Volume 9
(2020 Annual Meeting Abstracts)

This issue publishes all abstracts submitted for the 94th annual meeting of the Louisiana Academy of Sciences. The meeting was scheduled for Saturday, 14 March 2020, just three days after the World Health Organization declared the COVID-19 outbreak a global pandemic. With cases rising across the U.S. and the state, the Executive Council of the Academy acted in the interest of the safety of its membership by reducing annual meeting activities to a single event, the student competition, and rendered it virtual.

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Louisiana Academy of Sciences
[Submitted] Abstracts of Presentations
2020 Annual Meeting - Cancelled due to the COVID-19 Pandemic

Louisiana State University, Alexandria
Alexandria, Louisiana
[LAS Annual Meeting was scheduled for] 14 March 2020

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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:

AGFD	Arizona Game and Fish Department
APSU	Austin Peay State University
AZP	Alexandria Zoological Park
BTNEP	Barataria-Terrebonne National Estuary Program
CIFE	Centre International de Formation Européenne
CGCINC	Covenant General Contractors, Inc.
CU	Covenant University
DU	Duquesne University
ESU	Ekiti State University
ETU	East Tennessee University
GMU	George Mason University
GSU	Grambling State University
ISTEMA	Iberville STEM Academy
JSU	Jackson State University
JU	Jagiellonian University
LDWF	Louisiana Department of Wildlife and Fisheries
LSU-A	Louisiana State University, Alexandria
LSU-BR	Louisiana State University, Baton Rouge
LSU-E	Louisiana State University, Eunice
LSUHSC-NO	Louisiana State University Health Science Center, New Orleans
LSUHSC-S	Louisiana State University Health Science Center, Shreveport
LSU-S	Louisiana State University, Shreveport
LTU	Louisiana Tech University
LU-NO	Loyola University, New Orleans
MC	Mayo Clinic
MSSU	Mississippi State University
MSU	McNeese State University
NOUSI	NOU Systems Inc.
Nicholls	Nicholls State University
NU	Niigata University
NSUL	Northwestern State University of Louisiana
NZ	Nashville Zoo
RPCC	River Parishes Community College
SLU	Southeastern Louisiana University
SSCALLC	Sekisui Specialty Chemicals America, LLC
SUAMC	Southern University and A&M College
THS	Thibodeaux High School
TU	Tulane University
UCan	University of Canberra
UCop	University of Copenhagen
UG	University of Georgia
ULL	University of Louisiana, Lafayette
ULM	University of Louisiana, Monroe

UNCF	Universidad Nacional de Ciencias Forestales
UNR	University of Nevada, Reno
UOHSC	University of Oklahoma Health Science Center
USDAFS	United States Department of Agriculture Forest Service
USDAFSFPL	United States Department of Agriculture Forest Service, Forest Products Laboratory
USDAFSSRS	United States Department of Agriculture, Forest Service Southern Research Station
USIUA	United States International University Africa
USUHS	Uniformed Services University of the Health Sciences
VTU	Virginia Tech University
WUSL	Washington University, St. Louis
YAT	Youth Advocacy Team

Division of Agriculture, Forestry, and Wildlife

Bosco, J., K. Abdollahi, Y. Twumasi. SUAMC. B. Osimbo. USIUA. R. Okwemba, and K. Kiwale. SUAMC. **Development of non-causal models between spatial atmospheric data and their application in determining air cooling benefits by urban trees in Baton Rouge.**—Studies of ecologically friendly approach to mitigation of urban heat islands are being carried out by the authors. 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 prove that if a pair of independent variables share a confounding variable, its variation impacts both the independent variables and develop non causal models between them including modeling cooling benefits of urban trees. A review of literature on impact of trees on ambient thermodynamic states will be carried out. Atmospheric data would be monitored and measured at data collection stations. GIS and statistics software will be utilized in assignment of the stations and modeling respectively. The results will be useful in understanding spatial relationship between atmospheric data regarding tree cover.

Lanclos, K., and C. Corbat. LSU-A. **Do multiple woodrats use a den and are they aggressive toward conspecifics?**—We studied conspecific interactions and den use by Eastern woodrats (*Neotoma floridana*) in central Louisiana. Live and camera trapping were used to investigate use of dens by multiple woodrats, aggressive behavior between individuals, and whether woodrats at multi-burrow nests used one burrow predominantly. Out of 21 observed dens, 18 appeared to have more than one woodrat present, which suggests woodrats are not solitary animals. Burrow use was monitored at 22 dens, but did not differ significantly from random, though nine nests had clearly predominant burrows. Of 34,434 woodrat photos analyzed, multiple rats occurred in only 116 pictures. No aggression was observed in any of the photos. Previous reports that eastern woodrats are solitary and aggressive toward conspecifics were not supported by our study. Burrow use needs to be studied further, as use of a dominant burrow would reduce equipment needs in camera trapping studies.

Lee, L., and C. Corbat. LSU-A. **Efficacy of artificial cover objects in relation to natural cover for sampling snakes in a bottomland hardwood forest.**—We evaluated use of artificial cover objects (ACOs) for sampling snakes in a forest with abundant natural cover and along a grassy lane outside the forest to determine whether distance to natural cover influenced use of ACOs by snakes. There was no difference (p=0.31) in distance to natural cover between ACOs that captured snakes and a random selection of ACOs with no captures in the forest. Ambient temperatures and temperatures beneath ACOs when snakes were captured did not differ (p=0.416). When captures were compared between ACOs in forest and lane, ACOs in the lane produced more captures than expected by availability (0.001<p<0.05). There was no indication that ACOs in forest interior functioned as extensions of natural cover or placement relation to impacted capture success within the forest. Maybe more effective at capturing snakes' areas within little cover.

Lemoine, A., and C. Corbat. LSU-A. **Nest building materials of the Eastern woodrat in central Louisiana.**—Eastern woodrats (*Neotoma floridana*) are known predominantly for construction of

above-ground stick nests used for protection, but different types of nests are used depending on geographic location. Northern populations nest in rock crevices and southern populations nest in burrows and downed trees. In fall 2019, we conducted a study on a tract of bottomland hardwood forest in Rapides Parish, Louisiana to determine types of nesting material most commonly chosen by local populations of Eastern woodrats. Trail cameras were placed at nests that appeared active and had above ground components. In addition, we used photos obtained on this same study site in fall 2016 and spring 2017. Only 307 of 31,640 photos examined showed woodrats carrying nesting material. Of five categories of material considered, sticks made up a significantly greater proportion (34%) of the nesting material than expected (p<0.001). Palmetto (*Sabal minor*) fronds were used proportionately (20%) despite dominating the understory.

Majors, S., and Z. Ning. SUAMC. **Assessing ecological benefits of trees in five urban parks in Baton Rouge, LA.**—The research objectives were to assess tree canopy cover in each of the five parks, evaluate land use classes, estimate tree's ecological benefits, and appraise tree's economic values. The I-Tree Canopy Model and its associated methodologies were used for the study. A total of 500 sampling points were randomly selected in each park. Data collected were entered to the I-Tree Canopy Model for analysis. The results provide first - hand information of the five parks, including tree canopy cover in each park, amount of pollution trees remove each year, amount of impervious surfaces contributing to storm water run-off, amount of carbon trees store, amount of space available for new tree planting, and the monetary values of the trees.

Ning, Z., A. Johnson, K. Abdollahi, C. Chappell, and Y. Twumasi. SUAMC. **The ANSWERS Institute -The Institute for Air, Nutrient, Soil, Water, Ecosystem, and Remote Sensing.**—To promote natural and biological resource conservation through research, education, and service to communities both in urban and rural settings, the Institute for Air, Nutrient, Soil, Water, Ecosystem, and Remote Sensing (ANSWERS) has been established. The objectives are to conduct cutting edge research focusing on natural and biological resources such as water, air, soil, wetlands, forests, bioenergy, bio-products, and ecosystems, provide hands-on research training and experiential learning to next generation of leaders in natural resources, utilize research results and analytical laboratories to provide technical services to the communities, and promote scientific collaboration and partnership building at state, regional, national, and international levels. The research projects are being carries out by the Institute's four centers - Center for Air Quality and Bioenergy, Center for Nutrient, Soil, and Land Management, Center for Water and Ecosystem, and Center for Remote Sensing. The expected major impacts of the ANSWERS Institute include enhanced sustainability and productivity of the natural and biological ecosystems and resources, and greater resiliency and mitigation & adaptation ability of the urban, rural, and interface ecosystems.\

Ning, Z., S. Majors, H. Suslu, and K. Abdollahi. SUAMC. **Comparative soil nutrient analyses of Barataria Bay and Wax Lake Delta in Louisiana.**—This research aims at assessing soil carbon and nutrient content and explore their correlation with above ground biomass and carbon storage in coastal wetlands of Louisiana. Specific objectives are to determine and compare soil carbon and nutrient contents in Barataria Bay (BB) and Wax Lake Delta (WLD) study sites, compare the contents between forested and mash wetland type at BB and WLD, compare the contents among different salinity, compare the contents among different depth of the soil, and determine correlation among C, N, P at BB and WLD study site respectively. A total of 7 samples

sites were selected using stratified random sampling method with wetland salinity as the main layer/factor of stratification and vegetation type as secondary layer/factor. A total of 13 soil cores were collected using Russian Core soil sampling device. Each soil core was then sub-divided into 20 soil samples with 5cm interval by soil depth. A total of 260 soil samples have been collected and prepared/pretreated for carbon and nutrient content analyses. This paper reports the analysis results.

Ning, Z., W. Thomas, and K. Abdollahi. SUAMC. **Quantifying photosynthesis, stomatal conductance and transpiration of crepe myrtle (*Lagerstroemia indica*) in response to flooding at elevated CO_2 settings.**—The objectives of this study were to examine the physiological response of Crepe Myrtle (Lagerstroemia indica) to flooding, assess the effects of flooding at different CO_2 settings, and compare cyclic flooding effects. Saplings of Crepe Myrtle were placed into flood simulation tanks for a two - week flooding period followed by a three-week dry-down/recovery period. Data were collected both in flooding and recovery periods. A portable photosynthesis system LICOR-6400) was used to collect data on net photosynthesis, stomatal conductance, and transpiration rate at 400, 500, 600, 700, and 800ppm CO_2 settings. Using SPSS software, data were analyzed by Independent T-tests, TUKEY and LSD multiple comparisons to detect any significant difference between the saplings under flooding treatment and those under control at each CO_2 level and between flood cycles. This paper reports the major findings that could be used in urban forest management.

Okwemba, R., Y. Twumasi, J. Bosco., K. Abdollahi., and C. Akinrinwoye. SUAMC. B. Osimbo. USIUA. **Application of image editing software in the visualization of urban forestry green infrastructure solutions.**—The field of Urban Forestry is fundamental to the management of our natural resources. It offers sustainable and resilient green infrastructure solutions that if adopted could mitigate environmental degradation and climatic change caused by anthropogenic activities. A major challenge exists in conveying these Urban Forest green solutions to lay people in a format they can easily comprehend and thus, adopt them. This study proposes the utilization of image editing software to visualize these green infrastructure solutions. When coupled with other methodologies, visualization can become a vital tool in conveying these concepts and influence the desired behavioral change. The study will evaluate three image editing software packages with the purpose of identifying which would be best suited for this purpose. Images similar size and properties and a set of parameters will be utilized to measure the software capabilities. At the end of this study, the most suited software will be proposed.

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 different treatments: 1) *Saccharomyces cerevisiae* (SC); 2) *Lactobacillus acidophilus* (LA) and 3) *Pediococcus acidilactici* (PA) were inoculated and prepared for making quinoa yogurts at 42ºC and stored at 3°C. All cultured samples were examined for pH, Aw, moisture content, color (L*, a*, b*), viscosity, and lactic acid bacteria counts. Results show that quinoa yogurt cultured with SC had the lowest pH and maintain good physicochemical characteristics. In addition, this study

found that SC can be an optimal alternative probiotic strain to reduce the fermentation time of yogurt processing.

Street, D. and K. Abdollahi. SUAMC. **Biochar soil application for urban forest restoration**.— Restoration of urban forest ecosystem through reforestation is known to be one of the best strategies in enhancing sustainable green buffer infrastructure in urban areas. biochar generated from pyrolysis of known wood waste was randomly applied at 3 rates (0 Kg, .25 Kg and .50 Kg) to planting hole of 45 newly planted spruce pine saplings in a completely randomized design in an urban industrial setting in Baton Rouge, Louisiana. Growth and physiology of trees were measured and compared after 6 months. Soil respiration was measured and analyzed for all the experimental plots. The results are provided through series of graphs, charts and tables depicting the impact of biochar application on growth, physiology and soil respiration of spruce pine saplings.

Sullivan, B. USDAFSSRS. H. Munro, and K Ghanhi. UG. **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.

Suslu, H., and Z. Ning. SUAMC. **Vegetation health, biomass, and carbon storage of Wax Lake Delta and Barataria Bay in Louisiana**.—This research project uses state-of-the-art remote sensing data to evaluate biomass (vegetation) and land use change in Barataria Bay and Wax Lake Delta in Louisiana. The objectives are to evaluate vegetation health, assess changes in vegetation (forest/shrub/wetland/marsh) and biomass, quantify carbon storage by biomass, estimate land use/land cover change, and compare biomass and carbon storage of the two study sites. Using Landsat Imageries of 1989-2019, the objectives are being accomplished by developing an efficient transition of storing spatially and statically referenced vegetation health index and land use data. The following procedures are utilized: identifying spatial signatures of ecosystem vegetation health through multispectral image analysis, creating variables for spatial analysis in use of estimating land use change, and generating a spatial database in order to support future studies in the study area. This paper reports the preliminary results.

Twumasi, Y. SUAMC. E. Merem. JSU. J. Namwamba, K Abdollahi. SUAMC. S. Welch. JSU. R. Okwemba, C. Akinrinwoye, J. Tate, and K. LaCour-Conant. SUAMC. **Assessing the risks from changing climate in South Texas Region.**—The yearly havoc from the forces of changing climatic parameters on coastal communities does not differentiate among boundaries when inflicting damages of any kind. For that, in the last several years, climate risks continue to plague the southern portion of Texas. The pressures from heavy storms in these settings are such that, they often leave in their wake an indelible footprint on the surrounding ecology. This comes with extreme impacts on both the natural and built environments particularly around big cities holding vital infrastructure crucial in economic development. The situation is further compounded by the region's propensity to natural disasters and the fragile coastal ecosystem. This paper assesses

changing climate impacts in the South Texas region using secondary data analyzed with descriptive statistics and Geographic Information System under a mix scale method. Policy recommendations will be offered to help minimize climate change impacts on the ecosystem and built environments.

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.

West, J. LSU-A. **Effects of prescribed burns on skinks in longleaf pine forest.**—Prescribed burns are a management tool for maintaining the longleaf pine (*Pinus palustris*) forest community. However, effects of prescribed burning on some species are not well known. I used burlap bands and quadrat sampling to assess populations of little brown skinks (*Scincella lateralis*), common five-lined skinks (*Plestiodon fasciatus*) and broadhead skinks (*Plestiodon laticeps*) on longleaf pine stands ranging from newly-burned to 7 years post burn on the Kisatchie National Forest in central Louisiana in Fall 2019. Unfortunately, the skink sample was not large enough for statistical analysis. However, I found a surprising number of green anoles (*Anolis carolinensis*), and numbers of anoles differed between sites (p<0.001). I observed 94 green anoles in the site that was burned during the dormant season of 2019. However, I saw only 8 green anoles in the most recently burned site. I am continuing this study with additional sites and some changes in sampling methodology.

Division of Biological Sciences

Botany Section

Ashworth, Z., C. Rouse, N. Hayat, and V. Salum. LSU-A. **Functional characterization of glucosidases in medicinal plants for metabolic engineering of anti-cancer compounds.**—Medicinal plants have long been utilized for their therapeutic properties. Two plant species, *Catharanthus roseus* and *Camptotheca acuminata* produce anticancer alkaloids used for chemotherapy treatments. Due to low abundance of these alkaloids in plants, reconstitution of biosynthetic pathways into microbial systems have been pursued to increase their productions in metabolic engineering. Removal of glucose from intermediate alkaloid, known as strictosidine in *Catharanthus roseus* and *Rauwolfia serpentina* is a critical step to produce about 3000 diverse alkaloids. In vitro enzyme assays of stereospecific strictosidine glucosidases from *C. roseus* and *R. serpentina* compared with alkaloid glucosidases from *C. acuminata* showed that although they are homologous at the protein sequence level, *C. acuminata* glucosidases are mechanistically unique. Molecular docking of plant glucosidases was also utilized to detect functional differences of amino acids in their catalytic pockets to modulate their stereospecificity in production of anticancer alkaloids.

Foster, C. and J. Willis. Nicholls. **The effects of inundation depths and durations on the survivorship and growth of four marsh vegetation species**.—As one method to addressing Louisiana's coastal wetland loss, particularly in those areas affected by subsidence, sediment diversions are planned as a mechanism to increase marsh elevation. However, scientific understanding of how the resulting alterations in inundation patterns will affect foundational vegetation species are currently lacking A large-scale mesocosm study has been initiated at the Nicholls State University Farm Facility to examine the effects inundation depths and durations relevant to sediment diversions on the survivorship and growth of four marsh vegetation species, *Spartina alterniflora*, *Spartina patens*, *Sagittaria lancifolia*, and *Typha latifolia*. Inundation depths (0, 20, 40 cm) and durations (2, 4, 8, 12 weeks) are being compared to control conditions (constant water depth 10 cm below the soil surface) for a variety of short-term and integrated growth indicators. These findings will assist coastal managers prediction efforts of sediment diversions impact on the survivorship and growth of key marsh vegetation species.

Giri, N., and T. Sasek. ULM. **Responses of *Arabidopsis thaliana* lines differing in anthocyanin concentrations to ozone exposure.**—*Arabidopsis thaliana* is a short life-cycle plant with a small genome that is an ideal model organism for various fields of plant biology. Several lines were selected varying in anthocyanin production, including two natural accessions and four mutant lines. Three-four week-old seedlings were exposed to ozone concentration of 150, 300, or 450ppb for eight hours on three consecutive days. Anthocyanin concentration and plant dry weights were determined before exposure and one week after exposure. Some exposed plants were grown until seed production. Lines with higher anthocyanin concentrations were found to be more ozone resistant as evidenced by less leaf damage and better growth one week after exposure. The highest

anthocyanin line had increase of as much as 107% in anthocyanins one week after exposure. Some lines had higher increase as 61% under 150ppb than 34% increase under 450ppb ozone exposure. The *Arabidopsis thaliana* lines had higher increase under 300ppb.

