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Abstracts of Presentations

2018 Annual Meeting

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

AFRL	Air Force Research Lab
BU	Baker University
CPMC	Calcasieu Parish Mosquito Control
CSG	Crocodile Specialist Group
CU	Covenant University
FCC	Fresno City College
G-PZ	Gladys-Porter Zoo
GSU	Grambling State University
IC	Imperial College
ICTU	ICT University
LSU-A	Louisiana State University, Alexandria
LSU-BR	Louisiana State University, Baton Rouge
LTU	Louisiana Tech University
LU-NO	Loyola University, New Orleans
MSU	McNeese State University
NSU	Nicholls State University
NWSU	Northwestern State University
SLU	Southeastern Louisiana University
SLU-MSUB	Southeastern Louisiana University Math Science Upward Bound
SUAMC	Southern University and A&M College
TU	Tulane University
TLPZ	Tampa's Lowry Park Zoo
UD	University of Dayton
ULL	University of Louisiana, Lafayette
ULM	University of Louisiana, Monroe
UP	University of Poitiers
USDA-FSSRS	USDA Forest Service Southern Research Station
USUHS	Uniformed Services University of the Health Sciences
UTM	Universiti Teknologi Mara
UTMC	University of Texas Medical Center

Division of Agriculture, Forestry, and Wildlife

Boyd, C., C. Fontenot, J. Bossart, and B. Crother. SLU. **Follow-up survey of herpetofauna in a transforming Louisiana wetland: 30 years of reptiles and amphibians in the Manchac Wildlife Management Area.**—The Manchac Wildlife Management Area is a southeastern Louisiana marshland that was logged from forest swamp in the early 1900s. A cursory survey of the herpetofauna was conducted in the late 1980s as the habitat shifted from a low salinity marsh to brackish marsh with expanding areas of open water. A second survey was conducted from 2002 to 2006 that documented the impacts of hurricanes Ivan and Katrina on the herpetofaunal assemblage compared to a remaining healthy swamp. The closure of the Mississippi River Gulf Outlet somewhat remediated the high salinity, yet extreme weather events and altered sediment accretion continue to drive marsh fragmentation. This survey resumes the efforts to document changes in population assemblages of herpetofauna throughout habitat shifts. Since April 2017, changes in salinity and relative species abundance have been documented. Most strikingly, this survey has found a dramatic shift in dominant anuran species over the past decade.

Norris, T., and C. Corbat. LSU-A. **Activity of the Eastern Woodrat as related to weather and moon phases.**—Influence of environmental conditions on activity of the Eastern Woodrat (*Neotoma floridana*) is poorly understood. We placed camera traps at woodrat nests to gauge the influence of temperature, cloud cover, and moon phase on woodrat activity patterns. Photos were used to capture activity per hour, which was then compared to weather variables during that hour. Woodrats were significantly more active on nights with 21-80% moon visibility and significantly less active on nights greater than 81% moon visibility. No relationship was found between activity and temperature. Assessment of cloud cover impacts was inconclusive due to spotty availability of cloud cover data. Research conducted across a broader time frame could potentially reveal a relationship between cloud cover and activity.

Pruss, L., and C. Corbat. LSU-A. **Improving trapping efficiency of the Eastern Woodrat.**—We have been trapping Eastern Woodrats (*Neotoma floridana*) for several years on a study site in central Louisiana using pecans as bait. However, trap success has decreased over time. In an attempt to determine factors that might improve the likelihood of trapping Eastern woodrats, we conducted trials that investigated the effectiveness of two trap types and 6 bait types (pecans, acorns, oranges, apples, vegetables, and peanut butter with rolled oats) in Spring 2017. Tomahawk traps were found to be more effective than Sherman traps in capturing adult woodrats. However, we experienced predation problems using the Tomahawk traps. Oranges and apples were ineffective as bait. Acorns, vegetables, and peanut butter/oats were used proportionately to availability. Pecans captured the most woodrats and were very close to being used more than expected based on availability. Therefore, we found no reason to change bait.

