used the c++ script for implication and Unity, to help with the graphic design aspects of the scenes. The first-person functions include a user directed angle perspective, allowing running and jumping. My virtual reality simulation was not created to be used as a tool but rather a learning experience that emboldens the player to become aware of the ebb and flow of these emotions and break free.

Rafi, M. R. and M. Salam. SUAMC. **Machine learning based anomaly detection in Internet of Things networks.**—In recent years, the Internet of Things (IoT) has grown up rapidly and tremendously. The exponential growth in the use of IoT networks in various fields of our daily life leads to an increase in anomalies and threats. In this ongoing research, we propose to detect the maximum number of anomaly attacks in IoT networks by applying machine learning (ML) methods namely K-nearest neighbors, logistic regression, and random forest model. The UNSW-NB15 dataset has been used for this study. These algorithms will be used to identify a maximum number of attacks if newly released attacks are added in the dataset or if it is implemented on

another dataset. We will compare the performance using these three ML algorithms. After the implementation of these models, we are expecting 99.5% accuracy of detecting attacks in the dataset. In this way, a maximum number of anomaly attacks in IoT networks can be identified by machine learning techniques.

Rafi, M. R., C. Zhang, J. Lei, U. Bhandari, and S. Yang. SUAMC/LSU-BR. **Yield strength prediction of refractory high entropy alloy using machine learning.**—Yield strength calculation of refractory high entropy alloys (RHEAs) at high temperature attracts researcher interest in materials science at present time. However, it is complex, expensive, and time-consuming to measure the yield strength at high temperature by going through experiment setup. Accurate prediction of yield strength at high temperature is urgent to investigate the mechanical performance of RHEAs. In this study, for the first time, a machine learning (ML) method based on the convolutional neural network (CNN) technique was employed to predict yield strength of RHEAs at the desired temperature. Based on the available simulation and experimental data of yield strength at various temperature, the yield strengths of MoNbTaVW at 800 °C and 1600 °C, were predicted to be 873 and 448 GPa respectively. Our results were consistent with the experimental reports, showing the high accuracy of CNN model on predicting the yield strength of RHEAs at the desired temperatures.

Ranjbar, S. and Y. Banadaki. SUAMC. **Review of machine learning applications in depression.**—Review of Machine Learning Applications in Depression Rapid technological advances in digitization and data analytics reshape our society and impact various scientific disciplines. Artificial Intelligence (AI) methods are already improving the areas that directly impact humans, such as psychology and medical diagnosis. While coronavirus affects the whole world, isolation strategy with quarantine was a useful model to control rapid coronavirus transmission. In contrast, this strategy can affect mental health. Depression is one of the causes of disability and morbidity, and it can affect about 10% of the population. As a complex clinical entity, it is challenging to accurately and timely diagnose depression for an effective treatment approach. Machine learning (ML) is a subset of AI that has recently demonstrated an immense potential to enhance diagnostic and intervention research in depression. The development of assessment and prediction tools that can accurately predict depression is one of the most exciting ML applications in psychological science. This paper provides a brief review of ML applications in depression. The paper also highlights the usefulness and current limitations of ML approaches, and provide evidence of their potential impacts on future clinical translation and mental illness diagnosis like depression.

Roberson, S. and M. Salam. SUAMC. **Safely scaling virtual private network for a major telecom company during pandemic.**—Virtual private network (VPN) usage across the world has increased due to the COVID-19 pandemic. With companies trying to lay the course through this unfamiliar state, corporations had to implement a Business Continuity Plan which included several elements to maintain a scalable and robust VPN connection. We have proposed a 4-step model called the “playbook” that can be used to overcome the crisis during any pandemic like COVID-19. This model consists of Asset Deployment Plan, Remote Access Plan, Network Plan, and Communications Plan. This plan outlines the processes and procedures an organization should follow to reduce the risk/vulnerability of the enterprise. The enterprises that will flourish in the future will be those with an unyielding strategy that will permit remote work on all echelons

throughout the organization. It is hoped this study will inform Information Security personnel and employees about the process and procedures for scaling VPN during a major crisis.