Lambiotte, A., and J. Willis. Nicholls. **Effects of sediment diversion-relevant inundation depths and durations on marsh vegetation belowground and biogeochemical responses**.—Louisiana's coastal wetlands provide critical ecosystem services for the state as well as the nation. However, these crucial ecosystems are experiencing a high degree of loss due to both natural and anthropogenic stressors. A variety of restoration techniques have been proposed to address this high rate of coastal land loss, including sediment diversions. The effective use of such large-scale restoration techniques requires an appropriate knowledge base of vegetation and soil biogeochemical responses. In this research, sods of four foundational marsh species (*Spartina patens*, *Spartina alterniflora*, *Typha latifolia*, *Sagittaria lancifolia*) are being exposed to inundation depths and durations consistent with likely sediment diversion operation in a mesocosm setting. Resulting alterations to soil biogeochemistry and belowground processes are being assessed to understand the likely responses of major marsh types to sediment diversions and their sustainability.

Nair, P. GSU. **Phytotoxicity and underlying mechanisms of manufactured nanoparticles on plant.**—Engineered nanoparticles (ENPs) have been recognized as valuable components of new technologies and are currently being used in a broad range of industrial applications due to their unique physico-chemical and electrical properties. However, the unique functional properties of ENPs may cause toxic effects to various organisms as a result of their release into the ecosystem. The potential of release and accumulation of ENPs in agricultural soils may affect plants, the basic components of the ecosystem and also the source of food for living organisms. Therefore, understanding the impacts of ENPs on plants is crucial for the evaluation of potential environmental risks on food safety. Based on the previous studies conducted by us under controlled laboratory conditions, the comparative phytotoxic (the morphological, physiological, cellular and molecular level) effects of silver nanoparticles, copper oxide nanoparticles and zinc oxide nanoparticles and their underlying toxic mechanisms on commonly used model plant *Arabidopsis thaliana* and various crop plants will be presented. The necessity for longer term risk assessments on plants and possible phytoremediation strategies of ENPs remains to be investigated.

Woods, A., and J. Willis. Nicholls. **Macrophyte influences on the reduction of microplastics from wetland surface water.**—Reduction of microplastic (100nm-500nm) pollutants from wetland environments is crucial to maintain the function and structure of natural wetland processes and could represent a low-cost approach to water quality enhancement. Removal of two different size classes (43-250µm; 250-500µm) of high-density polyethylene (HDPE) microplastics from surface waters by floating and emergent wetland vegetation is being assessed through a mesocosm study at the Nicholls State University Farm Facility. Initial findings of a small-scale pilot experiment revealed significant retention of microplastics on submerged macrophyte surfaces, with the mechanism for this appearing to be biofilm interactions with the microplastic particles. Impacts to plant physiological processes, such as stomatal conductance and net CO_2 assimilation, are being evaluated. By providing a mechanistic understanding of vegetation-microplastic interactions, this study will inform management strategies and enable future studies to refine nature-based microplastic pollution abatement strategies.

Environmental Sciences Section

Aubert, J., and J. Earl. LTU. **Effects of soil composition on leaf tannins in water**.—Tannins are polyphenols found in the leaves of most plants and protect them from herbivory and pathogens. Tannins leaching from tree leaves into water can negatively affect aquatic organisms. Our goal was to determine whether wetland soils affect tannin concentration in water over time and what components of soil are most important. To answer this, we performed two experiments by placing different soil types into jars with water containing dissolved tannins, using two wetland soils in the first experiment and using clay, silt, and fine and coarse sand in the second. We found tannins decreased the most with the wetland, silt, and clay soils, meaning that tannins are likely binding to the soil particles. Since most ponds have these soils, these areas are likely to have lower concentrations of tannins. This research tells us that aquatic organisms may be less affected by tannins in water with clay and silt soils.

Gray, K., S. David, and Q. Fontenot. Nicholls. **Preliminary results of fish community survey in a restored marsh**.—In 2018, the BHP Terrebonne Biodiversity and Resiliency Project was undertaken by Resource Environmental Solutions, LLC (RES) to restore private marshland in Chauvin, Louisiana. The project objectives were to 1) restore degraded marsh habitat, 2) enhance biodiversity, 3) improve ecosystem services, and 4) safeguard the levee that protects local communities. The Nicholls State University Department of Biological Sciences commenced monthly surveys at the restoration site in June 2019 to monitor the re-establishment of flora and fauna. Gill netting was employed to assess changes in the local fish community. Exploratory surveys have established sampling locations in pre-existing marsh, terrace, and open water habitats. Preliminary data indicates highest species richness in October 2019 with seven species encountered, however recent decreases in catch per unit effort (CPUE) likely correspond to reduced fish activity due seasonal habitat changes.

Hermann, M., N. Clay. LTU. M. Evans-White. UA., and S. Entrekin. VTU. **Direct and indirect low-level sodium additions to riparia impact leachate quality**.—Freshwater salinization is a global problem that threatens freshwater biota that is driven in part from agricultural practices like irrigation that runoffs into nearby riparian zones and streams. Salts can also be incorporated into plant tissue that through senescence falls into riparia or streams. To test how low-level salinization of riparia affects leachate chemistry and conductivity, decomposition, and riparian community structure we set up two riparian soil mesocosm experiments: 1) Direct low-level NaCl deposition in water onto riparian soils, and 2) Indirect low-level NaCl deposition through Na-enriched artificial litter on riparian soils. Leachate conductivity and sodium concentrations were 12-fold and 1.5-fold higher in treatments than controls for direct and indirect NaCl addition respectively. Decomposition rate was 1.3-fold higher/lower in NaCl addition than control mesocosm and invertebrates trended higher abundance in control mesocosms. Together, this suggests that even low-level salinization of riparia can negatively impact riparian ecosystem function and leachate quality.

Kadlubar, G., and J. Hoffman. MSU. **Impact of a pipeline right-of-way on small mammal movement and composition in Louisiana**.—The effect of pipeline right-of-ways on small mammals has yet to be investigated. We examined small mammal movement and abundance along

a pipeline right-of-way in Sam Houston Jones State Park, Lake Charles, Louisiana. Three grids, consisting of 315 Sherman live traps, were used to capture small mammals in the forested areas adjacent to the pipeline. Trapping occurred for a period seven days during winter, spring, summer, and fall seasons totaling 8,820 trap nights. Each captured individual was identified to species, sexed, aged, and fitted with a unique ear tag. A total of five species were captured and estimates of prevalence were 0.286 for *Neotoma floridana*, 0.270 for *Peromyscus spp.*, 0.254 for *Sigmodon hispidus*, and 0.190 for *Blarina carolinensis*. Two *S. hispidus* and one *B. carolinensis* were captured in traps set in the center of the right-of-way, and three *S. hispidus*, one *N. floridana*, and one *Peromyscus spp.* crossed the right-of-way.

Lowry, M., N. Clay. LTU. L. Santiago, and K. Harms. LSU-BR. **Subsidy or stress? How sodium levels impact decomposer communities and decomposition rates**.—Sodium is essential for invertebrate osmoregulation and detritus decomposition. In sodium-limited ecosystems, slight increases will promote decomposition, while large increases will cause stress. We hypothesized that in Ruston, LA, where sodium is likely near optimal levels, invertebrate diversity and decomposition rates would increase up to 5% added sodium before dropping due to stress. To test this, 20- 0.25 x 0.25m^2 plots were set up, with artificial litter containing 0%, 1%, 5%, and 10% NaCl solutions (n=5 ea.). Plots received a standard substrate to measure decomposition rates. After 1 month, substrates were collected and after three months, all invertebrates were extracted from plots. Compared to controls, 1% NaCl had a 2.3-fold increase in decomposition, and 5% and 10% had no significant difference, however, preliminary results suggest 10% NaCl had the most invertebrates. Our results suggest that only small increases in sodium will enhance decomposition due to microbial sensitivity.

Namwamba, J., Y. Twumasi. SUAMC. B. Osimbo. USIUA. R. Okwemba. SUAMC. T. Nyatta. MSSU., and C. Akinrowye. SUAMC. **Cost-benefits analysis of biogas digester systems for application in 9th Ward, New Orleans, Louisiana.**—In United States, biomass is available as manure and waste from farms etc. Methane, a component of biogas is highly flammable and suitable as a fuel. Other components include, carbon dioxide and minute quantities of water vapor etc. Adoption of biogas systems can lower costs of operation for industries, farms, and homeless shelters etc. The objectives of this study are to analyze biogas digester designs including their cost-benefit analyses with regard to potential application in 9th Ward, New Orleans, Louisiana. The study will also propose lowering toxic byproducts from the digestion process. Modification of the most feasible design will be proposed to mitigate toxic byproducts. At the end of the study, modified biogas systems for use in 9th Ward and homeless shelters will be proposed. The latter could combine biogas production with farming, boosting the sustainability of the shelters while engaging residents in productive beneficial activities.

Nyatta, T., C. Kobia. MSSU. J. Namwamba. SUAMC. **Rate of decomposition of different textiles materials**.—Large quantities of textiles solid waste (TSW) are taken to the landfills each year. An estimated 16.9 million tons of textiles enter into municipal solid waste streams, making up 7 percent of the total solid waste generation, this is despite, a large percentage of textiles being recycled. In this study, we evaluate the rate of breakdown of textiles through the decomposition of different types of clothing materials in southern USA to document what to expect in terms of deterioration of the different types of textiles in landfills. We tested natural and synthetic textile fibers, namely cotton, paper, nylon, and polyester. The composting soil for all the samples was

similar in all samples and the ambient temperature in composting boxes was maintained at room temperature in all the samples. Before use in the study, the samples were washed four times to remove any excess processing chemicals or starches. Each sample was put in a separate composting box and the rate of decomposition was observed every two weeks and documented. In this presentation, we will present the preliminary results of this study.

Oubre, C., and Boopathy. Nicholls. **Effect of silver oxide nanoparticle on the sediment bacteria of the Gulf of Mexico in removing carbon and nitrogen**.—Nanoparticle use in engineering, medicine, cosmetics, personal care products, and manufacturing is becoming more common. Nanoparticles have unfortunately been reported to be toxic to microbes. Because nanoparticles are becoming commonplace, it is likely that they are being disposed of improperly and will eventually end up in the coastal waters of South Louisiana due to drainage of Mississippi watershed into this coastal ecosystem. Nanoparticles in coastal waters should have an impact on the bacteria that play a key role in biogeochemical cycles such as carbon, nitrogen, and phosphorous cycles. In this study, sediment samples were collected from Grand Isle and Cocodrie of coastal Louisiana and were enriched for common heterotrophic bacteria that carry out carbon and nitrogen cycles in coastal waters. These enriched bacteria were exposed to various concentrations of silver oxide nanoparticle.

Phillips, T., and R. Boopathy. Nicholls. **Biodegradation of metribuzin under various electron acceptor conditions.**—Metribuzin (4-amino-6-tert-butyl-3-(methylithio)-1,2,4-triazin-5(4H)-one) is a photosystem II inhibiting herbicide currently used as a substitute for atrazine in sugarcane farms. Metribuzin is a triazinone class herbicide and known endocrine toxin with the same method of toxicity as atrazine though the threshold is approximately 1% that of atrazine. Biodegradation of metribuzin by bacteria from the soil of the USDA Sugarcane Research Unit in Houma, LA, bacteria from anaerobic digester sludge collected from the Thibodaux Sewage Treatment Plant and *Rhodococcus rhodochrous* will be studied under aerobic and anaerobic conditions which will include fermentative, nitrate reducing, sulfate reducing, and mixed reducing environments. Once a condition under which metribuzin is degraded is found, the bacteria from that triplicate will be streaked for isolation and identified using BioLog. The concentration of metribuzin will be analyzed by HPLC, while the byproducts of degradation will be evaluated by GC/MS.

Steitz, M., L. M. Landry. TU. J. Diaz. LSUHSC-NO., and L. Gary. TU. **An evolving option to eliminate pollution by dye wastewater.**—Traditional textile companies employ aqueous dyeing processes that consume inordinate amounts of clean water – and, simultaneously, generate excessive amounts of wastewater. Such raw dye wastewater goes largely untreated in developing countries. Surface and ground water resources, both essential for survival in developing countries, are acutely venerable to untreated textile wastewater. Toxic chemical contamination with raw dye wastewater is equally rampant and a threat to community health, plus destructive for fishery and agricultural industries. Of particular concern are aniline compounds. An evolving nonaqueous alternative to commonly used aqueous media for textile dyeing is offered for discussion. Under review is clean, high pressure, inert carbon dioxide (CO_2). This alternative technology eliminates discharge pollution by dye wastewater. Commercial sustainability is achieved by recycling the used carbon dioxide. Also presented are initial cost-benefit analyses, focusing on water conservation. Included are comparative analyses of emerging carbon dioxide media treatment versus traditional aqueous dyeing.

Microbiology Section

Agosta, G., H. Soorya, C. Oubre, E. Naquin, C. Toups. Nicholls. M. Lo. ULM., and R. Boopathy. Nicholls. **Presence of sulfonamide resistant bacteria in a rural sewage treatment plant in Southeast Louisiana**.—The presence of antibiotic resistance is a growing global concern which has affected Southeast Louisiana in recent years. Improper usage and improper disposal of antibiotics by consumers, hospitals, industry, and sewage treatment facilities have enhanced the emergence of antibiotic resistance in the waterways of southeast Louisiana with reports existing of human contact with antibiotic resistant bacteria through interaction with the waterways. Southeast Louisiana culture revolves around the waterways being used both recreationally and commercially and the impact of antibiotic resistance cannot be understated. Throughout previous years, the Environmental Biotechnology lab at Nicholls State University has studied the increasing presence of antibiotic resistance in the waterways of Southeast Louisiana and has correlated some of this increase in resistance to processes of local sewage treatment facilities. In this study, samples were collected from a sewage treatment facility in Thibodaux, Louisiana and two bacteria resistant to sulfonamide antibiotics, one able to grow in the presence of Sulfamethoxazole and one able to grow in the presence of Trimethoprim, were isolated. These bacteria were then subjected to various concentrations of antibiotics in the presence of glucose. Bacterial growth and carbon and nitrogen metabolism of the bacteria were monitored. The results of this study showed growth in both cultures in all concentrations of antibiotics including the highest concentration tested at 1000 mg/L of the sulfonamides indicating antibiotic resistance. Research is currently being conducted to determine whether these bacteria can use sulfonamides as the sole source of carbon and whether these bacteria contain sulfonamide resistance genes, sul1, sul2, sul3, and sulA.

Cortez, J. Nicholls. **Biodegradation of triclosan by bacteria isolated from the Thibodaux sewage treatment plant**.—Triclosan (5-chloro-2-(2,4-dichlorophenoxy)phenol) is an antibacterial and antifungal 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 that can degrade triclosan were isolated and identified. The effect of triclosan on the isolated pure culture were assessed at different concentrations, and the EC50 value was calculated. The triclosan biodegradation process was studied using liquid chromatography/mass spectrometry method.

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 infections since the 1960's. However, more recent studies have observed an alarming increase of community-acquired methicillin resistant *Staphylococcus aureus* (CA-MRSA) infections outside of clinical settings. The aim of this study was to monitor the prevalence of MRSA on common surfaces in a university building. Over 100 samples were collected, using pre-

moistened cotton swabs, and plated on CHROMagar MRSA medium. MRSA was isolated from 83% of the samples taken from bathroom surfaces including paper towel dispensers, urinal flush valves, and toilet seats. Forty-two of 95 desks swabbed from high traffic classrooms tested positive for MRSA. Approximately 50% of samples collected from door handles also contained MRSA. The results of this study demonstrate that MRSA is present on surfaces that students frequently come in contact with. Thus, these surfaces could represent a significant source of possible MRSA infections.

Marceaux, T. MSU. M. Pilligua-Lucas. USUHS. W. Dees. MSU., and A. Jerse. USUHS. **Sulforaphane treatment of endocervical cells results in a dose-dependent reduction of** *Chlamydia trachomatis* **inclusion bodies**.—*Chlamydia trachomatis* (Ct) has been the most reported sexually transmitted disease in the United States since 1994. We tested the effectiveness of sulforaphane (SFN), which induces host cells to produce antimicrobial factors, to inhibit replication of Ct in human endocervical cells. Endocervical cells were treated with SFN at the same time as inoculation with Ct or at various time intervals post-infection. Five different concentrations of SFN were used for each of the experiments. All treated cells were fixed at 28-hrs post-infection except for one experiment in which cells were fixed 40-hrs post-infection. Treatment of Ct at the same time of infection and at 2-hr, 4-hr, and 8-hr post-infection resulted in a dose-dependent inhibition of Ct; however, treatment 18-hrs post-infection did not result in fewer inclusions. Cells fixed at 40-hrs appeared to have slightly larger inclusions. These data support further investigation of SFN as a host-directed therapeutic against Ct infections.

Smith, A., T. O'Neal, N. Baudoin, and C. Lyles. NSUL. **Aerobic degradation of acetaminophen by sewage bacterial community**.—This research project was focused on the degradation of the pain and fever reducer acetaminophen, paracetamol, under aerobic conditions. Accumulation of acetaminophen in treated sewage water released to the environment has raised concern because of potential for toxic effect. Enrichment cultures included inoculated (diluted sewage and 1 mM of acetaminophen), unamended, sterile, uninoculated and positive. Acetaminophen of 1mM was selected to test degradation because of resemblance to concentrations present within sewage treatment plants. Samples were collected daily over an 18-day period and concentrations of acetaminophen were measured by HPLC-UV. Pure cultures of isolates were isolated by growing 14-day inoculated cultures onto solidified media containing acetaminophen as the sole source of carbon and energy. MALDI-TOF was used to identify 20 pure bacterial cultures capable of biodegrading acetaminophen. It was determined that most isolates were *Pseudomonas sp*. and *Rhodococcus sp*.

Soorya, H., and R. Boopathy. Nicholls. **Presence of sulfonamide resistant bacteria in Thibodaux sewage treatment plant**.—Sulfamethoxale and Trimethoprim are the commonly used sulfonamide class of antibiotics. Antibiotic resistance in bacteria in waste water treatment plants is a major concern due to the presence of antibiotics and bacteria in high concentration in these facilities. It is important to understand the effects of antibiotic resistant bacteria (ARB) and their antibiotic resistance genes (ARGs) in the environment. The Thibodaux sewage treatment plant is an ideal habitat to study ARB and ARGs. Samples were collected from the anaerobic digester of the Thibodaux sewage treatment plant and a bacterial consortium was developed. This bacterial consortium was exposed to various concentrations of sulfamethoxazole and trimethoprim. The results showed that the bacteria were not inhibited even at the maximum concentration of 250

mg/L tested in the study. The bacteria were able to remove carbon and nitrogen compared to control with no antibiotics. Two pure cultures were isolated and identified as *Leuconostoc mesenteroides* and *Shigella flexneri* by 16s rRNA analysis. Both these pure cultures used sulfamethoxazole and trimethoprim as the sole source of carbon. The bacteria developed necessary enzymes to degrade the antibiotics. The presence of specific Sulfonamide resistant genes, namely, sul1 and sul2 will be analyzed in the pure cultures.