Smith, D., and C. Corbat. LSU-A. **The Eastern Woodrat's response to size of novel objects.**—This study examined whether Eastern Woodrats (*Neotoma floridana*) exhibited a preference for size when selecting novel objects to incorporate in their nests. Thirty-six woodrat nests with an obvious aboveground component were used in the study, which was conducted in Rapides Parish, LA. Eight groups of three tinfoil-wrapped balls (1 large, 1 medium, and 1 small) were placed in a circle at fixed compass directions and 1 m distance from the center of each nest. Each

nest was sampled twice. Balls were checked each morning for a week, and those incorporated into the nest or missing were recorded. A total of 301 balls were incorporated into nests or missing. Large balls were used more than expected, small balls were used less than expected, and medium balls were used proportionate to their availability, whether we considered only balls incorporated into nests or a combination of balls incorporated and missing.

Sullivan, B. USDA-FSSRS. **Louisiana should prepare for the return of southern pine beetle.**—Last century the southern pine beetle (SPB), *Dendroctonus frontalis*, caused massive economic losses to forestry in Louisiana. However, populations of this insect west of the Mississippi decreased to undetectable levels after 2000, and it has ceased to be a concern in these areas. Since 2016, SPB is again being detected in monitoring traps in central Louisiana, and numbers appear to be increasing. Populations are still low and tree mortality due to SPB has been found in only one location; however, the ‘reappearance’ of the insect should be cause for concern and preparation. My talk will discuss the southern pine beetle, its history in Louisiana, evidence of increasing populations, and preparations that owners of pinelands can take to reduce risk of losses.

VanderSchaaf, C. LTU. M. Blaxier. LSU-BR. E. McConnell, J. Adams. LTU. **Determining unthinned shortleaf pine plantation economic rotation ages in the western gulf.**—Shortleaf pine (*Pinus echinata* Mill.) has been planted in the Western Gulf region. The Forest Vegetation Simulator (FVS) is the only widely available comprehensive yield prediction system for these plantations. Predictions from the time-of-planting were obtained for densities of 300, 500, and 700 for site indexes of 50, 60, 70, and 80 feet (base age 25). Based on verification analyses conducted using observed yields from other studies, FVS projections conducted from the time-of-planting are relatively low. Hence, additional verification analyses were made based on reported diameter distribution and associated height data in 10 year old plantations. In general, if plot data are available, allowing FVS to be “calibrated”, much more accurate predictions will be produced. In terms of economics, given current markets, economic rotation ages are generally around 40 to 50 years. For low quality sites (e.g. site index 50 feet) financial returns will likely not be positive.

Division of Biological Sciences

Environmental Sciences Section

Belding, C., and R. Boopathy. NSU. **Presence of antibiotic resistant bacteria and antibiotic resistance genes in the coastal waters of southeast Louisiana.**—One of the major public health problems facing the world today is the occurrence and spread of antibiotic resistant bacteria (ARB) in the environment. The main reservoir for ARB is the aquatic ecosystems. Culture based methods and qualitative molecular techniques were used to screen and determine the presence of antibiotic resistance genes (ARG) and ARB in three coastal waters, namely, Grand Isle, Cocodrie, and Port Fourchon in southeast Louisiana. The bacteria of interest include *Enterobacter cloacae/aerogenes*, *Enterococci* spp. and *E. coli*. The antibiotic resistance genes of interest include *ermB*, *sul1*, *tetA*, *tetX*, *tetW*, and *mecA* that are responsible for resistance to erythromycin, sulfonamide, tetracycline, and methicillin antibiotics. These locations receive water locally as well as from the Mississippi River, which are known to contain heavy load of contaminants, antibiotics, and personal care products. Monthly samples were taken for a six-month period and analyzed for the presence of ARB and ARGs along with carbon, nitrogen, and phosphorous levels in the water samples. The results of demonstrated the prevalence of antibiotic resistance in the coastal waters and this eventually will help to create public awareness of this problem and possibly may lead to preventive measures such as proper treatment of wastewaters and sewage plants. The presence of ARB and ARGs in the coastal waters is a cause for concern because of the potential threat of the spread of ARGs into native bacteria and into fish and wildlife in these waters.