Williams, S., and B. Baniya. GSU. **Skin cancer detection and segmentation.**—Skin cancer, scientifically known as melanoma is a cancer that effects the skin, the detection of this disease can sometimes be very challenging as symptoms are not shared universally, to aid this process we have been developing software that can increase accuracy in early detection. creating a diverse selection of images to accommodate for varying skin tones and shades, using image the watershed segmentation to mask the surrounding skins pigment and emphasize the spots in question, plotting the data from the pixels the program will compare images taken to images in our data set and predict if melanoma is present. Using this technology to identify other cancer cells, or underlying diseases will be a significant step forward in ensuring accuracy in a medical prognosis. The issues with this program lie in the fact some spots do not have a gradient and are a solid color, however in this case they typically are one color that is darker than the surrounding skin and are larger than moles or other skin blemishes. Also, people with other skin features such as moles, or freckles may skew the data.

Materials Science and Engineering Section

Audain, S.A., D. Roberts, H. Yang, N. Seetala, H. Wen, and S. Guo. GSU/LSU-BR. **Effect of Cu composition on magnetization of laser heat treated SmCo/Cu powder mixtures.**—The microstructure and magnetization of SmCo₅ micro-particles may be used as feedstock for 3D printing. Thus, these were studied under various heat treatments using vacuum furnace annealing and high wattage laser heating. Commercial micro-particle SmCo₅ powder was used to optimize parameters to make strong magnet using laser heat treatment. The magnetization of laser heat treated at 50-watt showed an increase in magnetization, while the coercivity decreased significantly. The vacuum annealing or heating in hydrogen gas flow furnace showed that the magnetization generally increases with the temperature, while the coercivity decreases significantly. To understand if these effects are due to particle aggregation during heating, Cu nanoparticles are used at 10, 100, and 1000 times to SmCo particles to minimize aggregation of SmCo particles during laser heat treatments at different laser powers of 15, 30, and 50 W. The variations in the magnetization and coercivity with different Cu composition and laser power indicate that the changes in the parameters observed in laser heating of SmCo without Cu are not due to particle aggregation rather it is due to grain growth within particles.

Bari, S.M.I., L. Reis, and G. Nestorova. LTU. **Lab-on-a-chip immunosensor for the quantification of TNF- α : experimental results and 3D numerical simulation of heat transfer.**—This study demonstrates the application of a lab-on-a-chip immunosensor for quantification of the inflammatory cytokine TNF- α with a limit of detection of 14 pg mL⁻¹. The immunoassay was performed in a microfluidic device with an integrated antimony/bismuth thermopile a theoretical Seebeck coefficient of 7.14 μ V mK⁻¹. The anti-TNF- α monoclonal antibody was used to capture the analyte while the detection was performed using glucose oxidase-conjugated secondary antibody. The heat generated by the enzymatic reaction between glucose oxidase-conjugated antibody and glucose was converted to an electric output by the thermoelectric sensor. The efficacy of the device was evaluated by quantifying TNF- α in the astrocytes cell culture medium. Numerical analysis was performed to investigate the heat distribution as a function of channel height (50 μ m, 100 μ m, 150 μ m, and 200 μ m), the velocity of the injected substrate (0.168 mm s⁻¹ and 0.084 mm s⁻¹), and channel material (glass, PMMA, and PDMS).

Billa, S., I. Hossain, C. Gong, T. Murray, L. Blaga, N. Moldovan, and P. Arumugam. LTU. **A multifunctional electrochemical biosensor probe for real-time glutamate and GABA detection.**—Glutamate (GLU) and gamma-aminobutyric acid (GABA) are neurotransmitters (NT) essential for normal brain function, neuronal activity, information processing, neural plasticity, and network synchronization. GLU is a major excitatory NT and GABA is a major inhibitory NT, and they must maintain a proper balance for the brain to operate normally. A GLU-GABA dysregulation plays a critical role in several brain disorders, including epilepsy (a disorder affecting 1.2% of Americans), dementia (a disorder that will affect 130 million worldwide by 2050) and Parkinson's (a disorder affecting 1.5 million Americans today), which profoundly impact the quality of life of patients. Measuring such NT concentrations was possible only in vitro via microdialysis, during ~1-10 min experiments, while the interest is in measuring concentration changes in real time with sub-second temporal resolution, for rapid diagnosis. Here, we report on developing an electrochemical microbiosensor array silicon (Si) probe for simultaneous GLU and