Molecular and Biomedical Biology Section

Adedokun-Afolayan, A. LSU-S. J. Alexander, C. Boyer, W. Orr, M. Alfaedi. LSUHSC-S., and U. Cvek. LSU-S. **Fabrication of human-scaled biliary trees surgical replacements through 3D Printing**.—Fabrication of biliary trees through three-dimensional (3D) printing is a combination of manufacturing methods techniques that has a great potential in a variety of future patient-specific medical technologies. This experiment was able to prove crosslinked polyvinyl alcohol (XL-PVA) 3D printed stent infused with human primary cholangiocytes. The bio-fabrication method in this study was done by fabricating 3D printed stents and infusion of primary cholangiocytes for immediate prototyping of customized living biliary stents with clinical application in the patients with malignant and benign bile duct obstruction. These cholangiocytes infused hepatobiliary (bile duct) stent device created through 3D bioprinting may facilitate suitable placement, provide protective matrix against the bile constituents, potentially limit the development of biofilms in the bile duct and limit infection. In general, this method allows physicians to create personalized bio-integrating stents for use in the biliary procedure and give a new direction for new patient-specific stent fabrication technique.

Barnett, H., J. Newman, and M. Caldorera-Moore. LTU. **Investigating the role of extracellular cues of hydrogel biomaterials on stem cell fate**.—My project aims to create a functional tissue patches that can be used to repair/replace lost or damaged tissue. Previously, our lab has developed a tailorable poly(ethylene glycol) dimethacrylate (PEGDMA) hydrogel scaffold in which human adipose-derived stem cells have been successfully seeded and remained viable. The challenge in creating a successful scaffold lies in reproducibly differentiating stem cells on these materials to desired lineages. Despite the volume of research being conducted in this area, the interactions between stem cells and the external environment of biomaterial substrates are not well understood. My research will investigate how extracellular cues, specifically elasticity and surface chemistry of a biomaterial influence stem cell fate. This research could lead to a better understanding of how stem cell environment determines cell fate and consistently direct differentiation towards desired lineages. The goal is to create an innovative, adaptable hydrogel biomaterial to repair/replace lost or damaged tissue.

Bari, S., L. Reis, and G. Nestorova. LTU. **Calorimetric sandwich-type immunosensor for quantifying TNF-α: experimental results and numerical analyses of heat transfer for maximized detection sensitivity**.—This study presents a calorimetric immunosensor for the quantification of TNF-α. A fluidic channel fabricated from Kapton tape was sandwiched between a glass slide and a coverslip to form the device. An anti-TNF-α monoclonal antibody was used to

capture the analyte followed by detection via glucose oxidase-conjugated secondary antibody. Glucose (55mM) was injected through a sample loop into the fluid flowing within the microfluidic device. A nanovolt meter connected to the Sb/Bi thermoelectric sensor (placed outside of the lower channel wall) recorded the voltage change due to the enzymatic reaction. The concentration of TNF-α measured using the calorimetric immunosensor (251 pg ml-1) had an excellent correlation with the concentration measured using microplate-based ELISA (252 pg mL-1). A three-dimensional numerical study shows that reducing the channel height, using PDMS instead of glass, and eliminating the heat sink at the reference junction of the thermopile sensor increases the thermoelectric signal by 783%.

Dorsey, W., T. Austin, T. Guyton, M. Francis, A. Jones, W. Johnson, and D. Nelson. GSU. **Autophagy mechanisms in pentachlorophenol-challenged human airway A549 lung cells and TIB-73 murine liver cells**.—Autophagy is a natural and regulated mechanism that removes cellular trash with the help of specific gene proteins. This intracellular clearance is a friend to mammalian cells because it maintains cellular homeostasis. However, autophagy mechanisms are associated with the progression of cancer. Pentachlorophenol (PCP) is an organochlorine fungicide, which has been used as a prevalent wood preservative in the United States (U.S.) for more than 130 years. PCP is a persistent environmental pollutant and has been established as a human Group B2 carcinogen by the U.S. Environmental Protection Agency using animal model studies. In this study, we hypothesized that PCP will cause an autophagy response in human airway A549 lung cells and TIB-73 mouse liver cells. Interestingly, we observed increased levels of Beclin-1 (regulator of autophagy), and ATG16 (essential for autophagosome formation), Nrf2 (transcription factor responsible for restoring redox homeostasis), in PCP-exposed A549 cells in a concentration-dependent manner. An accumulation of LCB3, an autophagy marker, also confirmed the autophagy response in the PCP-treated human airway lung cells. In TIB-73 mouse liver cells, we observed an increase in p62/SQSTM1, indicating an autophagic influx as well as a decrease in LCB3; indicating a biotransformation mechanism. Overall, these findings provide evidence of autophagy responses in PCP-treated human airway A549 lung cells and TIB-73 mouse liver cells.

Cart, J., C. Miller, A. Bryan, I. Pursell, H. Barnett, and J. Newman. LTU. **The role of notch signaling and environmental factors in adult stem cell myogenic and osteogenic differentiation.**—Human adipose-derived stem cells (hASCs) have significant therapeutic potential due to their ability to self-renew, differentiate, and modulate the immune system. The Notch signaling pathway is known to regulate cell state and differentiation in hASCs. We are currently investigating how environmental factors interact with the Notch pathway to direct cell fate. Our primary interest is optimizing the differentiation of hASCs towards bone and muscle tissue to identify more efficient methods for regeneration of these tissues in people who suffer from injuries, degenerative diseases, and prolonged exposure to micro-gravity. Our current focus is investigating the impact that media composition has on myogenesis while also assessing changes in the Notch signaling pathway that occur during differentiation. This was characterized by examining cell morphology, gene expression, and protein expression. We are currently using these same techniques to optimize osteogenic differentiation of hASCs and utilize Notch signaling to further enhance this process.

Francis, T., and D. Darlymple. GSU. Y. Yanamadala, V. Carriere, S. Poh. LTU. A. Kim, and P. Kim. GSU. **Cell-penetrating MK2 inhibitory peptide blocks LPS-induced expression of pro-inflammatory cytokines in HepG2 hepatocytes**.—Mitogen-activated protein kinase-activated protein kinase 2 (MK2) is an enzyme that plays an important role in inflammation. We synthesized and evaluated the functionality of two selective MK2 inhibitors: anti-inflammatory peptide (AIP-1) and AIP-1 conjugated to a novel cell-penetrating peptide (CPP-AIP-1). CPP-AIP-1 reduced the expression of CXCL8 and TNF in HepG2 human hepatoma cells challenged with lipopolysaccharides (LPS), whereas AIP-1 had no significant inhibitory effect. Our results demonstrate the application of a cell-penetrating peptide to enhance drug delivery in an in vitro model of liver inflammation.

Hodnett, R., and J. Newman. LTU. **Role of MED12, Notch1, Notch3 interactions in hASC cell state regulation and their integrated use in public educational materials.**—Adult stem cells offer significant therapeutic potential. To harness their medically relevant properties, more basic research is necessary. The MED12 subunit of the Mediator complex and the Notch signaling pathway are both known to influence hASC self-renewal. We will investigate the physical relationships between MED12, Notch1, and Notch3 intracellular domains and use siRNA mediated knockdown, to determine the effect that decreased MED12 expression has on Notch1 and Notch3 activity. Understanding the interaction of MED12, Notch1, and Notch3 and their influence on self-renewal will increase understanding of hASC applications in regenerative medicine. To advance support for stem cell research, public education of the medical relevance of stem cells must also be addressed. An interactive children's book is currently being developed; specifically designed to communicate fact-based content, address misconceptions, and promote engagement. Together, this project will elucidate regulatory mechanisms in hASC self-renewal while providing educational materials for support of stem cell research.

Hutson, K., K. Willis, C. Nwokwu, and G. Nestorova. LTU. **Ionizing radiation-induced alteration of mitochondrial copy number and base-excision repair capabilities in human astrocytes.**—Reactive oxygen species produced during radiotherapy induce DNA lesions which can lead to cancer development. In this study, we assess the effect of radiotherapy on mitochondrial copy number, gene expression of the DNA repair protein 8-oxoguanosine (OGG1), and 8-hydroxy-2'-deoxyguanosine (8-OHdG) oxidative stress biomarker levels in human astrocytes. The expression levels of OGG1 reflect the cells' recovery capabilities, and mitochondria play an important role in radiation-induced genomic instability. To conduct this study, human astrocytes were treated with 0.5Gy and 3Gy proton and photon radiation at Willis-Knighton Cancer Center in Shreveport. Cell media, DNA, and RNA were collected after 14 hours. The concentration of 8OHdG in cell media was measured via ELISA. OGG1 expression level and mtDNA copy number changes were assessed via reverse-transcription qPCR. The results from this study indicate that exposure to high-energy radiation is associated with suppressed DNA-repair capabilities of the cell and reduction of mitochondrial DNA copy number.

Hyat, N., C. Rouse, E. Mahdavian. LSU-S. F. Chen, X. Yu, A. Dragoi, and J. Li. LSUHSC-S. **Fusarochromanone as a therapeutic potential for prostate cancer.**—Prostate cancer (PCa) has become a health issue globally due to resistance to androgen deprivation therapy leading to castration resistant PCa (CRPC). Fusarochromanone (FC101) is an anti-cancer flavonoid compound shown to affect certain types of cancer such as triple negative breast cancer, bladder

cancer, and skin cancer. However, further study is required for application of FC101 as a therapeutic treatment for prostate cancer. The aim of this project is to observe the effects of FC101 in PCa. Cell proliferation and cell cycle analysis demonstrate that FC101 reduced the growth of PCa cells. The potential for FC101 for treating prostate cancer can be further analyzed by examining androgen receptor pathway via in silico molecular docking. Combination of in vivo and computation modeling will pinpoint the metabolic pathways effected by FC101 in cancer cells.

Idigo, O., and J. Newman. LTU. **The role of MED12 in adipogenesis of human adipose stem cells.**—Interest in adipogenesis stems from the high rate of obesity in the world and the motivation to better understand the process of cell fate in relation to human diseases. Specific roles of Mediator and MED12 in cell state regulation are unclear, nevertheless, are critical for understanding stem cell regulation and clinical applications. This study investigates the role of MED12 in relation to the Mediator complex in order to understand transcriptional control of adipogenesis in hASCs. MED12 expression will be diminished with MED12 specific siRNA and adipogenesis will be induced/assessed at different time-points using phase imaging to detect lipid droplets with Oil red-O staining, used to validate differentiation and visualize cells. To validate and confirm the effects of the MED12 knockdown, qRT-PCR and western blot analysis will be carried out. At the end of the study, we should be able to determine the roles of MED12 in regulating adipogenesis of hASCs.

Murphy, B. LSU-S. **Reverse phase protein Assay analysis of TNBC and ATC cell lines treated with FC101a.**—As a novel, small fungal metabolite, fusarochromanone (FC101a) exhibits potent inhibitory effects toward numerous cancer cell lines in-vitro, but limited effects in-vivo. The mechanism in which it acts is unknown, making synthesizing new, effective derivatives limited. The predominate goal of this research was to use reverse phase protein assay (RPPA) analysis to discover proteins effected by FC101a, thereby deducing possible mechanisms of action of FC101a induced apoptosis in triple negative breast cancer (TNBC) and angioplasty thyroid cancer (ATC) cell lines. Proven successful against ATC, YM155 was analyzed alongside FC101a for effectiveness comparison. RPPA analysis provided over 500 proteins, narrowed down to 272 after validation using normalized linearization. In the TNBC cell line, FC101a influences JNK2 and Shc_pY317. In the ATC cell line, FC101a effects FoxM1, Axl, and Myosin-IIa pS194. Utilizing the proteins significantly influenced by FC101a, potential mechanisms of action can be established to synthesize successful derivatives.

Nwokwu, C., S. Bari, and G. Nestorova. LTU. **'Smart' microprobes imbued with recognition element as a sensitive bioanalysis platform for exosomes.**—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 for isolation of pure exosome populations. Microneedles (300μm×30mm) were functionalized with exosome-specific anti-CD63 antibodies and their capture efficiency assessed via Fluorocet assay post-incubation, in astrocyte-derived exosome suspension enriched by a standard kit, while blocking non-specific binding with 1% BSA. Our results indicated an 18-fold increase in exosomes captured by microprobes incubated overnight on ice (2.8×106 exosomes/probe) vis-a-vis 2 h incubation (1.6×105 exosomes/probe), suggesting that longer incubation at low temperature favors exosome capture. The microprobe's exosome loading capacity decreased when incubated in conditioned astrocyte medium. Our designed probe showed

efficient exosome capture and was amenable to exosomal protein and miRNA extraction, in amounts sufficient for downstream analyses. Future works will focus on its integration into a lab-on-a-chip platform.

Patel, F., L. Cain, C. Peterson, S. Venigalla, and J. Newman. LTU. **Investigation of transcriptional control in directing cell fate**.—Cell fate is driven by changes in gene expression which result from external cues, endogenous signaling pathways, and transcriptional machinery all working together. Our project is primarily interested in investigating how protein expression levels of the four subunits of the Mediator kinase domain affect adipogenesis of human adipose-derived stem cells (hASCs). We use hASCs because they are multipotent, self-renewing, and have natural immunomodulatory capabilities. Cell culture allows for the in-depth study of cell fate determination by manipulating the environment to assay changes in cell fate, transcription, and protein expression. Relative transcript levels are measured through analysis of RNA-derived cDNA. Mediator protein levels are assessed by using protein specific antibodies. By using cell culture, directed differentiation, RT-PCR, and Western Blots we are able to understand the transcriptional processes that direct hASC fate, creating a strong foundation for future research to investigate novel therapies for cancers and other disorders.

Perez, N., S. Adams, L. Lee, H. Barnett, J. Newman, J. Cart, and M. Caldorera-Moore. LTU. **Methods and techniques for myogenic differentiation of human adipose-derived stem cells.**— Human adipose-derived stem cells (hASCs) are multipotent stem cells that have the potential to self-renew and differentiate. To optimize conditions for the myogenic differentiation of stem cells, we cultured hASCs on collagen-coated tissue culture plates using two different medias with varying amounts of fetal bovine serum (FBS). Following six weeks of myogenesis, cells were characterized by cellular morphology, protein expression, and transcription of myogenic specific genes. Staining and immunofluorescence (IF) were used to determine the success of each media by allowing for the visual and qualitative evaluation of myogenic protein expression. To quantitatively analyze our cultured hASCs, we used quantitative reverse transcriptase-polymerase chain reaction (qRT-PCR). By using these cell culture and molecular techniques, we are able to differentiate hASCs and characterize the efficiency of myogenesis under various conditions. Conclusions drawn from this research contribute to regenerative medicine research currently seeking improved methods for the generation of functional muscle tissue.

Richardson, D. GSU. M. Langley, H. Yoon, K. Hanui, A. Matveynko, and I. Scarisbrick. MC. **Pathogenic changes in spinal cord glia in a model of Type 1 diabetes.**—This study sought to determine the impact of type 1 diabetes on myelin and myelinating cells of the adult central nervous system. Six-week-old female mice of NOD/ShiLtJ (non-obese diabetic) and CD-1 IGS (control) strains were provided with standard rodent chow for 10 weeks, after which the lumbar section of their spinal cords was harvested. Lumbar sections were stained for oligodendrocyte precursors (Olig2), mature oligodendrocytes (GST3), myelin proteins (MBP, PLP), astrogliosis (GFAP), and microglial activation (Iba1). Microscopy was completed using 5X and 10X objectives and CellSens software. Analysis was completed using ImageJ software. Statistical analysis was computed using GraphPad Prism software. Olig2 and GST3 were lost in the dorsal column of the NOD mice. PLP expression was significantly decreased in gray matter of NOD mice. GFAP and the area of Iba1+ microglia were reduced in NOD mice. These results suggest a suppression of immune response accompanying down regulation of myelin production.

Rinderle, C., and J. Straub. LTU. **MED12 and Adipogenesis.**—The Mediator complex is a central regulator of cell type-specific gene transcription. The complex has four modules, including a kinase module which possesses the MED12 subunit. Given the kinase module's role in regulating Mediator activity and MED12's occupation of genomic super-enhancers, we hypothesize that the loss of MED12 disrupts differentiation of human adipose-derived stem cells: a stem cell candidate for regenerative medicine applications. Through the use of siRNA-mediated knockdown, it is evident that MED12 plays a role regulating adipogenesis without diminishing the viability and self-renewal capabilities of the cells. Further research investigating protein-protein and protein-DNA interactions will determine if MED12 serves as an activator of PPAR-γ, a master regulator of adipogenesis. Overall, this research will benefit the future clinical application of human adipose-derived stem cells for regenerative medicine and the study of metabolic diseases.

Sharma, I., H. Meyer, and K. Jackson. MSU. **Expansion of the range of *Diploechiniscus horningi* in Eastern United States**.—Tardigrades (Phylum Tardigrada) are microscopic panarthropods found in marine, freshwater, and terrestrial habitats. here are 30 families, 142 genera, and 1,298 species. The genus *Diploechiniscus* now has both *Diploechiniscus oihonnae* and *Diploechiniscus horningi* from western USA and Canada. It is not easy to distinguish unknown specimens from closely related tardigrade species because they have very limited morphological differences. Samples from both Virginia and Georgia were compared to each *Diploechiniscus* species to determine their identity. Where *D. oihonnae* have spines *D. horningi* have filaments. Morphological, morphometric, and molecular data were analyzed, leading to the conclusion that the unknown specimens from Georgia and Virginia were *D. horningi*. This expands the range of the species to Eastern United States. DNA was obtained for *Diploechiniscus horningi*, which also distinguishes it from E. oihonnae. Unfortunately, there are as yet no DNA data from *Diploechiniscus horningi* from western North America.

Venigalla, S., and J. Newman. LTU. **Expression levels of Mediator kinase subunits and their interaction with transcription factors during adipogenesis.**—Obesity is a major epidemic with obesity-related metabolic disorders becoming more common. With dysregulation of genes involved in lipid metabolism being a common feature, understanding how transcription factors and their cofactors regulate adipogenesis is a focus of many studies. Mediator is a transcriptional coactivator that binds with gene-specific transcription factors and RNA Pol II. The kinase domain, a dissociable four subunit module of Mediator consists of subunits MED13, MED12, CDK8, and CCNC, that control the expression of different subsets of genes to direct cell fate. This study determines the levels of protein for each of the kinase module subunits during adipogenesis and their interaction with transcription factors in pre and mature adipocytes. Results suggest that the expression of these subunits decrease in later stages of adipogenesis. Identifying molecular details of the kinase domain in the regulation of adipogenesis aids in identifying novel therapeutic targets for the treatment of metabolic disorders.

Xavier, R., and P. Kim. GSU. **Effect of sugar-alcohol diet on inflammatory responses in *Drosophila*.**—*Drosophila melanogaster* plays a critical role in the study of human genes due to the evolutionary conservation of genes. To study the effects of sugar- and/or alcohol-enriched diets in the risk of disease, fruit flies were placed on diets of high sugar, high alcohol and a combination of both, then triglyceride and dopamine levels were tested to evaluate the increased risk of inflammatory diseases and addiction. We deduced that the triglyceride levels of the flies increased

gradually from those on control diet, 5% alcohol, 0.6M sucrose, and the sugar-alcohol combination respectively. Currently, this study demonstrated that high sugar-alcohol consumption increases triglyceride levels in fruit flies, and that fruit flies may be a useful model organism to study links between diet, obesity, and disease.

Zoology Section

Atkins, S. LTU. J. Riggins, C. Siegert. MSSU. J. Tang. USDAFS. O. Leverón. UNCF., and N. Clay. LTU. **Impacts of bark-beetle attacked trees and bluestain fungi (Ascomycota: Ophiostomataceae) on the diversity of ants (Hymenoptera: Formicidae) in deadwood.**— Bluestain fungi (Ascomycota: Ophiostomatacea) are carried by bark beetles to trees during their attacks. Bluestain fungi do not decompose wood but have been shown to increase some decomposer organisms. Ants (Hymenoptera: Formicidae) are important ecosystem engineers and are often used as bioindicators for habitat quality. We tested the hypothesis that bark-beetle attacked deadwood containing ophiostomatoid fungi has a higher diversity of ants than unattacked deadwood. A bark beetle-attacked and healthy pine tree were felled in Honduras and cut into slices that received one of three fine mesh treatments: 1) fully covered, 2) covered from above, 3) no covering. After one year, deadwood (n=10 per treatment) was collected and ants extracted and identified. Contrary to our predictions, ants were on average 5.4-fold more abundant in unattacked deadwood, with the highest abundance on uncaged, unattacked deadwood. This suggests that conditions in bark-beetle attacked wood after one year exclude ant colonization.

Aucoin, S., A. Thapa, E. Fruge, J. Bonza, E. Marque, K. Sweeney. MSU. S. Baker. AGFD. W. Brame, and M. Merchant. MSU. **Characterization of antibacterial activity of hemolymph from desert hairy scorpions.**—Adult desert hairy scorpions (*Hadrurus arizonensis*) were captured in the Sonoran Desert of Arizona. The animals were maintained in individual enclosures in our lab and hemolymph was collected periodically with a TB syringe directly from the tubular heart. The hemolymph was challenged with a broad spectrum of bacterial species to characterize the potential immune activity. The hemolymph demonstrated antibacterial activity against both Gram-negative and Gram-positive bacterial species. The antibacterial activity was rapid, with strong activity noted almost immediately after exposure to bacteria. In addition, the immune activity was also temperature-dependent, with peak activity at approximately 30°C. Interestingly, the scorpion hemolymph exhibited no phenoloxidase activity or melanization response, which is an immune mechanism common in many arthropods. Searches of scorpion genomes for Toll-like receptors revealed the presence of a wide variety of these immunological proteins which are most-likely responsible for mediating the pattern recognition innate immunity in these ancient invertebrates.

Beachy, C. SLU. **How plethodontid lunglessness informs a perspective on ancestral state reconstruction for life cycle evolution.**—Plethodontid diversity exceeds that of any other group of amphibian. This species diversity is a direct consequence of life cycle diversity: the evolution of direct-development and paedomorphosis has resulted in species richness. 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 seemingly most important feature of plethodontids, i.e., lunglessness, informs a view of life cycle evolution in this family of salamanders. It is clear that lunglessness is a feature that enables persistence is 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.

Benedetto, N. LTU. J. Riggins, C. Siegert. MSSU. J. Tang. USDAFS. O. Leverón. USDAFSFPL., and N. Clay. UNCF. **Impacts of bark beetles and termites on wood decomposer communities in Honduras.**—Bark beetles attack and kill trees, inoculating them with bluestain fungi, which attracts termites. Termites are ecosystem engineers that can impact subsequent decomposer wood colonization. A bark beetle-attacked and healthy tree were felled, cut into slices, and placed in a Honduran pine forest with three fine-mesh covering treatments: 1) fully covered, 2) covered from above, and 3) no covering. We predicted that bark beetle-attacked trees, specifically uncovered and half-covered wood would have the highest species abundance because of increased termite presence. After one year, 10 replicates of each treatment were collected, and invertebrates were extracted and identified to at least order. Contrary to our prediction, species abundance did not increase with termite presence. Instead a pattern of increased species abundance driven by oribatid mites occurred in fully covered, bark beetle-attacked wood. These results suggest that decomposer fungi rather than termites may facilitate species abundance at this stage of decomposition.

Bergeaux, P. ULL. K. Beshera, A. Williams. LSU-E. C. Morgan. LSU-B., and A. Armstrong. LTU. **Genetic data support the existence of novel cryptic diversity within *Eleutherodactylus cystignathoides* (Rio Grande Chirping Frog) from Northern Mexico and Southern US.**—*Eleutherodactylus cystignathoides*, Rio Grande Chirping Frog, is native to northeast Mexico and the southernmost tip of Texas. In recent years, its geographic range has been rapidly expanding in other US states including Louisiana. Until now, populations from wide geographic range have been lumped into a single species based on external morphology, but no explicit phylogenetic hypothesis is available to corroborate the grouping. We therefore undertook phylogenetic analysis of 16S ribosomal RNA gene sequences of 17 samples of *E.* (*Cystignathoides*) *campi* (a subspecies of *E. cystignathoides*) from northern Mexico and southern US in the aim of evaluating the taxonomic status of the group. Our study revealed that *E.* (*Cystignathoides*) *campi* is comprised of two clades (the Mexican clade and the US clade) that exhibit significant geographic and genetic (between-clade sequence divergence = 7.9%) differentiation suggesting that *E. cystignathoides* as currently known is probably composed of multiple species.

Bowers, S., K. Mayeux. LSU-A., and R. Riedel. AZP. **Reproductive monitoring of a male and female jaguar (*Panthera onca*).**—The Alexandria Zoological Park houses jaguar (*Panthera onca*) that have exhibited breeding behavior and copulation without resulting in a viable pregnancy. Due to this, hormone monitoring began with fecal samples collected at least 3x a week over a 5m period. Fecal samples were analyzed to measure reproductive metabolites. The female jaguar showed estrous behavior in late January and copulation was observed 4 days after estrus. During this time, estradiol was elevated with peak fecal estradiol concentration being 240 ng/g feces. An increase in progestins were detected 12 days after copulation and remained elevated, with peak progestins being 5.2 ug/g feces. The female jaguar underwent a breeding soundness evaluation; no gross structural abnormalities were noted. Uterine biopsy and culture performed at

that time were consistent with endometritis. Fecal collection, paired with behavioral observation, is ongoing, and uterine culture is planned to aid in determining the next steps for a successful pregnancy.

Brock, T., and C. Beachy. SLU. **Speed dating in small spelerpine salamanders.**—*Urspelerpes brucei* is a miniaturized salamander with adult body sizes reaching 25mm snout-vent length. This miniaturization is believed to be due to a larval period bookended by rapid sexual maturation at or immediately preceding metamorphosis. We aim to determine the age at metamorphosis of *U. brucei*, identify differences in the maturation of male versus female animals, and view our findings in a phylogenetic context by incorporating them into a published dataset. To determine age, a combination of SVL plots and skeletochronological methods will be used. We will test for a relationship between measured body size and age via linear regression. A sample of newly metamorphosed U. brucei will be kept over Winter 2020 to observe any post-metamorphic development and/or courtship behaviors. We expect age at metamorphosis to be approaching 2 years with no significant differences between the maturation of males versus females.

Cannon, C., and C. Beachy. SLU. **Environmental impacts on alternate life-history pathways in Caudata.**—Salamanders have extreme life-history diversity. Several salamander species have the potential to exhibit either simple life cycles (SLC's) or complex life cycles (CLC's). This intraspecific heterochrony has the potential to have broad implications from evolutionary biology to community ecology. It has been demonstrated that environmental factors, (e.g. density and larval growth rate) can affect the life-history pathways expressed by these facultatively paedomorphic species. Several environmental and ecological variables contribute to the expression of alternate life-history pathways (e.g. food abundances, growth, temperature, density, sex, etc.). Using density experiments and food and temperature experiments I have tested how certain environmental factors can impact the expression of life-history pathways in an facultatively paedomorphic Ambystomatid species.

DuBose, J., and G. LaFleur. Nicholls. **Comparing the reproductive anatomy of the Apple Snail (*Pomacea maculata*) in wetlands across the Barataria-Terrebonne Estuary.**—Apple Snails (*Pomacea maculata*) were first sighted in Louisiana in 2006 and have since become established in many wetlands. We have embarked on a project aiming to use the reproductive anatomy of the Apple Snail as an indicator of environmental health. In this study, 67 males were analyzed using a Penile Sheath to Operculum Length ratio (PSOL), and 100 females were analyzed using an Albumen Gland to Total Body Mass ratio (AGBM). The males had an average PSOL of 0.5484+/-0.0252, but at Bayou Ramos (n=14) we collected snails with significantly lower PSOL of 0.3619+/-0.0367 and snails from Bayou Lafourche (n=9) had a significantly higher PSOL of 0.7169+/-0.0614 (p < 0.0005). The females had an average dry AGBM of 0.1487+/-0.0099 with the Bayou Ramos (n=35) snails having a significantly lower dry AGBM at 0.0956+/-0.0152 and the Verret Canal (n=31) snails having a significantly higher dry AGMB at 0.2144+/-0.0153 (p < 0.0005).

Faria, V., A. Hale. MSU. R. Maxwell, and S. Kinney. LDWF. **Effect of freezer storage on *Anguilla rostrata* gonadal tissue.**—The aim of this study is to determine the optimal window of time for processing delay of *Anguilla rostrata* (American eel) gonads to ensure reliable histological analysis. In field studies, there is often a significant delay between collection and processing dates

of tissues which can cause damage to the samples. In a previous study, eels were caught throughout the state of Louisiana with the purpose of assigning sex, and many of those eels were in frozen storage for an extended period. When the sections were analyzed, artifacts due to freezer damage were observed. A qualitative analysis of the gonadal histology for this eel species was done at multiple stages of sexual development to compare the quality of ovarian structures. Fifty-three eel gonads were assessed to rank the quality of these structures. A scoring system was developed to objectively rank the quality of the tissue for a more precise conclusion.

Fulbright, M. ULL. S. Hromada. UNR. M. Iachetta, B. Beas. APSU. J. Flaherty. NZ. K. Wild. UCan. A. Scott, and C. Granger. APSU. **Reaping what has been sown: Agricultural impacts on herpetofaunal diversity.**—Intensification and expansion of agriculture is a pressing concern for biodiversity conservation. Amphibian and reptile communities can be particularly sensitive to land use change. Over ten years, we sampled herpetofaunal communities an agricultural/forest matrix on a military installation in western Tennessee. We assessed how land cover and pond characteristics influenced herpetological richness, diversity, and community structure. We found that, despite reduced water quality, amphibian diversity was higher in ponds with cattle access, though this is likely influenced by surrounding land cover. Pond permanence was important in shaping amphibian community structure and is a key factor in determining amphibian richness. We found no link between land cover and cattle access on reptile richness or diversity, though reptile community structure was influenced by cattle access and pasture cover. Historically the study area was native grassland, and pasture may be acting as a proxy for this lost habitat for amphibian and reptile communities.

Hedlesky, E., A. Hale, and M. Merchant. MSU. **Autophagy in crocodylian blood and immune response.**—Crocodylians are known to have a robust innate immune system and employ innate immune mechanisms common to mammals in their cellular defense. It has been suggested that autophagy evolved as a cellular antimicrobial defense system and is currently regarded as an integral part of human host defense. Since autophagy is an evolutionarily conserved process, it is likely that crocodylians also use autophagy for cellular maintenance and defense. We have previously characterized the expression of canonical autophagy transcripts and proteins in alligator liver tissue and now investigate their expression in the immune response and in erythrocytes. We report the detection of autophagy proteins in erythrocytes and their expression changes after an immune challenge. Ultimately, we plan to develop a protocol to assay autophagy activation or inhibition from blood draws. Our future aims include examining the role of autophagy during brumation, as it may serve to sustain cells during winter anorexia.

Jackson, K., J. Bonza, and H. Meyer. MSU. **DNA barcoding of *Minibiotus* cf. *fallax*.**— Tardigrades are microscopic animals found in diverse environments. Identification of tardigrade species by morphological characteristics has led to misidentified species and animals being placed in incorrect genera. Because of this, researchers are often amending the list of tardigrade species within genera. The most accurate way to identify a tardigrade is with both morphological and DNA data. Recently, our collaborators have been interested in a re-description of the *Minibiotus* and *Macrobiotus* genera. *Minibiotus fallax* collected from Australia was originally described based on morphological characteristics, but no genetic data was collected. We have recently identified *Minibiotus* cf. *fallax* in samples collected from Florida. For this study, we sequenced multiple highly conserved genes from *Minibiotus* cf. *fallax*. Genetic diversity within the species was

determined, and sequences were compared to other members of *Minibiotus* as well as species from the *Macrobiotus* genus to examine whether *Minibiotus* cf. *fallax* is in the correct genus.

Jackson, K., R. KC, and H. Meyer. MSU. **Genetic analysis of *Claxtonia maucci*.**—Tardigrades are microscopic animals found in both terrestrial and aquatic environments. Early research relied on morphological characteristics to identify tardigrade species. Due to similarities in morphology, some species were misidentified or placed in the incorrect genus. Recently researchers have been revising the list of tardigrade species within genera. Based on this work, *Claxtonia maucci* was recently moved from the genus *Echiniscus*. This change was made based on the morphological characteristic of dorsal plate sculpturing. Tardigrades can be identified most accurately by using a combination of morphological and genetic data. Tardigrade DNA is now being analyzed by DNA barcoding as a second method of species identification. For this study, we sequenced multiple highly conserved genes from *Claxtonia maucci* to determine genetic variation within the species as well as determine the correct genus for this species.

Kolbmann, C., and A. Wright. SLU. **Fossil sampling bias impacts node ages in a Formicidae phylogeny.**—Phylogenetic analyses that incorporate extinct data allow for a more complete picture of evolutionary history to be captured. The fossilized birth-death (FBD) model considers all available data points as part of the same macroevolutionary process of diversification and sampling, enabling fossil records to be fully integrated with extant data points for analysis of evolutionary history. Simulating biased fossil sampling events from model groups like the ant family Formicidae, can be used to detect the effect these biases have on diversification time estimation. Three sampling schemes were implemented: one in which the oldest fossil per subfamily was used, one in which the youngest per subfamily was used, and one in which a fossil was chosen at random per subfamily. We performed 50 replicates of the random subsampling test.

Lindy, M. SLU. K. Pereira, S. Woodley. DU. C. Fontenot, B. Crother, and d. Kandalepas. SLU. **Chytrid growth inhibition in two fully aquatic salamanders.**—Chytrid fungal pathogens, *Batrachochytrium dendrobatidis* (Bd) and *B. salamandrivorans* (Bsal) are causing amphibian die-offs worldwide. The factors underlying chytrid susceptibility are poorly understood. Anuran skin secretions are known to contain antimicrobial peptides (AMPs) shown to kill Bd in-vitro and are hypothesized to be important for limiting Bd infections. We tested whether *Siren intermedia* (Lesser Siren) secrete peptides that inhibit the growth of chytrid pathogens using growth inhibition assays. Skin secretions were collected from 10 *S. intermedia*, enriched for peptides, and combined with either Bsal or Bd zoospores in a 96-well plate. Optical density was read daily to assess changes in fungal growth. We found that even at low concentrations, the skin peptides of *S. intermedia* inhibited the growth of Bsal and Bd. These results suggest *S. intermedia* secrete AMPs which may protect them from Bsal infections. We are repeating this study with two *Necturus* species and expect similar results.

Meyer, H., K. Jackson. MSU. P. Gasiorek, K. Zajac. JU. D. Nelson. ETU. R. Kristensen. UCop., and L. Michalczyk. JU. **The *Echiniscus virginicus* complex and tardigrade distributions.**—Many tardigrade species have been considered cosmopolitan in distribution; however, this conception may be affected by difficulties in species delineation. We considered two species, *Echiniscus virginicus* and *E. lineatus*. They cannot be distinguished by light microscopy, suggesting either that they were synonyms or cryptic species. However, genetic analysis showed

deep divergence in three markers, and slight morphological differences could be detected by scanning electron microscopy. *E. virginicus* extends from New England to northern Georgia, while *E. lineatus* is pantropical, including Louisiana and Florida. Modeling suggests that climate is the most likely factor determining the allopatric geographical ranges of these deceptively similar (pseudocryptic) species. This study demonstrates that globally-distributed tardigrade species do indeed exist; nevertheless, biogeography using only morphology may overestimate their ranges.

Meyer, H., G. Richard, and K. Jackson. MSU. **Additional description of *Pilatobius nodulosus* (Ramazzotti, 1957), a North American tardigrade.**—The tardigrade genus *Pilatobius* currently numbers 26 species. *Pilatobius nodulosus* was described in 1957 from lichens collected along the Michigan-Wisconsin border. The species has since been reported from Alaska, Canada, Maine, New Mexico, Tennessee, Virginia, British Columbia, New Brunswick, Mexico, and New Zealand. Ramazzotti's description was complete by the standards of the time, but lacked photographic imagery and some of the morphological measurements considered important today. We analyzed 13 specimens collected in 2019 from the type area using current morphometric standards. CO1 and 18S sequences from five specimens are also being analyzed. Many records in the have no images or morphometric data. Our results are consistent with the data from New Brunswick, British Columbia, and New Zealand. However, since many genetically distinct tardigrade species cannot be distinguished readily with light microscopy, in the absence of molecular data the presence of *P. nodulosus* outside the type area is unconfirmed.