GABA detection in vivo for the first time, based on selectively oxidizing GLU and GABA into a secondary electroactive product in the presence of enzymes, which is then detected by amperometry. The probes have three detection sites to detect GLU and GABA and one site as a sentinel for interferent rejection. The Si probe also features a microfluidic channel for the introduction of chemicals in the immediate vicinity of the detection sites, such as for functioning of an On-Demand In-situ Calibrator for accurate detection, or, alternatively, inject specific drugs for testing their NT response.

McGibboney, C., S. Yoshida, N. Fujishima, S. Takahashi, and T. Sasaki. SLU/NU. **Progress on developing a general theory for fatigue with the field theory of deformation and fracture.**— We present results on our hypothesis that the Field Theory of Deformation and Fracture (Field Theory) characterizes fatigue on a fundamental theoretical level. Previous research has demonstrated that the Field Theory can make damage predictions under monotonic loading. We have demonstrated that when materials are experiencing cyclic loading, the driving frequency relative to the resonant frequency is a major contributing factor for the generation of the wave dynamics. From the viewpoint of wave dynamics described by the field theory we describe deformation dynamics of elastic, plastic, and fracture stages, using the same theoretical foundation. We derive wave equations from the Field Theory and analyze numerical models under conditions assimilated with physical experiment. The Field Theory defines each stage with specific spatiotemporal features that are also observed in experiment at each state of deformation with corresponding fringe patterns, obtained by Electronic Speckle-Pattern Interferometry, that are consistent with stress-strain characteristics.

Moore, T., H. Yang, R. Burell, and C. Peter. GSU. **Impact of laser pulse width on the melting of nanoparticles.**— Study on laser melting of metallic particles is important in the application of three-dimensional (3D) metal printing. Impact of nanoparticles during the laser melting process has not been studied as much, possibly because loss of nanoparticles as they leave the surface when heated. In order to overcome the problem of particle losses, we have employed a novel approach that reduces the loss during the laser melting by sandwiching the powders between two quartz glass plates. For the control of pulse width of laser beam, we have applied square waves to the laser power controller, which enabled us to control the pulse width from a few seconds to micro-seconds for a semiconductor laser that emits 450 nm. In this paper, we discuss the impact of the laser pulses width on the melting of nanoparticles when the laser pulses are irradiated to the powders confined in a small volume.

Mathematics and Statistics Section

McGibboney, C. SLU. **Geometries of the Riemann Zeta Function.**—We expand on Carl Erickson's work that shows Euler (Cornu) Spirals can be plotted using the Riemann Zeta Function. Using the Riemann Zeta function, for values of s on the critical strip ($\text{Real}(s)=.5$) where complex values of s produce the nontrivial zeroes, to plot Euler Spirals such that the second spiral, in the twin spiral pair, is centered at zero. We demonstrate numerically (in some cases) that there is a relationship between the $\text{Real}(s)$ and the distance from the generation point to the center of the last Euler spiral. This is important because it may indicate that there is a geometric constraint which produces the nontrivial zeros for $\text{Real}(s) = 0.5$. These methods are poorly defined from a numerical perspective and from the approximation methods used to make geometric assertions about Riemann Zeta Function. Every mathematical relationship is approximate until proven.

Physics Section

Champagne, C., K. Boudreaux, I. Pal, and M. Jadhav. ULL. **Micrometeorite hunting in Lafayette, Louisiana.**—Earth's surface is hit by nearly 78,000 tons of extraterrestrial materials every year. The bulk of this material reaches Earth as micrometeorites which are microscopic meteorites (50-200 microns in size). These micrometeorites represent asteroidal and cometary materials. Until recently, samples were recovered from fairly inaccessible locales, polar ice and deep-sea sediments, making their studies very difficult. A recent study, however, outlined a method for finding micrometeorites in urban environments. We have started looking for micrometeorites near rain gutters on flat rooftops in Lafayette. Roofs that have not been swept in a year or more are our primary targets because theoretical studies estimate the micrometeorite flux on Earth's surface to be one 100-micron micrometeorite per square meter per year. Our aim is to build a well-characterized micrometeorite collection that can be further analyzed by microanalytical techniques to provide information on under-sampled regions of our Solar System.