Naquin, E., R. Boopathy, and J. Daigle. 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. In Louisiana, one out of every seventy jobs are related to the seafood industry and has a large economic impact. 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. This survey of antibiotic-resistant bacteria and genes was accomplished using Kirby-Bauer Assay as well as PCR techniques for gene display. The results of this study show the presence of multi-drug resistant bacteria exhibiting resistance to all antibiotics tested. Furthermore, the sulA, sul1, sul2, sul3 genes, genes for sulfonamide drug resistance, and tet(A), tet(W), and tet(X), genes for tetracycline drug resistance, were identified.

Ogunkoya, Y. SUAMC. **Avian stomach as observed under the scanning electron microscopy.**—Avian stomach of three passerines with disparate diets was studied with scanning electron microscopy. The proventricular wall was thickest in the omnivore, thinnest in the granivore and intermediate in the nectarivore. The surface epithelium formed spiral folds (plicae) anastomosing and branching between the openings of the proventricular glands. The number and size of the folds varied between species: 4-5 folds in the nectarivore, 1-2 discrete folds about 90 μm in diameter in the omnivore and about 2-3 spiral folds about 128 μm in diameter in the granivore. The glands varied in shape between the three species. They were oval in the nectarivore (340 by 260 μm); large gourd-shaped lobules (460 by 280 μm) in the omnivore and elongated spheres (360 by 380 μm) in the granivore. SEM revealed the deep proventricular glands as major structures in the wall of the proventriculus of these species. The ventriculus was lined by a gastric

cuticle. The thickness of this membrane varied in the three species; it was thickest in the granivore, soft and thinnest in the nectarivore and intermediate in the omnivore. The surface of the gastric cuticle had longitudinal ridges and grooves. These ridges conformed to the pattern of the underlying mucosal surface. The pattern of the ridges was finer in the omnivore than in the granivore and was not evident in the nectarivore. These ridges and grooves were evident at a very low magnification) in the granivore. The openings of the ventricular glands were located in the grooves and appeared to form arch-like openings with the surface epithelial layer.

Oubre, C. Nicholls. J. Pitre. THS. D. Leblanc. BTNEP., and R. Boopathy. Nicholls. **Presence of antibiotic resistant bacteria and antibiotic resistant genes in the migratory birds of Louisiana.**—Antibiotic resistant bacteria (ARB's) and antibiotic resistance genes (ARG's) have become a rapidly growing problem. ARB's and ARG's are able to move around using humans as a vector. However, these potentially harmful bacteria and genes could be spreading in another way. ARBS' and ARG's have increased in local waterways for a number of years now. Also present in these waterways are several species of migratory birds. 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 along the Mississippi Flyway migratory route. 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. Bacteria were identified using 16srRNA sequencing techniques.

Perrera, B. SLU. **Spatial ecology of *Sternotherus odoratus* (Eastern Musk Turtles) in a suburban environment.**—Urban expansion has resulted in a decline of natural habitat for native biota. Turtles are faced with one of the highest threats to extinction of any vertebrate group, a major cause being habitat destruction. Urbanization impacts on herpetofauna is limited and inference on whether urban environments provide suitable habitat for turtle populations is novel. The objective of this study is to describe movement patterns, population demographics, and use of *Myocaster coypus* (Nutria) burrows of *Sternotherus odoratus* within a suburban environment. Nine individuals were collected in a man-made canal in Kenner, Louisiana and fitted with radio transmitters and iButton temperature loggers. Telemetry locations were obtained from spring of 2019 to January 2020. Trapped and opportunistic captures of additional musk turtles were reserved for mark-recapture. Surveys have indicated a dense population and a female-biased population. Preliminary analysis indicates turtles occupy small, defined home ranges and frequently utilize nutria burrows.

Whiting, D., and Z. Jones. SLU. **Raptor perch and location preferences in rural Southwestern Oklahoma.**—Migrating and overwintering raptor species use a variety of hunting methods and perching types to hunt in rural and agricultural landscapes. This study was conducted to identify raptor perch type preferences and landscape context near chosen perch locations. Two 48-km routes were sampled beginning in fall 2018, one north and one south of Weatherford, OK. Preliminary data show that American Kestrels (*Falco sparverius*) primarily used wires between poles; Red-Tailed Hawks (*Buteo jamaicensis*) indicated a preference for trees; Northern Harriers (*Circus cyaneus*) and Swainson's Hawks (*Buteo swainsoni*) were primarily observed in flight. All species preferred areas with little to no presence of man-made structures other than utility poles or fences. Differences in hunting methods and perch types may create niche partitioning. The

presence of utility poles may also increase the number of perch types available enough to benefit both kestrels and Red-tailed Hawks that utilize utility poles and lines during hunting.

Division of Physical Sciences

Chemistry Section

Andras, A., U. Pokharel, B. Curole, D. Daigle. Nicholls. and F. Fronczek. LSU-BR. **Understanding the mechanism of lactone formation in ferrocene-bound keto-carboxylic acids.**—Ferrocene and its derivatives play important roles in chemistry due to their stability, aromatic properties, and reversible electrochemistry. Although aromatic properties of ferrocene have been studied well, the influence of ferrocenyl moiety to enhance the nucleophilicity of the carbonyl group, lying on its α-position, is still a new area of research. To understand the reactivity of the carbonyl group, we synthesize various keto carboxylic acids from the Friedel-Crafts acylation of ferrocene with aromatic or aliphatic cyclic anhydrides. When the keto-carboxylic acids are treated with trifluoroacetic anhydride, the molecules undergo intramolecular cyclization to give lactones. The lactones also undergo facile dimerization at α-position when there is no possibility of β-elimination in the molecule. Synthesis, spectroscopic characterization including molecular structures of key compounds, and the possible mechanism will be discussed.

Antenucci, P., B. Wicker, and H. Marcello. SLU. **Modular green synthesis of tridentate NacNac ligands.**—NacNac ligands have been in use for decades due to their cheap and easy synthesis. The expansion into tri- and tetra-dentate varieties has expanded the versatility of NacNac ligands, but the synthesis of these new varieties can be expensive, difficult, or both. Herein, a green synthetic process by which tridentate (Chen-type) NacNac ligands can be produces will be presented the scope of the synthetic method will be discussed.

Anyanwu, A., N. Dissanayake, K. Boggavarapu, and V. Thalangamaarachchige. MSU. **Ionic liquids as cellulose solvents.**—Cellulose is the most abundant biopolymer on earth. Throughout the human history, cellulose was used mainly in paper and textile industry. Due to insolubility of cellulose, it was cumbersome to find proper ways to extend its applications into sustainable energy. Ionic liquids (ILs) is a special class of solvents with unique properties, which can dissolve cellulose effectively. ILs 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 ILs to dissolve cellulose. During our study, the effect of substituents and promoting the dissolution while introducing pretreatment methods will be addressed. The end goal is to generate novel biomaterials which can be utilized in biomedicine and pharmaceutical applications.

Basnet, P., S. Murru, I. Chauvin, and J. Chamcheu. ULM. **Design, synthesis and anticancer activity of novel flavonol derivatives.**—Flavanols derivatives exhibits anti-proliferative activities which can be useful in treatment of high-risk and aggressive skin cancer which exist in two major form: melanoma and non- melanoma. Currently available treatment method has some side effects including scars. Therefore, there's an urgent need to develop potent anticancer drugs with minimal side effects. Based on the preliminary data on anti-cancer activity of 5 flavanol compounds, we

designed and synthesized a library of novel chalcones and flavanols with different substituent patterns. All the synthesized compounds were characterized by various analytical and spectroscopy techniques, and evaluated for in-vitro anticancer activity against human melanoma (A375), and non-melanoma skin cancer (A431) cells. Pre-treatment with all compounds exhibited significant decrease in cell growth/viability with minimal effects on normal cells. Some of these compounds displayed low micromolar anticancer activity. Synthetic methods, structural characterization and biological activity data from cytotoxicity and immunofluorescence assays will be presented in the poster.

Bista, R., S. Murru, J. Chamcheu, and E. Perez. ULM. **Synthesis and anticancer activity Evaluation of pyrazole and isoxazole derivatives.**—Skin cancers are one of the high-risk cancers which exist in two major forms: melanoma and non- melanoma. Non-melanoma Skin cancers (NMSCs) are the most common type of cancer which comprises more than a third of all cancers in the United states. Pyrazoles and isoxazoles are known to possess a wide range of biological and pharmaceutical activities such as antimicrobial, antioxidant and anticancer. Because of their importance, it is crucial to develop methods that are faster, give higher yield of the product, and are cost effective. Along those lines, we have synthesized a library of novel pyrazole and isoxazole compounds with different substituent patterns. All the synthesized compounds were characterized by various analytical and spectroscopy techniques and evaluated for in-vitro anticancer activity against human melanoma (A375), and non-melanoma skin cancer (A431) cells. Synthesis, characterization and biological activity data will be presented in the meeting.

Bonton, A., and D. Rivera-Vazquez. NSUL. **Modification of activated Carbon: Towards the optimization of wastewater treatment.**—The presence of toxic components in humans that are due to the intake of water globally is an ongoing issue. Levels of toxicity found in natural sources are due to several factors including agricultural runoff, industrialized waste, and pharmaceutical contaminants. Although many water purification techniques have been presented, the one that stands out the most is the use of Activated Carbon (AC) due to its accessibility and low cost. The goal of this project is to modify AC to increase the adsorption property to heighten the chances of purifying water. Modifications include functionalization and loading the surface of activated carbon with nanostructures to increase its selectivity. Adsorption isotherms performed for modified AC showed similar surface area as non-modified AC. FTIR shows peaks associated with the oxidation of graphite in the region of 2660, 1800, and 1460 cm^-1. Future works include the addition of metal sulfide nanoparticles as potential antimicrobial agents.

Chauvin, I., K. Bailey, and S. Murru. ULM. **Synthesis and characterization of novel Euparin-based chalcone and flavonol derivatives.**—Flavonols are naturally occurring polyphenolic compounds found in many different fruits and vegetables, and exhibit variety of biological activities. Euparin is a heterocyclic compound that, can be isolated from various plant species, exhibit antioxidative and antifungal properties. Even though there are many anticancer agents in the market, challenges around multi-drug resistance, poor therapeutic efficacy, adverse side-effects and poor bioavailability necessitate the continued development of novel anti-cancer agents. We are currently building a library of Euparin-derived flavonols, hoping to take advantage of the natural properties of Euparin and the anti-cancer capabilities of flavonol compounds. We synthesized chalcones using Euparin and various benzaldehydes, and converted them to flavonols via oxidative cyclization. We purified these final products using column chromatography and

crystallization methods, and characterized the compounds using IR, GCMS and NMR analysis. After we have successfully isolated a number of Euparin flavonol analogs, they will be screened for their anti-cancer properties.

Davies, J., B. Wicker, and S. Jones. SLU. **Applications of new phosphonium ionic liquids.**—Ionic liquids are an exciting area of green chemistry research due to the novel applications that non-volatile liquids have in manufacturing and high-tech fields such as space exploration. Recently, our group has developed a series of ionic liquids based on the triphenyl-2-pyridyl phosphonium scaffold. This poster will illustrate the development of ILs using other phosphines, as well as some applications of the first-generation ionic liquids.

Dumancas, G., H. Ellis, C. Setijadi, B. Dufour, J. Felix. LSU-A. L. Adams. WUSL., and E. Arroz. UOHSC. **Chemometrics: A powerful and simple tool for the development of analytical methods.**—Chemometrics is a relatively new area of science and a branch of analytical chemistry that involves the use of statistics and computer applications in analytical chemistry. Over the years, this particular field has not received a wide span of attention in the undergraduate curriculum due to the daunting mathematical calculations that are involved in the subject. In this presentation, I will discuss several key undergraduate research projects that utilized chemometrics in the development of novel analytical methods including its applications in the rapid detection of honey authenticity and the prediction of cardiorespiratory fitness based on behavioral, physiological, metabolic, genetic and metabolomics factors. Other key applications in undergraduate research projects will also be discussed including our publications in Analytical Letters, Applied Spectroscopy, Spectroscopy, Bioinformatics and Biology Insights.

Fierro, J., N. Dissanayake, K. Boggavarapu, and V. Thalangamaarachchige. MSU. **Organo-catalysis using ionic liquids.**—Ionic Liquids (ILs) possess useful properties, such as high thermal stability, non-flammability, and unique solution features. Studies have shown that imidazolium-based ILs are used as pre-catalysts for N-heterocyclic carbene (NHC) catalyzed reactions. The focus of this research is to utilize the generation of carbenes to catalyze benzoin condensation reactions. In addition, this study extends to examine the effects of the length and the size of the alkyl group, aromaticity and steric properties of the cationic imidazolium ring on catalyzing benzoin reactions. In order to study these effects, a series of ILs were successfully synthesized. After optimizing reaction conditions, our aim is to target the most efficient ILs in the catalysis of á-Hydroxy ketones (benzoin derivates) generation reactions. Benzoin known for their utility in the pharmaceutical industry as anti-depressants, antibacterial, anti-inflammatory, diuretic, and sedatives agents.

Flemming, C., B. Wicker, and S. Jones. SLU. **Applications of new phosphonium ionic liquids.**—Ionic liquids are an exciting area of green chemistry research due to the novel applications that non-volatile liquids have in manufacturing and high-tech fields such as space exploration. Recently, our group has developed a series of ionic liquids based on the triphenyl-2-pyridyl phosphonium scaffold. This poster will illustrate the synthesis and characterization of new, dipheny-bis(2-pyridyl) phosphonium ionic liquids.

Gallo, A., C. Brassieur, L. Allain, D. Bullard. ULL. A. Boudreau. LSU-BR. A. Nguyen, K. Robin. ULL. **Chemical analysis and biological screening of extracts from *Baccharis halimifolia* and**

propolis.—An ethanol-water extract of *Baccharis halimifolia* (groundselbush,GB), a native Louisiana plant with documented use in Creole folk medicine, was further extracted with hexane, dichloromethane and ethyl acetate and has been shown to inhibit lipopolysaccharide (LPS)-induced inflammation in cultured macrophages. The extracts were also examined for the effects of GB on adipocyte development and function, as these processes are attractive targets for intervention in insulin resistance. Propolis is generally known as the "bee glue", which is a generic name that refers to the resinous substance accumulated by the bees from different types of plants, in this case GB. The collection of *Baccharis* and propolis along with the extraction procedures used will be discussed. The chemical composition of GB and propolis was carried out using GC-MS and a number of different compounds were isolated and identified. Flavonoids in addition to cinnamate esters, alcohols amines and hydrocarbons were present.

Gaudet, R., and D. Rivera. NSUL. **Synthesis of zinc sulfide quantum dots and surfactant dependent size study.**—Quantum dots (QDs) are widely used in the Nanotechnology field. QDs are interesting because of their unique optical and electronic characteristics which differ from their bulk counterpart due to quantum confinement. Zinc sulfide is specifically of interest due to its high abundance, and luminescent capabilities. However, industrial production of QDs can be costly and slow. This poster presentation will highlight a fast and cost-effective method for producing Zinc Sulfide QDs using microwave irradiation and will ultimately discuss the relationship between the rate of QD synthesis, as made evident by the reaction solution color change, and the concentration of surfactant (Triton X-100) added. UV-Vis spectroscopy will be used to estimate QD size, as well as band gap.

Johnson-Buchanan, S., K. Williams, and F. Ohene. GSU. **Computational study of concerted Diels Alder reactions.**—The Diels–Alder (DA) reaction is a powerful tool employed frequently in the synthesis of six-membered ring systems with excellent regio and stereoselective control. In addition, they represent a versatile synthetic tool for constructing simple and complex molecules. The use of butadiene and ethylene derivatives to form six-membered carbocycles in a single-step process is often used for the synthesis of natural products and bioactive molecules. Solvent effects were considered by optimizing the stationary points using a self-consistent reaction field (SCRF). To determine and evaluate the impact of solvent effect on this reaction, ethanol and tetrahydrofuran (THF) were employed as solvents in the computational study of the reaction between maleic anhydride and 2-methoxy 1,3-butadiene using both Ab-Initio (HF) and Density functional Theory (DFT) at 3-21G and B3LYP/6-31G(d,p) level of theory. This reaction was found to proceed by a synchronous concerted mechanism leading to an endo cycloadduct compared to exo cycloadduct. to produce an Adduct. In order to characterize the reorganizations of population electronic at the new bond formation at various selected points in this reaction pathway, an analysis of the physicochemical parameter of the reagents based on DFT and HF were performed; followed the intrinsic reaction coordinate (IRC) by a potential energy surfaces (PES) study of the reaction to illustrate the barrier activation of this reaction in presence and absence of solvents. The bond-formation pathway of this reaction in presence and absence of solvents were performed to establish the nature and changes of electron density along the bond formation in IRC and to illustrate the barrier activation of this reaction in presence and absence of solvent medium. This reaction was found to proceed by a synchronous concerted mechanism leading to an endo cycloadduct compared to exo cycloadduct.

Jones, S., B. Wicker, and J. Davies. SLU. **Development of phosphonium-based ionic liquids.**—Ionic liquids are an excited area of green chemistry research due to the novel applications that non-volatile liquids have in manufacturing and high-tech fields such as space exploration. Phosphonium-based ionic liquids have received interest, recently, due to their high thermal stability, compared to nitrogen-based ILs. This work will present the development of new phosphonium ionic liquids based on the tripheny-2-pyridyl phosphonium scaffold. The synthesis, characterization, and some applications will be discussed.

Junk, T., D. Smith, D. Alexis. ULM., and F. Fronczek. LSU-BR. **Synthesis of novel heterocyclic organotellurium compounds 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 and 10H-pyrazino[2,3-b][1,4]benzotellurazine derivatives 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.

Komati, R., and J. Miller. Nicholls. **Scaffold hopping: A versatile approach to develop new ligands for LXR.**—The liver X receptor (LXR) is a ligand-activated receptor protein that is involved with metabolic processes and is responsible for maintaining cholesterol levels in the blood and in cells. This nuclear receptor has become the subject of intense investigation in the last few years because of its potential to serve as a target in efforts to lower cholesterol levels and to starve cancer cells of cholesterol, thus killing (or slowing the growth of) these cancer cells. We have been involved in research aiming to identify novel LXR ligands that bind to the receptor very strongly. We have carried out computational investigations in order to identify new ligands with strong potential to bind LXR. The main computational tools we have used are protein-ligand docking, scaffold replacement studies. To date, we have identified three ligands, along with several methylated derivatives, that show strong potential for LXR binding. We are currently in the process of determining the synthetic route that can be followed in order to synthesize these molecules. Once this has been determined, we will synthesize these ligands and do bioassay studies in order to determine how well these ligands bind to LXR.

Lo, M., S. Murru, R. Bista, S. Sekhar, A. Dahal, and S. Jois. ULM. **Pyrazolones as potential anti-cancer agents.**—Lung cancer is by far the leading cause of cancer-related death among both men and women. The two major forms of lung cancer are non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC), and NSCLC comprises approximately 85% of all lung cancers. Currently we are working the biological evaluation of pyrazole and pyrazolone based small molecules as potential anticancer agents. We have recently identified a set of compounds exhibiting anticancer activity particularly towards non-small cell lung cancers (NSCLC). Until now, treatment of NSCLC has had limited success and new therapeutics are desperately needed. We synthesized a library of nitrogen heterocyclic compounds and evaluated their in-vitro antiproliferation activity using Celltiter Glo assay. A few compounds showed good potency against two cancer cell lines. We will present the results from our biological assays including PARP inhibitor analysis, cell cycle analysis, and kinase profiling studies.

Lou, L., and H. Yan. ULL. **Investigating CO adsorption on mesoporous Pt-ceria with VT-DRIFTS.**—Carbon monoxide (CO) has been used as a molecular probe to study the interaction between metal-based supported catalysts in water-gas shift reaction. In both reaction mechanisms (associative, redox), CO adsorbs the periphery of metal nanoparticles and H2O dissociates on the support. CO adsorption on mesoporous Pt-ceria was studied by in-situ diffuse reflectance IR spectroscopy, DRIFTS as a function of temperature. It was investigated that CO adsorbs on both mesoporous ceria and Pt-ceria. And formate bands characterized at 2940 (bridged) and 2840 (bidentate) cm-1, started to form at 250 °C during heating with CO flow and continuously to appear on the 2nd cycle of adsorption. It is concluded that during the 2-cycle adsorption, formate bands don't disappear because of the unreducible support feature; and the CO adsorption result will serve as a reference for future WGS analysis or any CO-related reactions.

Marcello, H., B. Wicker, and P. Antenucci. LSU. **Modular green synthesis of tridentate NacNac ligands.**—Hebert Roesky developed a tetradentate NacNac ligand with amine pendant arms over 20 years ago. However, his ligand has not seen wide usage, in part, due to the difficulty in his synthetic procedure. Our lab has developed a procedure to generate Roesky-type tetradentate NacNac ligands of both symmetrical and asymmetrical varieties. Progress toward building a library of these ligands, as well as their synthesis will be presented.

Naquin, A., U. Pokharel. Nicholls. F. Fronczek. LSU-BR. **Metal-organic supramolecules from ferrocene-linked tetradentate ligand.**—Metal-organic supramolecular chemistry is an interesting area in inorganic chemistry since the structurally challenging molecules are synthesized in relatively fewer synthetic steps. In this project, we explore the synthesis and the coordination properties of tetradentate ferrocene-linked bis(pyridyltriazole) ligand with monocationic and dicationic transition metal ions. The ligand is synthesized starting from 1,1'-ferrocenedicarboxylic acid. The dicarboxylic acid is reduced to diol in the presence of lithium aluminum hydride, and the diol is converted to diazide using sodium azide. The diazide is reacted with 2-ethynyl pyridine under "click conditions" to give the desired ligand. Our preliminary complexation studies with Cu(I) and Pd(II) salts indicated the formation of symmetrical molecule. However, their full characterization is still underway. As a close organic analog of the ligand, we also have synthesized ortho-xylylenebis(pyridyltriazole), o-xpt ligand. The Pd(II) complex of o-xpt ligand shows the formation of discrete macrocycle on which the Pd···Pd separation of 3.618 Å as evidenced by single-crystal X-ray analysis.

Naquin, S., A. Naquin, U. Pokharel. Nicholls. F. Fronczek. LSU-BR., and B. Curole. Nicholls. **Synthesis and spectroscopic characterization of the alpha ferrocenyl carbenium ion.**—Carbocations are important reaction intermediates in organic chemistry, however, their isolation and characterization are still challenging. This project explores the possibility of generating carbocations at the alpha position of a ferrocenyl moiety, taking advantage of its electron-releasing effects. In a sequence of reactions starting from ferrocene and succinic anhydride, we synthesize a ferrocene-bound cyclic ketone, on which a keto group lies at the alpha position of the ferrocenyl moiety. The ketone is reduced in the presence of NaBH4 to give an isomeric mixture of exo and endo carbinols. The carbinol mixture gives a single product on treatment with trifluoroacetic acid with a downfield shift in one of the proton's resonance in 1H NMR which indicates the formation of a carbenium ion. The carbinols dehydrate, giving an alkene moiety when heated at 80 °C under

reduced pressure. Synthesis and spectroscopic characterization including the structure of related ferrocene derivatives will be discussed.

Nasirian, V., J. Dennis, E. Rabalais, and V. Salim. LSU-S. **Isolation and purification of complex alkaloids from medicinal plant *Camptotheca acuminata*.**—Alkaloids are basic nitrogen-containing compounds that are found in many plant species. These compounds have been known to be pharmacologically active for treatment of various diseases. Camptothecin is a well-known alkaloid with high anti-tumor activity by inhibiting human topoisomerase-I, originally identified in the extracts of a Chinese tree, *Camptotheca acuminata*. This medicinal plant species was also reported to accumulate other forms of alkaloids that need to be elucidated for investigation of their biological activities. This present study is to develop extraction methods for metabolic profiling of *C. acuminata* tissues and further develop a reverse-phase high-performance liquid chromatography (HPLC)-UV/fluorescence (Flu) and High-performance liquid chromatography-mass spectrometry (HPLC-MS) methods. The findings based on this purification method demonstrate different metabolite profiles between root and leaf tissues. The structural elucidation of novel alkaloids from *C. acuminata* will assist the characterization of camptothecin biosynthetic pathways and further efforts in anticancer drug discovery.

Poe, A., L. Scott, and C. Thibodeaux. NSUL. **A comparison of copper and lead concentrations in filtered vs unfiltered drinking water at Northwestern State University.**—The object of this study was to compare the concentration of selected heavy metals (Cu and Pb) in filtered vs unfiltered drinking water on campus. It is vital to monitor such metals as exposure to elevated levels can pose health threats to the human body. Samples were collected from three buildings; preserved; and analyzed using ICP-OES as outlined in EPA Method 200.7. Since the construction of these buildings, regulations have changed significantly including banning the use of lead-containing solder in plumbing. This makes the campus a unique place to examine the concentrations of such trace metals in drinking water. Results will be presented, with a particular focus on the variability between filtered and unfiltered fountains at each location.

Pokharel, U., B. Curole, A. Andras. Nicholls. and M. Lo. ULM. **Lactone formation in ferrocenyl keto-carboxylic acids.**—Since the γ-lactone is an important structural motif in natural products and biologically active molecules, the development of facile approaches to synthesize these skeletons has been an attractive field of research. Although various methodologies of synthesis have been developed, the mechanism of cyclization of γ- or ω-keto carboxylic acids is still unclear. To understand the mechanism, we have synthesized a series of ferrocenyl keto-carboxylic acids from the Friedel-Crafts acylation of ferrocene with different cyclic organic anhydrides. The keto-carboxylic acids obtained from succinic or glutaric anhydrides undergo internal cyclization to give five- or six-membered lactones in the presence of trifluoroacetic anhydride. However, the keto carboxylic acid obtained from phthalic or naphthalic anhydride also undergo cyclization under similar conditions but they undergo dimerization at the alpha position of the ferrocenyl group. Synthesis, characterization, and the mechanism of cyclization will be discussed.

Primeaux, S., and P. Chanda. SLU. **Diastereoselective aldol reactions of N,N-dialkylphenyl-acetamides.**—The use of a boron reagent in diastereoselective aldol reactions of carbonyl compounds provides ample opportunities to get a desired stereoselectivity in aldol products. A combination of dicyclohexyliodoborane (Chx2BI) and triethylamine was reported to provide syn-

aldol products of N, N-dialkylphenylacetamide. However, anti-selective aldol reaction of N, N-dialkylphenylacetamide remains unexplored to date. We have studied the effects of several variables on the diastereoselectivity of enolboration-aldolization of phenylacetamides. These variables include alkyl groups of amides, alkyl groups of boron reagent, enolization-aldolization temperature, solvents, and tertiary amine base. Therefore, we will report the progress towards the development of anti-selective enolboration-aldolization of N, N-dialkylphenylacetamides.

Reed., P., and D. Rivera-Vazquez. NSUL. **Synthesis and characterization of CuS quantum dots: Towards the development of a cost-effective biosensing platform.**—Quantum dots (QD's), also known as semiconducting nanocrystals, are nanostructures within all dimensions in the range of 2 – 30nm. These materials exhibit interesting physicochemical properties that differ from their bulk counterparts. Of particular interest is their potential to be utilized as biosensors. While their potential has been studied, synthesized QD's rely on highly toxic metals and costly methods. Copper possesses low toxicity and environmentally favorable properties. Our project aims to study the potential of copper (II) sulfide (CuS) as a low-cost, green alternative to current biosensing materials. CuS QDs were synthesized via microwave assisted method in a mixture of copper and sulfide ions which is a more cost-efficient method. UV-Vis absorption shows a shoulder close to 340 nm, which is characteristic to CuS. Further characterization will include FTIR, fluorescence and electron microscopy measurements. Future works will focus on synthesis optimization and functionalization into a highly selective biosensor. Keywords: Quantum dots, copper sulfide, biosensors, microwave synthesis.

Smith, C., N. Dissanayake, K. Boggavarapu, and V. Thalangamaarachchige. MSU. **Dissolution of biomass in ionic liquids.**—Biomass is primarily comprised of cellulose and lignin. Both are polymeric and are insoluble in most well-known organic solvents. During our study, Ionic Liquids (ILs) are used to efficaciously dissolve these compounds. The ILs are synthesized using 1-methylimidazole as the precursor. ILs are extremely effective non-coordinating mediums that can dissolve both organic and inorganic solutes. Additionally, ILs are non-flammable solvents with negligible vapor pressure. ILs are stable at elevated temperature which makes them a promising alternative to classical organic solvents. Moreover, ILs are recyclable solvents, therefore the dissociation of biomass using ILs is a green and sustainable process. In this work, the process of synthesizing ILs and the effect of their cations and anions in dissolution of cellulose and lignin will be discussed.

Warren, O., and D. Rivera-Vazquez. NSUL. **Modification of graphene oxide for desalination and antibacterial application.**—Billions of people all around the world are affected by water pollution. Water pollution treatment costs 4.3 billion dollars in the US; this number is expected to grow. There are many different treatments used for water purification and desalination, but there is a need for a cheaper and more efficient alternative. Graphene oxide membranes have shown to be a cost-effective alternative for desalination. The goal of this project is to produce a cost-effective graphene oxide-based material for desalination and antimicrobial activity. Graphene oxide was produced via Hummer's Method. FTIR measurements show the formation of carbonyl and carboxylic groups on the graphene oxide. Further characterization will include electron microscopy measurements as well as surface area determination. The addition of thiol groups along with research on any potential antimicrobial activity the material may exhibit will be explored in this project.

Vaugh, T., A. Fruge, and S. Meissner. MSU. **E-Liquids as a vehicle for the investigation of organic mechanisms.**—E-liquids, components of electronic nicotine delivery systems, have increased in popularity of the past decade. Despite growing popularity, very little has been published about the possible chemical reactions which can occur between the many organic compounds found in E-liquids. This investigation has found some surprising compounds present in E-liquids and we shall attempt to explain the presence of some compounds by examining organic chemistry mechanisms.

Xavior, A., N. Dissanayake, K. Boggavarapu, and V. Thalangamaarachchige. MSU. **Extraction of chitin using ionic liquids.**—Chitin is mainly found in the exoskeleton of invertebrates in particular crawfish and shrimp. Chitin derivatives are used in medicinal, pharmaceutical, agricultural, and industrial applications. There are many ways to extract chitin from an organism's exoskeleton; however, to maintain the structural integrity of chitin is a main concern when choosing an extraction method. One of the best methods discovered so far to extract chitin while maintaining structural integrity is to use ionic liquids (ILs). In this study, novel ILs are synthesized and used to extract chitin effectively. Later, extracted chitin will be deacetylated to convert into chitosan. Chitosan has immense antibacterial properties as well as coagulant properties. Therefore, the extraction of chitin using ILs is a very important process to provide such amenities, and to keep up the quality of all the products. In this work, synthesis methods of ILs and the extraction protocols for chitin will be discussed.

Computer Science Section

Banadaki, Y., R. Joubert. SUAMC., and S. Sharifi. LSU-BR. **On the use of convolutional neural networks to identify the optical modes.**—Gaussian-beam modes are the solutions of the free-space Maxwell's equations within the paraxial approximation called Laguerre-Gaussian (LG) modes in cylindrical coordinates [1]. They have applications from optical communications [2] to atomic physics [3]. In the experimental laboratory, the CCD or CMOS cameras usually use to capture the mode information such as centroid and radius of a beam profile [4] but identifying the modes with human eyes is challenging especially in higher modes. One good solution to automatically identify modes with high speed is to use machine learning methods.

Basalan, A., and M. Salam. SUBR. **Intrusion detection in IoT systems using machine learning algorithms.**—In recent years, the Internet of Things (IoT) has grown up rapidly. An urgent topic of the problem is security and privacy for IoT devices. For the security of IoT, detecting anomaly attacks is a crucial point for avoiding any interrupt of the Internet connection of the IoT devices. Machine Learning algorithms are rising and improving year by year. Many classic tests can detect many attacks in current times. However, those techniques are not enough for security. The types of attacks are changing frequently. In this study, we used machine learning algorithms to improve the security level of IoT. This study provides deep learning techniques, especially Long Short-Term Memory (LSTM) and Convolutional Neural Network (CNN). Both of these algorithms have shown improvements over a wide variety of intrusion detection in IoT. Dataset is an important

point for the use of those techniques. This study will use the UNSW-NB15 dataset which is a publicly available dataset.

Brasseaux, Z., I. Al-Agha, and P. Chowriappa. LTU. **Active learning using dense convolutional neural networks (CNNs) in multi-modal sensor streaming data.**—The mining of streaming data is untenable, as the volumes of data streams vary in volume and velocity. Supervised learning algorithms are difficult to use as every data point in the data stream is treated as equally important rendering these algorithms computationally inefficient. In this work we use algorithms of change-point detection to predict events that are relevant for training a deep learning algorithm. The proposed method is an implementation of a human-in-the-loop active learning architecture built over a dense convolutional neural network (DCNN) in order to more accurately verify these events as time progresses. This architecture can be applied to a vast array of sensors, such as pressure and fluid flow. Our objective is to accurately filter out false positives and boost the reliability of event prediction using machine learning.

Conn, C., G. White, and Y. Reddy. GSU. **Penetration Testing.**—Penetration Testing or ethical hacking is an officially permitted simulated attack of a computer system, network or web application to find security vulnerabilities that an attacker could exploit. Metasploit, Nmap, Wireshark, Aircracking, John the Ripper, Nessus, and Burpsuite are some of the best cyber security penetrating testing tools. The proposed research project explores the penetration testing using the tools NMAP, John the Ripper and Metasploit through Kali Linux. Using these tools, we explore the target computer to identify the IP addresses, location and passwords. The results conclude that the penetration test help to prevent or minimize hackers' attack. We further conclude by automating the penetration tests minimizes the hacking in network environment.

Drozdenko, B., and M. Maasberg. LTU. **Optimal mote placement for an ad hoc distributed sensing system.**—Recent events have demonstrated the need for systems that can provide situational awareness and decision making on a large scale to allow quick reaction before local populations are affected. Proper communication among crisis response and disaster recovery entities needs to be achieved to support disaster resiliency. We envision a distributed framework to support crisis and disaster response with low power devices in an ad hoc mesh and fog infrastructure. To address the connectivity challenges, we envision an optimal placement of sensor motes to maximize continuous communication and consider added costs of network traffic from altered parameters. Modeling and simulation are conducted to calculate probability of communication optimizing the criteria of area coverage, reduction of network traffic, and maximizing the percentage of connected nodes. Our results demonstrate how the area coverage, network traffic, and percent of connected devices is a nearly linear function of frequency and the number of motes.

Hegab, N., B. Drozdenko, and J. Spurgeon. LTU. **Enhancing wireless communication in inventory management.**—Inventory management systems have been modernized in recent years to include the use of electronic sensor-based devices to automate bookkeeping. In particular, the lack of consistent Wi-Fi connectivity on Air Force bases due to the presence of thicker building materials such as steel-reinforced concrete presents a major problem for integrating these devices into a Cloud-based data fabric. In this work, we explore the use of alternate wireless protocols for maintaining consistent connectivity of inventory management devices. Our experiments use the

ZigBee and LoRaWAN wireless protocols to prototype a mechanism for continuing wireless operation in the absence of Wi-Fi. Our results compare the timing, message consistency, RSSI over various distances, and RSSI through different building structures. We also compare RSSI measurements to those of a standard Wi-Fi access point. Using these results in MATLAB-based simulations, we demonstrate an optimal algorithm for determining wireless mote placement for a given base.

Jackson, C., and B. Baniya. GSU. **Machine learning in cybersecurity.**—With the advancements of network technologies and strong global connectivity have led to the exponential growth of data, processing capabilities, learning algorithms, and expand in several research areas. The internet is a rapidly growing technology and undoubtedly stands as an integral part of our daily life despite the several known and unknown challenges. The increasing connectivity heightens the security concern (vulnerabilities) in networks and compels the researchers (security analysts) to explore robust security technologies to combat the complex cyber-attacks. We elaborate on machine learning score in cybersecurity and finally focus on intrusion detection. The role of fast Intrusion Detection Systems (IDSs), as demanding to detect anomalies and attacks in the network, is becoming more important. We introduced the computationally efficient algorithm, the extreme learning machine (ELM) to classify the intrusion detection and achieved notable classification accuracy within the minimum amount of time (training and testing time). The well-known NSL-KDD dataset is used to measure the performance of this algorithm.

Joubert, R., SUAMC. S. Sharifi. LSU-BR., and Y. Banadaki. SUAMC. **Apply convolutional neural networks to identifying the Laguerre-Gaussian modes.**—Designing an automated detection of Laguerre-Gaussian (LG) modes give us a benefit of cavity tuning and using LG modes in optical communications. In this project, we demonstrate the ability of using deep neural network, specifically convolutional neural network to classify the intensity of the first 15 LG modes of a laser beam in experimental data while we deal with different noises such as Gaussian noise, Poisson noise, camera blur, and speckle noise. Our result shows an accuracy of 90% after 100 epochs. The study evaluates the CNN's ability to generalize to new data and adapt to experimental conditions.