Division of Science Education

K-12 Section

Gary, A., and M. Malbrough. YAT. **Youth development through controlled chaos.**—The current American education system is focused mostly on teaching young people knowledge, while failing to inculcate vital skills, such as critical thinking, problem-solving, strategic planning, plus the fundamentals of leadership with equal success. Most young people are forced – on their own – to learn such vital skills through the difficult, even discouraging, process of trial-and-error when they transition to the world of work, enlist in a branch of the armed services, or for some, enroll in higher education. Our presentation offers for discussion the view that the best way for young people to acquire and polish these vital skills is through the benefits of exposure and experience outside the classroom in a dynamic environment. The process for developing and honing these vital skills is presented as controlled chaos. Three paths of development will be presented to show the challenges and rewards of this approach.

Division of Sciences and Humanities

Busby, A. Nicholls. **Two cultures, one classroom: An examination of a class on art and science.**—In 1959, C. P. Snow argued that the modern industrial era's emphasis on specialization had created “two cultures,” the scientific and the artistic. Despite efforts to emphasize STEAM or to acknowledge the relevance of the liberal arts, we continue to see the fallout of such a shift in higher education. Students in both disciplines assume that these two fields are situated in direct opposition despite the fact that science and art have been historically linked. This paper examines a course at Nicholls aimed at non-art majors. “Art and Science, Bridging the Divide” examines moments of intersection from the Renaissance to the contemporary era. Organized chronologically, lectures expose students to artists and scientists responding to one another's work. Course topics include the biological and physical sciences as well as psychology and mathematics. This talk provides a course overview and suggests positive outcomes for students, especially science majors.

Chiasson, L.L. and J. Plaisance. Nicholls. **A comparison of levels of burnout in occupational therapists in Louisiana.**—Burnout is often described as feelings of exhaustion and dissatisfaction towards one's work experience. The abbreviated Maslach Burnout Inventory (aMBI) separates burnout into three components: emotional exhaustion (EE), depersonalization (DP), and personal accomplishment (PA). Each component is individually measured to determine its influence. This study examined levels of burnout, identified the most prominent component of burnout, and determined correlations between burnout and demographic characteristics of Louisiana occupational therapists (OTs). Thirty-six OTs completed a survey consisting of the aMBI and additional questions regarding demographic information. Occupational therapists reported moderate EE scores, indicating that emotional exhaustion was the most prominent component. Further analysis showed that burnout was associated with OTs who were younger, unmarried, possessed a master's degree, and worked with adolescents, young adults, and elderly clients. However, because there is limited literature regarding burnout in OTs, further research is needed to confirm the results of this project.

Doucet, J. Nicholls. **A Bacillus on the Bononi: A fifth reading of science poetry.**—Despite the long literary relationship between poetry and science, little of what Aristotle recognized as “the language of all higher learning and thought” survives either as functional or even memorable writing. However, what we recognized as separate cultures in the 21st century is well demonstrated by relatively recent examples of poets using scientific diction (Chaucer, Donne, Poe, Hardy, Auden, Wilbur) and, though less frequently, scientists writing in poetic forms (Maxwell, Oppenheimer, Huxley), not to mention the casual use of terms like “DNA” and “electrons” in modern poetry. In revival of the tradition, this presentation is a fifth installment of original poetry on modern scientific topics. The poems are written in formalist structures with concise, epigrammatic narrative emulating the nature of scientific writing. Subjects of readings will be selected from several series of short poems, including “The Diaries of Darwin” and “Molecules Misbehaving,” as well as longer-form pieces.

Doucet, J. Nicholls. **Ecological anthropology of a Louisiana marshland village.**—Located along Bayou Lafourche about 50 miles south of Thibodaux and about 21 miles north of the Gulf

Coast, the village of Golden Meadow was founded by farmers during the great land reclamation enterprise of the early 20th century. Fishermen also found the village's natural land ridge an attractive area of settlement. Beginning in 1893, a triumvirate of severe early-century hurricanes eventually drove the entire coastal shrimping to the village, with floods from the final storm in 1915 effectively ending reclamation farming. When oil was discovered in the late 1930s, the already densely populated fishing village became home to hundreds of derrick workers. While the historical economy of other marshland villages also transitioned from fishing to drilling, Golden Meadow was uniquely founded by farming. This study describes the ecological-industrial continuum of the village as well as other aspects of its origin inextricably linked to its coastal marshland environment.

Giguette, R. and A. Alexander. Nicholls. **How do humans compute meaning?**—Humans perceive the universe as a collection of objects, animate and inanimate, somehow connected by emotional bonds and a sense of purpose and meaning. But how exactly do we derive meaning from our perceptions? The steps involved in computer processing may give us a clue. When a computer receives input, the first processing step is computational, turning data into operands the arithmetic unit. The next step is linguistic. Programming languages use math to model the structures, behaviors and other characteristics of real-world objects. Finally, the computer's graphical interface presents these language-defined entities visually, making them more life-like and appealing. This appears to mimic the process used by the human mind. For both human and machine, the process has evolved over time. Yet, we may have intuitively built into computers the same layering of computation, language, and visualization that humans use to create meaning.

Jara, P.A. and M. Silverstein. LU-NO. **Stress, coping, and resilience in parents of children with Autism Spectrum Disorder.**—Research suggests that parents of children with Autism Spectrum Disorder (ASD) experience high parenting stress. The aim of this study is to investigate why some parents of children with ASD are more distressed than others despite experiencing similar ASD-related stressors. One hundred parents will complete an online survey, which includes the following measures: sociodemographics, Mini International Personality Item Pool (Mini-IPIP), Perceived Stress Scale (PSS), Stress Mindset Measure (SMM), Coping Self-Efficacy Scale (CSES), and Connor-Davidson Resilience Scale (CDRISC-10). Investigators will analyze data using bivariate correlations and a mediation model using the Hayes Process Macro on SPSS. It is hypothesized that parents with higher levels of coping self-efficacy, extraversion, positive stress mindset, and resilience will have lower levels of perceived stress. We also hypothesize that coping self-efficacy and resilience will mediate the relationship between severity of ASD and perceived stress. Results will inform stress-reducing interventions for parents of children with ASD.

LaFleur, G., G. Engeron, H. Dicharry, B. Crochet, E. Venable, and M. Robichaux. Nicholls. **A bestiary of physiological models to highlight value of comparative biology.**—As part of my Physiology and Developmental Biology courses, I introduce students to a menagerie of animals and physiological systems that the typical textbook of Human Anatomy and Physiology does not cover. It appears that students often fail to recognize that the mechanism we understand so well in humans was actually discovered, experimentally defined, and molecularly dissected using another animal that offered specific advantages. To address this, I have adopted a supplementary project for Honors Credit in my courses that requires students to create a bestiary entry devoted to a non-human animal model, a physiological process, and the scientists that made the contributions.

Students compose their entry in a triptych format with allusions to the historic illuminated bestiaries. So far, highlighted models include the nematode for apoptosis, the squid for the action potential, the sea urchin for fertilization, and the puffer for loss of introns.

Mathkour, M. and E. Grissom. LU-NO. **Sex differences in hippocampal morphology and hippocampal-dependent learning strategy in prepubertal rats.**—Empirical evidence suggests that male rats prefer a striatum-based place strategy during a water maze task before puberty. Contrarily, female rats prefer the hippocampus-based place strategy during a water maze task. Along with the differences in preferences between male and female rats during a hippocampal-dependent task, sex differences in the hippocampus's neuronal architecture were found between male and female rats during adolescence and adulthood. Eighteen prepubertal rats (9 males and 9 females, age 28 days old) will be included to investigate the sex differences in memory and learning stages during a water maze. Hippocampal structural sex differences will be investigated using brain tissue obtained from a parallel group of 5 male and 4 female rats. The current study hypothesizes that female rats will have more neuronal spines and dendritic branches in their hippocampus compared to males, corresponding to sex differences in learning and memory during the water maze task.