Katchoua, G. GMU., and F. Yari. SUAMC. **How can an organization successfully use artificial intelligence to promote diversity and overcome bias?**—Started back in the early 1940's, artificial intelligence (AI) has improved greatly and gaining popularity as it's used today in many organizations such as for recruiting, automating tasks among many. With this great tool, it's also been designed to solve some of the humanly difficult tasks to do such as making decisions that are bias-free, recruiting the right candidate for a job. However, AI has come under criticism because of some cases of biases shown as a result of using it to make decisions or recruit candidates for a job. This has brought so many questions as to whether AI can really be used to overcome bias in decision-making as intended. This paper examines; case studies where AI showed biases, the design and implementation of AI and the recommendations that organizations can use to improve the design and implementation of AI so that it can overcome bias at the workplace.

Logan, K., M. Batais, M. Shrestha, S. Acharya, and M. Foltz. MSU. **Design of smart energy management subsystem for a planetary rover application.**—Planetary rovers have assisted human being's space exploration on other planets and planetary satellites, such as Earth's moon

and Mars. The battery life has limited planetary rovers to function for a long time. Therefore, it is important to study the energy management of the planetary rovers and increase the lifetime of the rovers. In this paper, a smart energy management subsystem is designed for a simulated planetary rover. The rover contains embedded systems to execute simulated planetary activities using attached environmental sensors and wireless communication blocks. The power optimization algorithms and software are designed to optimize the power usage of the embedded systems, sensors, and wireless communication blocks so that the productivity of the rover can be maximized based on the scheduled work routine.

Maharjan, B, U. Cvek, P. Kilgore. LSU-S., and J. McLarty. LSUHSC-S. **Mobile application to improve detection of undiagnosed diabetes and pre-diabetes.**—Diabetes is a class of metabolic dysregulation characterized by hyperglycemia, a prolonged elevation in blood sugar. In 2015 alone, an estimated 30.3 million Americans had some form of diabetes with an estimated 7.2 million cases remained undiagnosed. More worryingly, 84.1 million Americans had pre-diabetes, a known risk factor for Type 2 diabetes. We developed a pre-screening utility for iOS and Android platforms to guide patients who believe they may be at risk for diabetes. This application provides users a brief nine-item questionnaire involving questions concerning age, body measurements, and medical history. This data is then fed into a decision tree classifier to predict the user's diabetes risk category and deliver a recommendation to the user. A usability study was then performed on a random sample of students using the Android and iOS implementations of our application. Then a survey was conducted designed to obtain the users' perceptions of the software.

Price, N., and Y. Banadaki. SUAMC. **On the use of machine learning approaches to detect anomaly in networks.**—There is a rise in many different types of cyber-attacks in the past few years. To combat these attacks, we employed a signature-based security method that can detect routine and common attacks. The anomaly-based approaches could help to stop zero-day attacks leading to the ability to monitor the network in real-time. The technique allows us to ensure that the attacks would not go unnoticed and could be stopped in the early stages. Machine learning enables the security system to detect and alert any phishing or suspicious activity. The CICIDS2017 data set has up-to-date and comprehensive attack diversity that is utilized for training a variety of machine learning methods demonstrating the success rates as follows: Naive Bayes 86%, QDA 86%, Random Forest 94%, ID3 95%, AdaBoost 94%, MLP 83%, and K Nearest Neighbors 97%.

Rogers, D., and B. Drozdenko. LTU. **Cloud analytics for smart communities.**—IoT-enabled smart communities generate massive amounts of data. Processing big data for smart communities' applications such as disaster prediction introduces bottlenecks in the context of real-time operation in IoT devices and high performance computing for data analytics algorithms. While the literature describes multiple data architectures, few validate their design quantitatively. In this research, we propose an efficient data pipeline for Cloud-based smart communities using quantitative metrics. Our experimental setup employs a ZigBee network of Raspberry Pis, which posts sensor data to a MongoDB instance hosted on a private Cloud. We introduce an approach to the collection and analysis of sensor data, focusing on reducing data processing times. For each component of our data pipeline, we describe experiments comparing its performance to competing technologies. These results provide a point of comparison for future smart community platform development.

Smith, C., and B. Drozdenko. LTU. **A straightforward, reusable, scalable smart cities infrastructure using the mean stack in docker containers.**—Modern smart cities and communities generate massive amounts of data in the general areas of power grid, water, transportation, and others. However, many issues prevent the widespread adoption of these platforms, including data collection and processing techniques and heterogeneous sensors and software platforms. While the literature describes different architectures for these applications, they are generally not open source, replicable, or scalable, and rarely consider Cybersecurity. We propose an open source, easy-to-implement, secure, modular, low cost, low power, automated smart city framework. Our infrastructure takes sensor readings (e.g. CO_2, water depth, weather, pressure) and communicates them via ZigBee to a fixed coordinator. The coordinator uploads fused datasets to the backend where is made available for the MEAN stack (MongoDB, Express, Angular, and NodeJS) in Docker Containers. Our results show that this architecture provides a secure platform that is easy to replicate for any industry and expand to any platform size.

White, A., and Y. Reddy. GSU. **Relic Application Monitoring.**—New Relic Application Monitoring is a cloud-based platform that assists you in understanding various applications through auto instrumentation, find root causes and fix the issues, and get the holistic viewpoint. Although New Relic can monitor various applications. The downside is the lack of not being able to send an alert when the .NET Agent goes down. So, for our project Deloitte set out on a mission to teach us everything about New Relic and Powershell. By doing so, we were able to combat this issue after learning how to work with the installation process and getting an opportunity to trouble shoot issues for the Hyderabad teams on multiple occasions. We were also allotted time to learn loadrunner. Which is software that is used to record the activity and analyze the data collected. 1. Learn New Relic Application Monitoring and Powershell 2. Install New Relic .NET Agent 3. Live installation with USI Team. 4. Create a script that lets us know when New Relic's .NET Agent is down. 5. Create a log file Our project was one of the necessary measures taken to move towards automation. The next steps are to create a run book and installation guide on New Relic for developer teams to use, export the log into a database, dynamically correlate administrators, and fully automate the service ticket. I look forward to the future developments and how the initiatives will be implemented to increase company proficiency.

White, G., C. Conn, and Y. Reddy. **Ransomware.**—Ransomware, is a type of malware that prevents users from accessing their system or personal files and demands ransom payment in order to regain access. Most ransomware variants encrypt the files on the affected computer, making them inaccessible, and demand a ransom payment to restore access. Ransomware was first seen in 2005 and has advanced to be more damaging and more expensive in recent years, partially due to the rise of bitcoin. Hospitals, police, Government, and even Louisiana school systems are all at risk of having their infrastructure locked and even deleted. In our research, we identified the ransomware cases and suggested the ways to prevent and protect from infrastructure from ransomware attacks. Further, we identified the most dangerous part is bank account like bitcoin, which is very difficult to trace the ransomware hacker. In our conclusions, we suggested guidelines to avoid the ransomware attackers. The implementation is related to security process but worth it.

Earth Sciences Section

Blanchard, G., and F. Adesina. SLU. **Initial results from student-built autonomous groundwater salinity monitor for marsh research.**—We have designed and built an autonomous groundwater salinity data collecting system for Southeastern Louisiana University's Turtle Cove Environmental Research Station. Two such monitors are currently being used to study the temporal and spatial evolution of groundwater salinity in the marsh to address the question of why groundwater salinity is higher in the marsh than in nearby freshwater sources. We present our instrument design, experimental methods, and initial results. Initial results indicate that fresh water that is introduced into the marsh does not mix with underlying salt water, but instead forms a 10-cm to 20-cm deep surface layer.

Materials Science and Engineering Section

Bari, S., L. Reis, and G. Nestorova. LTU. **Calorimetric sandwich-type immunosensor for quantifying TNF-α: experimental results and numerical analyses of heat transfer for maximized detection sensitivity.**—This study presents a calorimetric immunosensor for the quantification of TNF-α. A fluidic channel fabricated from Kapton tape was sandwiched between a glass slide and a coverslip to form the device. An anti-TNF-α monoclonal antibody was used to capture the analyte followed by detection via glucose oxidase-conjugated secondary antibody. Glucose (55mM) was injected through a sample loop into the fluid flowing within the microfluidic device. A nanovolt meter connected to the Sb/Bi thermoelectric sensor (placed outside of the lower channel wall) recorded the voltage change due to the enzymatic reaction. The concentration of TNF-α measured using the calorimetric immunosensor (251 pg ml-1) had an excellent correlation with the concentration measured using microplate-based ELISA (252 pg mL-1). A three-dimensional numerical study shows that reducing the channel height, using PDMS instead of glass, and eliminating the heat sink at the reference junction of the thermopile sensor increases the thermoelectric signal by 783%.

Burrell, R., N. Seetale, and H. Yang. GSU. **Impact of Cu nanoparticles on the melting and magnetic properties of SmCo.**—SmCo is a rare earth metal with strong permanent magnetic properties at high temperatures. It's currently being manufactured using the reduction/melt technique in a high temperature furnace. A laser melting approach can potentially find a more cost-efficient process of manufacturing SmCo magnet. It has been published that the addition of nanoparticles into the powder enhances the melting process due to improving the laser absorption. We were successfully able to melt the SmCo powder with the Cu particles using a consumer grade semi-conductor laser. After this we explored the impact of Cu nanoparticles on the melting and magnetic properties of SmCo powders. Different mixture ratios of Cu nanoparticle to the SmCo powder have been tested. This presentation will discuss the impact of the mixture ratio to the magnetic properties of laser melted SmCo.

Dokku, S., and S. Jones. LTU. **Effects of endogenous and exogenous agents on platelet adhesion.**—Platelet adhesion is regulated by both positive and negative feedback agents, such as NO and ADP, respectively. Both of these agents are released on platelet activation. To distinguish between the role of exogenous and endogenous agents, microchannels were produced that had multiple thrombogenic (fibrinogen) regions separated by non-thrombogenic (BSA-coated) regions. This geometry reveals the effect of agents released from different thrombogenic regions on one another. Adhesion was quantified by percent platelet surface area coverage (PSAC). PSAC differed between the upstream and downstream sides of the thrombogenic regions patterned with fibrinogen, collagen, and albumin. Positive and negative feedback effects were enhanced with increased platelet production of activator and inhibitor. In contrast, when the NO was exogenous, as when DPTA was added to the PRP, the feedback was less pronounced, and hence the spatial distribution of adhesion was more uniform.

Fayed, A., D. Tortorich, and Y. Yu. SLU. **LionBot: Design, simulation, and construction of an office assistant robot.**—This project introduces the design, simulation and construction of an office assistant robot (LionBot). This robot is consisting of a rigid modular frame and shelf, a robot arm and a series of codes for LionBot. The frame uses a track system with three sprockets on each side. Two motorized sprocket powers the tracks, two sprockets adjust the track tension, and two are free spinning. The robot arm is designed to lift a 5 lb. load. In addition to the gripper, the arm has three degrees of freedom: rotation about a vertical axis, rotation about a horizontal axis and extension via a linear actuator. Robot is programmed to do basic motions (moving forward, backward, left turn, and right turn.) Sensors are used to guide the robot navigation and allow obstacle avoidance.

Godara, S., and D. Mainardi. LTU. **CO adsorption on transition metal Fischer Tropsch catalysts: A DFT study.**—All Fischer-Tropsch mechanisms known to date begin with the adsorption of carbon monoxide followed by its dissociation on a given catalyst surface. Understanding how catalyst materials modify reactivity descriptors, such as CO adsorption and dissociation energies, is key for nano-engineering materials for this type of applications. CO adsorption studies on pure and bimetallic 0.5 and 1 nm clusters of transition metals (Fe, Pt, Pd, Ni, Co and Ru) is done. The CO binding energy on the cluster was seen to be changed by employing core-shell structure with a different metal atom in core (alloying). These cluster models have shown to retain the accuracy of the periodic slab models at a lower computational cost.

Holland, T., D. Gaines. LTU. N. Crews. NOUSI., and G. Nestorova. LTU. **One-step nucleic acid sampling technology for genetic analysis on the International Space Station.**—The GeneLab on the ISS has a section dedicated to extract and purify RNA from biological material. The goal of this study is to develop a solid-phase gene sampling device for quick, efficient, and non-invasive extraction of genetic material. This method involves using needles that have been functionalized with dT(15) oligoes for selective purification of mRNA. The current protocol used for extraction is time-intensive; each sample requiring 15 minutes. The new RNA capture pin system developed at Louisiana Tech University will allow for 16 samples to be collected in under 5 minutes. This technology has been developed with input from the NASA engineers who created the WetLab system and is fully compatible with current instrumentation on the ISS. This new method can greatly improve NASA's ability to perform genetic testing at a reduced cost and is currently scheduled for flight validation on the ISS.

McGibboney, C., S. Yoshida, N. Fujishima, S. Takahashi. SLU. T. Sasaki. NU., and M. Hoq. SLU. **Characterization of fatigue with the field theory of deformation and fracture.**—We present results on our hypothesis that the Field Theory of Deformation and Fracture characterizes fatigue on a fundamental theoretical level. From the viewpoint of wave dynamics, described by the theory, we can describe the transition from deformation to fracture in solids. Typically, determining a material's fatigue properties from fatigue testing is expensive for aerospace engineers since it is required to break physical aircraft components to obtain data needed to design aircraft. We conducted physical experiments with metal dogbone specimens undergoing cyclic loading. Using the optical interferometric technique Electronic Speckle-Pattern Interferometry (ESPI) we analyzed the temporal behavior of the displacement pattern formed while the specimens were experiencing cyclic loads. Deriving field equations that govern the displacement field of solids undergoing deformation we conducted numerical simulations using a Finite Element Model to search for similarities between empirical results of fatigue testing and the physics-based Field Theory of Deformation and Fracture.

Robinson, A., and P. Derosa. LTU. **Surface oxidation mechanisms of CrCoFeNi high entropy alloys.**—High entropy alloys (HEAs) are comprised of principal elements with comparable atomic composition. Some of the HEAs properties, including ductility and wear resistance, are superior to traditional materials. However, low oxidation resistance at high temperatures is a problem. A better understanding of the oxidation process will facilitate finding a solution to slow down oxidation. Computational modeling can provide unique insights into this process. In this study density functional theory (DFT) combined with molecular dynamics (DFT/MD) was used to simulate surface oxidation of the CrCoFeNi HEA. Three 100-atom surfaces with equal 25 atoms of each element were modeled. Three oxygen atoms were placed at trilateral sites on the surface, and DFT was used to simulate oxidation at these sites. Sites where oxide formation was observed, were then subjected to DFT/MD. DFT results suggest that O tends to migrate to bond with chromium and iron, where the oxidation process seems to start.

Sharma, I., W. Sun, and S. Stinnett. MSU. **CZTSSe based thin-film solar cell fabrication and characterization.**—Copper Zinc Tin Sulfide-Selenide (CZTSSe) is a quaternary semiconducting compound that has been recognized as a fascinating scientific topic for researchers for its application in thin film solar cells. It is also a promising alternative for Cu(In,Ga)Se2 (CIGS) absorber due to its earth abundant, inexpensive, non-toxic constituents and optimal material properties. In this study, we use a facile chemical route to fabricate CZTSSe thin films by spin coating a solution of highly soluble, inexpensive, and commercially available precursors in an environmentally friendly non-toxic Methanol solvent. A systematic study of the factors controlling crystal growth and microstructure development during selenization process was conducted in this study.

Zeidan, M., A. Derousselle, C. Davis, and M. Krutzfeldt. SLU. **Developing low-cost storm shelter.**—The goal of this project is to design a storm shelter for areas that are affected or in danger of being affected by significant storms or tropical storms and hurricanes. The shelter must be able to be assembled quickly, efficiently, and using basic tools only. It should be able to protect a family of four from a variety of natural elements that can be life-threatening. An important aspect of this shelter is that it must be adaptable to the geographical area it is placed in. Whether it is a sandy environment, rocky and mountainous, or flat ground, the shelter must be able to be assembled and

used in an emergency. The shelter should be built within a limited budget of $1,500 including material and labor, and have a limited maximum weight of no more than 200 kilograms to allow for mobility.

Zeidan, M., V. Langlois, and B. Reed. SLU. **Cement mortar for advanced construction applications.**—This study is part of a project which aims to develop a mortar that can be used for advanced application in construction like for 3D printing and robotic brick laying. The mortar should have relatively low setting time along with acceptable compressive strength, and high flowability. Previous research showed that colloidal nano-silica particles increased compressive strength and decreased setting time for the cement mortars. However, this also resulted in harder fresh mortar with lower ability to flow. These mortars were not ideal for to be pumped and to move through hoses and nozzles. Therefore, new group of mortars were developed in this study using special chemical additives (superplasticizers) to improve flowability. Different types and dosages were tied to find the optimum combination. The new mixes were tested using flow table to evaluate flowability, Vicat needle apparatus to measure setting times, in addition to compressive strength testing.

Math and Statistics Section

McGibboney, C. SLU**. Graphing Euler Spirals with the Riemann Zeta function**.—A new method for plotting Euler (Cornu) Spirals is presented using the Riemann Zeta Function. Euler Spirals were first drawn by James Bernoulli in 1694, while they were not formally characterized by Euler until 1744. Using the Riemann Zeta function for values of s on the critical strip (Real(s)=.5) where complex values of s produce the nontrivial zeroes, this new method generates Euler Spirals where the second spiral, in the twin spiral pair, is centered at zero. Thus, a non-continuous function now exists capable of drawing Euler Spirals without the Fresnel integral and in non-parametric equation form. This method is also different from the numerical algorithms published by Stephen L. Moshier and separately by William H. Press and his colleagues. Additionally, this method for drawing Euler Spirals demonstrates a relationship between complex values of s that produce the nontrivial zeroes and noise produced by the Riemann Zeta Function.

Michels, N., M. Hardin, M. Manning, and K. Adhikari. LTU. **Comparison of bearing estimation algorithms for a circular array transformed to have a Vandermonde manifold vector.**—Uniform circular arrays (UCAs) offer benefits over uniform linear arrays (ULAs) for direction-of-arrival (DoA) estimation, but are disadvantaged in that their array manifold vectors do not have the Vandermonde structure which allows for convenient electronic steering of an array. This project utilizes a Butler-type matrix to transform the array manifold vector of a UCA into a Vandermonde vector. We test this technique for simulated wide sense stationary plane-wave signals in Gaussian white noise. We also build a sixty-three microphone UCA and collect data to test our results. We implement conventional beamforming (CBF) and multiple signal classification (MUSIC) for DoA estimation and compare the performances. The results show that the transformed UCA is equivalent to a ULA for MUSIC but not for CBF. CBF degenerates for

particular numbers of sensors at low signal to noise ratios whereas MUSIC works well for any number of sensors.