Naquin, E., C. Oubre, and J. Doucet. Nicholls. **Toward molecular mechanisms for historical Houma Indian curatives. II.**—In 1941, Frank G. Speck published associations of 73 native plants and their medical folklore known to the historical Houma of southeastern Louisiana (*Primitive Man XIV* [4]: 49-73). In an effort to substantiate the reported medical usefulness of these plants, we undertook an associative study of Houma medical folklore with genus- and species-specific phytochemical constituents known to modern science. Our results demonstrate that a number of plants used by the Houma as curatives have bioactive chemical constituents with overall medical properties as reported in the folklore. In an era of drug-resistance and high costs of pharmaceutical development, forensic investigations of historical curatives for their mechanism of action may provide new avenues of drug discovery. In addition, our findings suggest that the early Houma conducted meaningful pharmacological evaluations of local plants that resulted in functional medical applications derived from environmental resources.

Division of Social Sciences

Messina, A. and E. Varela. LU-NO. **The relation between traumatic exposure type, negative cognitions, and social impairments.**—Around 60% of men and 50% of women experience at least one traumatic event in their lifetime. Many of these individuals suffer from post-traumatic stress (PTS), negative cognitions, and impaired social functioning following the event. Research has yet to investigate whether different types of trauma, such as assaultive and nonassaultive, may be associated with certain cognitions or social impairments. The purpose of this study is to examine how assaultive and nonassaultive trauma may differ in each of their relations with cognition and social functioning. In this study, Loyola University undergraduates were given the following self-reports to complete: the Life Events Checklist for DSM-5 (LEC-5), the PTSD Checklist for DSM-5 (PCL-5), the Barkley Functional Impairment Scale (BFIS), and the Posttraumatic Cognitions Inventory (PCTI). It is hypothesized that assaultive trauma will be associated with higher levels of negative cognitions, greater PTS symptom severity, and greater impairments in social functioning than nonassaultive trauma.

Saulsman, C. and E. Zucker. LU-NO. **Interpersonal distance, evaluation apprehension, and state anxiety in college students.**—To simulate a college classroom testing environment and evaluation apprehension, performance on a short multiple-choice quiz will be assessed with a researcher located either 6 or 12 feet away. In the evaluation apprehension present (EA+) condition, the researcher will face and watch participants and participants will be told that the five highest scoring students will receive a \$25 gift card; for the evaluation apprehension absent (EA-) condition, the researcher will be facing away and no mention of gift cards made. After the quiz, all participants will complete the State-Trait Anxiety Inventory. State Anxiety scores will be analyzed with a 2 (distance) X 2 (evaluation apprehension) analysis of covariance, with Trait Anxiety as the covariant. It is hypothesized that state-anxiety levels will be highest in the EA+ group at the closest distance. The results of this study have implications for improving test-taking environments in college campuses.

Topical Section:

Cyber Security and Information Assurance

White, A., G. White, Y. Reddy, and C. Catherene. GSU. **Tigris Communications**.—Companies currently rely on a number of different applications for both communication and the smooth running of their businesses. Regularly employees may message each other on a phone, by emails, and a private website for organizing and booking meetings. The process is time consuming and inconvenient for many employees, and does not connect the different department employees and management in the businesses. Therefore, a new approach is required that remains competitive. In the modern day, to remain competitive, easy to use, and timely give a call for important meeting messages and signal the participants of the meeting. To meet the current day needs, the tiger group recommended App based procedure to communicate more effectively and works real-time basis. The recommended App-based procedure will move toward an agile technique that could allow not only individual work forces to communicate in real time, but also allow enterprise communication across the globe. The agile model supports another feature which assists with the ability to limit what some employees are privy to. This level of security will be of great assistance to those employees that need to limit highly confidential information to only certain employees within the company. The app will give companies the ability to consolidate the various communication platforms down to only one application which will improve the flexibility and productivity of a company.

Bradley, Y. and Y. Banadaki. SUAMC. **Intrusion detection using auto AI**.—Cyber-attacks have significantly increased over the past decade, increasing the demand for protecting citizens' personal information on most networks. An Intrusion Detection System (IDS) has an important cybersecurity application to monitor the network for malicious activity. Throughout the years of development, IDS still faces difficulties in improving detection, false alarms, and unknown violations. To solve these problems, researchers have focused on analyzing the network using Artificial Intelligence (AI). In this work, IBM Watson's Studio's Auto AI is used to build an automated AI lifecycle management by organizing data, build and run AI models. Suspicious traffics are discovered by a virtual analyst working simultaneously with the network IDS to defend the threat environment and taking appropriate precautions with the permission of the analyst.

Davis, D., B. MullaMuri, and Y. Banadaki. SUAMC. **Simulation of quantum cheques circuits in five-qubit IBM Quantum Computer**.—A cheque is a printed document issued by an account holder to order the bank to pay a specified amount of money to the party carrying the cheque. It is much essential as taking a huge amount of money physically is not safe. However, this physical form of cheque still faces the problem of forgery and misuse. To avoid physical handling as well as the delays associated with manual processing of cheques and, most importantly, to improve the security of the transaction, a concept of quantum cheques is proposed. By using a quantum cheque, it is estimated that any sort of forgery is almost impossible. In the current work, the quantum cheque transaction is simulated and run experimentally by the IBM quantum experience platform using 5-qubit quantum computers. For this, quantum circuits for quantum cheque generation and verification were designed, tested, and verified by theoretical results achieved by simulation.

In Memoriam

Dr. Kamran Abdollahi

Dr. Kamran Abdollahi joined Southern University in 1992. He was a full-time tenured professor and Program Leader of the Urban Forestry and Natural Resources Department, College of Agriculture. He served as Program Leader/Chair and Graduate Director, 2006 to 2019; Project Director and Authorized Technical Representative for SU USDA-McIntire-Stennis Program, 2009 to 2019; Project Director for the SU USDA-Renewable Resources Extension Act (RREA) Program, 2006-2019; and Project Director for 20 National Research, Teaching and Training Projects, 1992-2019. His academic credentials include a doctorate and an M.S. from Austin State University, Texas; a B.S. from Pennsylvania State University (Penn State), University Park, Pennsylvania, and several specialized certificates from various institutions. His national professional leadership roles include: National President, Arboricultural Science and Education Academy, ISA, 2012-2014; National Fellow, Society of American Foresters; National Advisory Council Member to the USDA Secretary of Agriculture, National Urban and Community Forestry Advisory Council (NUCFAC), 2009-2013 and 2015-2018; National Chair, Urban Forestry TWG, Society of American Foresters (SAF), 2009-2011 & 2016-2019; National Executive Committee Member, National Association of University Forest Resources Programs (NAUFRP), 2009-2012 and 2013-2019; National Chair, 1890 McIntire-Stennis Coordinating Council, 2011-2016; National Committee Member, Society of American Foresters (SAF) Accreditation Committee, 2009-2012; National Council Member on the SAF National Accreditation Committee, 2008; and several other national roles. He has been serving on the Editorial Board of the Journal of Arboriculture & Urban Forestry, and as a Reviewer for several other journals. At the state level, he also played several roles: Member, Louisiana Governor's Advisory Panel for the Environmental Quality (LEAP); Director for Louisiana, International Society of Arboriculture (ISA), 1999-2002; Division Chair, Agriculture and Forestry, Louisiana Academy of Sciences, 2016-present; State Chair, Louisiana SAF; Council Member, Louisiana Urban Forestry Council, 2016-2020; and Executive Board Member, Louisiana Urban Forestry Council (LUFC), 1999-Present.

Dr. Abdollahi was a commending professor, a distinguished colleague, and above all, an upstanding human being. He will be sorely missed.

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