Olivier, P. ISTEMA. **Revisiting the quadratic formula.**—An interesting alternative derivation of the quadratic formula has been resurrected. It is based on ASSUMING solutions of the form r = b/2 + u and r = b/2 - u, this is obvious. The question addressed in this paper is: How could these solutions forms be known a priori?

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.

Dalier, A., D. Gilbert, D. Norwood. SLU. D. Wurm, X. Singer, G. Shitera, and B. Trinh. SSCALLC. **Viscosity measurement of polyvinyl alcohol solutions in various solvents.**—Selvol Polyvinyl Alcohol (PVOH) solutions are heavily used in products worldwide due to their high abrasion resistance, elongation, tensile strength, and flexibility. Since PVOH is synthesized from polyvinyl acetate a variety of different grades are measured using a single capillary viscometer and a Brookfield rotational viscometer. Comparing the viscosities measured from both systems using the Bland-Altman method illustrates consistent viscosity measurements across the two systems. We can evaluate good and poor solvents for PVOH solutions by studying their intrinsic viscosity using the Huggins method. The calculated intrinsic viscosity demonstrates how the added solute increases the viscosity in a dilute solution dependent on molecular weight and the conformation of the polymer in the solution. These two factors are the major determinants of the performance properties of PVOH solutions. Specific properties are sought out by clients that best suit the functionality of their products across a multitude of fields such as textiles, paper, adhesives, building products, and specialty applications.

Tastet, P., and M. Charilaou. ULL. **Monte Carlo simulations of magnetic iron-nickel meteorites.**—Iron meteorites are the only magnetism-carriers of the early solar system. Over the billions of years it took to travel to Earth, while cooling down in geological time scales, multiple iron-nickel phases occurred inside these meteorites. These phases all have distinct magnetic properties and they interact with each other, making the interpretation of the magnetic state in

meteorites challenging. In this work, atomistic Monte Carlo simulations shed light to the effects that the different Fe-Ni phases have on one another. Specifically, we simulate the magnetization as a function of temperature and the formation of magnetization textures at the boundaries between the different phases. This allows us to decipher the magnetic state in these extraterrestrial materials, with the goal of understanding how magnetization states are stored within meteoritic metals.

Division of Science Education

Higher Education Section

Adewunmi, M. SUAMC. **Faculty experience of learner's analytics in relation to student retention.**—Student attrition from college/universities remains a threat to America's workforce. Most work of retaining student falls on the shoulder of student affairs professional who provides student the service they need to persist, faculty members are usually left out. Studies have been conducted to discuss/demonstrate the usefulness of learner analytics in improving student retention, few studies have examined the Faculty's perspective on learner analytics in relation to student retention. The study would utilize Technology Accepted Model questionnaire which will be adopted to obtain data from respondents on feeling towards the use of learner analytics applications in relation to student retention. Feedback from the survey will provide pertinent information regarding faculty's experience of learner analytics in relation to student retention and it will add to the body of knowledge regarding student retention at the College level.

Mdah, R. SUAMC., and D. Wasum. CIFE. **Assessing the relationship between Pell Grant and Federal Student Loan at Louisiana four-year public institutions.**—70% of American postsecondary students borrow to finance their education as the cost of postsecondary education has risen. According to National Student Loan Data System, during the last 11 years, student loan debts has increased 2.8 times more from 2007 to 2018. Repaying the student loan debt is burdensome especially to students who do not complete their degree and are thereby less likely to get gainful employments. Thus, rise in student loan debts has become a major point of debate amongst scholars, policy makers, as well as the public. The purpose of this study is to assess the relationship between Pell Grant and Student Loan portfolio among four-year institutions in Louisiana. Our sample includes 16 recognized four-year public institutions in Louisiana. Secondary data for analysis is gotten from the National Center for Education Statistics. Descriptive, correlation, t-test and ordinary least square analyses are used to evaluate the data.

Namwamba, J. SUAMC., and N. Enime. CGCINC. **The impact of Nigeria's colonial Mathematics Education practice on the country's post-colonial era Mathematics Education practice.**—A qualitative method study, examining the impact of pre-independence era Nigerian Mathematics Education Practice on the country's Post-Colonial era Mathematics Education Practice was carried out. To achieve the goals of the study, qualitative information related to Pre-independence and Postcolonial era data related to Mathematics Education Practice in Nigeria was collected using face to face interview questions. The respondents in this were ten native Nigerians from different backgrounds and socio-economic status, with background knowledge of the Nigerian education, eight of whom live in the state of Louisiana and two in Nigeria. The researcher will use audio tapes to record. All the interview sessions were recorded and later transcribed for analysis. When the data was analyzed, over ten themes emerged. The themes suggested that the impact of Nigerian Colonial era Mathematics Education Practice on the independent Nigerian state is yet to completely disappear.

Zenon, E. RPCC. **Increasing equity in STEM and CTE with OER.**—This presentation will focus on using Open Education Resources (OER) in STEM and CTE courses as a way of promoting equity by reducing costs for learning materials.

K – 12 Section

Gary, A., B. Stokes, M. Malbrough. YAT., and L. Gary, TU. Leadership development in a high school environment.—Young don't just appear. They evolve. The best are guided by opportunity and are supported by a mentor. An example of unexpected opportunity mixed with dedicated adult mentorship is presented as a path for the evolution of young leadership. The combination of opportunity and support documented for presentation began and grew at St. Martin's Episcopal School, located in Metairie. The process of leadership development, presented for discussion as the blending of opportunity and support, is presented as a learning experience for cultivating and growing future young leaders. Three evolving paths of leadership will be presented to unveil the respective challenges to become a respected and successful young leader.

Division of Sciences and Humanities

Busby, A. Nicholls. **Two cultures, one classroom: An examination of a class on art and science.**—In 1959 scientist C. P. Snow argued that the modern industrial era and its 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. And yet, historically speaking, science and art have been intimately linked. This paper examines a new 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, students were exposed to artists and scientists responding to one another's work. Topics in the biological and physical sciences as well as mathematics were addressed.

Chiasson, L., and J. Plaisance. Nicholls. **A comparison of levels of burnout in occupational therapists in Louisiana.**—Burnout, according to the abbreviated Maslach Burnout Inventory, is classified into three aspects: emotional exhaustion (EE), depersonalization (DP), and personal accomplishment (PA). It is a prevalent issue that negatively impacts healthcare professionals. This project was meant to determine the most prominent aspect of burnout in Louisiana occupational therapists (OTs) and to identify any correlations between burnout and demographic characteristics. Thirty-six OTs completed a survey consisting of the aMBI and nine additional questions about demographic information. Emotional exhaustion was the most prevalent aspect of burnout. Analysis also determined that burnout was correlated with those OTs who are younger, unmarried, possess a master's degree, and work with young adults (adolescent to adult) and elderly patients. Existing literature regarding burnout and correlations with demographic information is contradictory, indicating that further research is needed to confirm these findings.

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 popular communication. 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 nature of scientific writing. Subjects of readings will be selected from several series of short poems, including "The Diaries of Darwin" and "Molecules Misbehaving," and 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, Golden Meadow was founded by farmers during the great land reclamation enterprise of the turn of the century. Fishermen also found the natural land ridge of the vicinity 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 towns also transitioned from fishing to drilling, Golden Meadow was uniquely founded by farming. This study describes the ecological and 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 a universe of matter as discrete, interacting entities, with which we form strong emotional bonds and ultimately 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 step is inevitably computational, since its primary function is still to feed operands to 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 may mimic the processes 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.

Mireille, M. SUAMC. **The prevalence of obesity in the United States.**— Obesity is a major health issue in the United States which has resulted to numerous diseases, specifically increased risk of certain types of coronary artery disease, type 2 diabetes, stroke, cancer, as well as significant increases in early mortality and economic costs. The estimated annual medical cost of obesity in the United States was $147 billion in 2008 US dollars; the medical cost for people who have obesity was $1,429 higher than those of normal weight. This study will use the Behavioral Risk Factor Surveillance System (BRFSS), a random-digit telephone survey conducted in all states in 2018. The BRFSS uses a multistage cluster design based on random digit dialing to select a representative sample from each state's noninstitutionalized civilian residents aged 18 years or older. Data from each state are pooled to produce nationally representative estimates. The aim of this study is to estimate the prevalence of obesity and use of weight control strategies among US adults in 2018.

Oubre, C. and J. Doucet. Nicholls. **Toward molecular mechanisms for historical Houma Indian curatives.**—In 1941, Frank G. Speck published associations of 73 native plants and their medical folklore as known to the historical Houma Indian tribe 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 medical properties as reported in the folklore. In an era of drug-resistance and high costs of pharmaceutical development, retroactive investigations of historical curatives for their mechanism of action may provide a new avenue of drug discovery. In addition, our findings suggest that the historical Houma conducted meaningful pharmacological evaluations that resulted in functional medical applications derived from environmental resources.

Division of Social Sciences

Akinrinwoye, C., Y. Twumasi, J. Namwamba, and R. Okwemba. SUAMC. **Identification and analysis of factors that have influenced urbanization in fine cities in Nigeria.**—All over the world cities have been observed to grow. Several factors have been found to influence cities population growth. Among them are, rural-urban migration, birth rate and quality of health services etc. Presently, over 50% of the world population reside in urban areas. Cities in Nigeria have also experienced growth in the last several years. The objectives of this study are to examine the dynamics of population change in five cities in Nigeria viz. Lagos, Port Harcout, Kano, Enugu and Maiduguri, and establish common and different drivers in the changes. A study of literature on research work related to this study will be carried out from reliable resources. Demographic and GIS data for the cities will be downloaded from online resources. Analysis of the data will be carried out using statistical and GIS software. From the outcomes of the analysis, common drivers for the changes will be identified.

Bello, A., F. Ayeni. SUAMC. T. Dokunmu. CU., and V. Mbarika. SUAMC. **Conflicts and emergencies: Comparing vaccination challenges in North Eastern Nigeria and United States.**—Vaccination recommended in children prevents against infectious diseases. In the US, over 70% individuals accept there is high benefits of vaccination. Most countries have vaccination policies but globally, children vaccination rates are declining. Several factors have been known to affect vaccination, however the increase in 'new war' phenomenon and climate change-prone-disasters, like terrorism, hurricane, tsunami, wild fire has aggravated this. In this context, disaster ravaged communities of northeastern Nigeria and US will be compared to determine the challenges faced by individuals against vaccination and possible solutions. This study will rely on health belief theory and survey research methodology with structured questionnaire, and a sample size of >100 participants from both regions will be evaluated using Chi-square statistical test for trends to compare proportions at a significance level of $p<0.05$. The study will elucidate and compare similar challenges and solutions on how to improve public health during security and environmental challenges.

Bello, A. ESU. A. Williams. SUAMC. M. Akinlade. ESU. F. Ayeni, and V. Mbarika. SUAMC. **Interrogating the impact of modular refinery policy on the sustenance of peace in Niger-Delta region of Nigeria.**—The Niger Delta region of Nigeria has been restive for decades. The violent agitations were reactions to destructive oil explorations in the region. Illegal bunkering was the major source of financing the agitations. However, among the strategies employed by the government to combat criminality arising from the violent agitations, is the modular refinery policy. The potential benefits the policy foreshadow, contributed to the relative peace in the region. This paper examines the peace-building mechanism inherent in the modular refinery policy. The study relies on democratic theory. Phenomenological qualitative research technique was used for data collection and analysis. Unstructured interview was conducted among selected stakeholders, which include government officials, agitators and local dwellers and others. Based on the findings, it was concluded that violent agitation is a reaction to bad governance and that people-centered-policy-oriented governance could reduce incidences of such violent outings.

Chirewa, R., F. Ayeni, V. Mbarika, and G. Fagbeyiro. SUAMC. **Financial literacy and savings culture among African Americans: A critical review.**—is a study of factors affecting savings culture and financial literacy among African Americans in the USA. According to several studies, African Americans consistently underperform other demographic groups in terms of investment and savings. According to literature, quite a number of reasons have contributed to this, this ranges from poor income levels to a poor savings and spending culture. The lack of investment and saving from African Americans ties to a complicated web of logistical and cultural factors and isn't simply a matter of poor choices. According to Latinum Network, although whites comprise of just 63 percent of the American population, more than 79 percent of the nation's financial advisors are white. Lack of racial diversity within the industry might make it harder for professionals to actively educate and engage minority groups. The Overarching research question was "What contributes to poor savings culture and financial literacy levels among African Americans?" This thesis seeks to investigate the factors affecting and influencing the African American savings culture and financial literacy levels. It also proposes a community-based framework to explain predictors of financial literacy, financial education programs and savings culture targeted towards informed decisions among African Americans. The study utilized a content based systematic review. Findings from this work could improve savings culture and financial literacy among African-Americans.

De Silva, S. TU. J. Diaz. LSUHSC-NO. L. Gray. TU. **Lingering health impact of the 2004 Indian Ocean Tsunami.**—In December of 2004, a mega-earthquake erupted in the Indian Ocean, triggering a massive tsunami. The first of several 100-foot waves hit the shoreline of Indonesia, followed by strikes to Sri Lanka, India, Maldives, and Thailand. Affected countries sustained massive damage, especially to vital public health and medical care facilities. Initially, the tsunami killed at least 225,000 people in just a few hours. While countries lining the Indian Ocean grappled with the enormous loss of life, they also braced for the impending health care threats the tsunami would ultimately unleash. The post-tsunami, lingering health care threats that arose in Sri Lanka, India, and Thailand, will be delineated and presented for discussion. The lingering challenges are: disease outbreaks, loss of resources, and mental health crisis. Different degrees of preparedness, foreign aid, and pre-existing infrastructure resulted in varying degrees of success in addressing smoldering and latent health threats.

Gronemeyer, J., and L. Lewis. LU-NO. **Understanding affective cognition through evolutionary developmental neuroscience.**—The increasingly interdisciplinary nature of contemporary behavioral research has blurred traditional distinctions between cognitive and socio-emotional process and between the individual psychological and evolutionary group levels of analysis. Exploring connections between human culture and socio-emotional development requires integrating ontogenetic and phylogenetic approaches to human social cognition. We propose a unifying affective neuroscience framework that accounts for individual and cultural processes within a Jamesian theory of sociocultural evolution by which human culture is a collective product of environmentally conditioned representational (re)descriptions of the basic physiological states of its transmitter-recipients. Such a view allows for a new perspective on such as why particular ideas, schemas, beliefs, and other forms of mental representations spread, how cultural selection pressures encourage adaptive mental structure, and which fundamental component processes best account for humans' individual and shared cognitive representations.

Njie, S. SUAMC. **Demystifying the essence of technological innovations and artificial intelligent machines for the 21st-century workers.**—Current statistics by Brookings institution as of 2018 revealed an illustration of 1,500 senior business leaders in the United States in 2017 were asked about artificial intelligence, only 17% were conversant. The growth of AI has allowed innovation in supporting job seekers and impending changes in the workforce. Scholars also attest to the opinion that technological innovations in AI have largely improved the quality of humans and their living standards. However, a group of scholars holds contrary views to this. Experts also anticipate people without unique skills are at risk of losing their jobs to robots. These approaching changes will have significant repercussions. While adopting the decision theory combined with the heuristic techniques, this paper adopts Creswell's mix research methods for analyzing data from unstructured and focus group discussions, with the view of specifically identifying how recent technological innovations in AI research have enhanced the quality of the 21st-century workers.

Pacquette, A. GSU. **Should African Americans register to be organ donors?**—The goal of this research project is to assess the general opinions of the Grambling State University students on the organ donor experience. It has come to the attention of the author, that African Americans generally do not trust the health care system enough to publicly be registered as organ donors. The aim of this study is to identify why this is and also to identify proper methods for improving the organ donor statistics in favor of the minority community. The author, being a foreign student of African descent, possesses an interesting and valuable lens for the introspection of this matter. A survey was developed and distributed without bias to students on the GSU campus. In a span of 1 week, 70 responses were collected. The analysis of these responses showed positive connections between personal experience with organ donation and the willingness to donate.

Sobotie, D. SUAMC. **Barriers to diabetes self-management among African Americans.**—Type 2 diabetes is considered a public health problem in the United States, especially among African Americans. Current estimates suggest that almost 50% of patients with diabetes do not achieve and sustain the recommended target of <7.0% for glycated hemoglobin (AIC) and only 14% are at target for co-morbidities, such as high blood pressure and high-density lipoprotein cholesterol. These statistics are worrisome, especially among the African American population. Despite significant advances in diagnosis and treatment, the prevalence of barriers to self-management raises significant concerns for managing the disease. This study identifies barriers to diabetes self-management among African Americans and develops interventions to improve the quality of type 2 diabetes care. The sample population is African Americans residents in New Orleans, Kenner, and Metairie. Data will be collected through a structured questionnaire administered to African American households with patients with type 2 diabetes obtained from the Louisiana State Department of Health.

Yehya, R. SUAMC. **Why the United States lags behind many countries in mathematics, science and reading, and what could be done about it.**—On average, the United States pays on education too much more per capita than any country. Still, the performance of 15-year-old American students in reading, mathematics, and science literacies is lower than that of many countries. According to the 2018 results of the Program for International Student Assessment (PISA), the U.S. average score in reading literacy was lower than those of eight countries. In mathematics literacy, the U.S. average score was lower than that of the Organization for Economic

Cooperation and Development (OECD). In science literacy, the U.S. average score was lower than those of 11 countries. The purpose of this paper is to examine the possible reasons or causes for why the United States lags behind many countries in those areas, and to discuss possible remedies that could be performed at the national, state, local and individual levels.

Topical Section:
Cyber Security and Information Assurance

Johnson, J., and P. Sreekumari. GSU. **Analysis of cyber attack techniques to ordinary users.**—The rapid increase of Internet usage and smart technologies creates new attack techniques for cyber-crime to ordinary users and organizations. While many consumers are enjoying their new electronic gifts and technologies, many may not know the alarming rate of certain techniques hackers used to hack their devices. In this research, we analyze different cyber-attack techniques used by the hackers to penetrate into computer systems and mobile phones for destroying, changing or stealing personal information from ordinary users. Based on the results of the analysis, we present security countermeasures in order to ensure the confidentiality, integrity and availability of user's data.

Zubari, C., and P. Sreekumari. GSU. **Biometric privacy laws: Identifying the common features.**—In today's world, the need for security becomes more and more important. Biometrics, the measurement and analysis of a biological feature and one of the latest trends in Cybersecurity. Biometric technologies are advancing at a fast rate. As with most any new technology, laws governing this technology are being developed as quickly as the technology. However, at least four states have already enacted privacy laws related to biometric technology: Illinois, Texas, Washington and California. Other states are considering similar legislation. This project presents the biometric privacy laws in different states and identifies the areas in which existing laws share common features or requirements.

Acknowledgement