Bird, D., and R. Boopathy. NSU. **Water Quality, Bacteriological Survey, and Observation of Acquired Antibiotic Resistance in Bayou Lafourche, LA.**—Recently, concern has grown around the presence of antibiotic resistant bacteria (ARB) and antibiotic resistance genes (ARG) due to their impacts on public health. While many instances of antibiotic resistance are often associated with healthcare facilities, antibiotics in the environment could greatly exacerbate the potential threats of drug-resistant pathogens. Bayou Lafourche of southeastern Louisiana serves as the raw source of drinking water for 300,000 people in the region. Four sites along the bayou and one site from its' input source on the Mississippi River were monitored for water chemistry, bacteriological analysis, and presence of ARB/ARG. Four bacterial isolates (*Escherichia coli*, *Klebsiella pneumonia*, *Enterobacter*, and *Enterococcus*) were tested for resistance to antibiotics (sulfamethoxazole/trimethoprim, tetracycline, cefoxitin, meropenem, imipenem, and vancomycin) and resistant bacteria were further examined to confirm the presence of antibiotic resistance genes (*Sul1*, *tet(X)*, *IMP*, *KPC*, and *OXA-48*). Results showed consistent presence of ARB and ARGs in this water body.

Brockmann, J., and G. LaFleur. NSU. **Can frog call surveys help us determine the ecological health of a freshwater vs. brackish marsh system?**—Since 2005, our lab has conducted frog call surveys in the Barataria-Terrebonne Estuary with the LA Amphibian Monitoring Program established by the LDWF and USGS. Each year we run three routes at three sites including a typical freshwater area in Choctaw Swamp and two brackish sites along Hwy. 55 in Monetgut

and along Falgout Canal Road. We compared the number of anuran species encountered over the last six years with Choctaw yielding 10.3 +/- 0.5, Falgout Canal yielding 6.8 +/- 1.1 and Montegut yielding 4.4 +/- 1.3. Since the coastal sites are adjacent to coastal restoration projects, these data will allow us to use the number of frog species as an indicator of restoration success. If the marsh becomes more saline, we expect the number of amphibian species to decline, whereas if the marsh becomes fresher, we can expect the number of amphibian species to increase.

Kyle, D., and R. Boopathy. NSU. **Water quality, bacteriological survey, and observation of acquired antibiotic resistance in Bayou Lafourche, LA.**—In recent years, concern has grown around the presence of antibiotic resistant bacteria (ARB) and antibiotic resistance genes (ARG) due to their impacts on public health. While many instances of antibiotic resistance are often associated with healthcare facilities, antibiotics in the environment could greatly exacerbate the potential threats of drug-resistant pathogens. Bayou Lafourche of southeastern Louisiana serves as the raw source of drinking water for 300,000 people in the region. Four sites along the bayou and one site from its' input source on the Mississippi River were monitored for water chemical composition, total and fecal coliform estimates, and presence of ARB/ARG. Water chemical analysis includes pH, dissolved oxygen, organic carbon, nitrite, nitrate, ammonia, sulfate, and phosphate. Total and fecal coliforms were estimated by means of the most probable number method (MPN). Four bacterial isolates (*Escherichia coli*, *Klebsiella pneumonia*, *Enterobacter* sp., and *Enterococcus* sp.) were tested for resistance to antibiotics (sulfamethoxazole/trimethoprim, tetracycline, cefoxitin, meropenem, imipenem, and vancomycin) and resistant bacteria were further examined with PCR to confirm the presence of antibiotic resistance genes (Sul1, tet(A), tet(W), tet(X), IMP, KPC, and OXA-48). Results showed consistent presence of ARB and ARGs in this water body.

Morin, C., J. Adams, G. Holley, A. Keith, P. Jackson, and N. Clay. LTU. **RatSectPro™ as a natural alternative for reducing red imported fire ant feeding and nests.**—The red imported fire ant (*Solenopsis invicta* Buren) is one of the most prevalent and destructive invasive species in the world. RatSectPro™ powder is a new natural alternative pest control option to deter *S. invicta* foraging and to extirpate nests. RatSectPro™ powder was tested in a feeding trial to determine if the treatment prevented foraging at a sucrose phagostimulant compared to a control. RatSectPro™ was further tested in the field on the extirpation of fire ant nests after being covered with the treatment powder. RatSectPro™ decreases foraging ~3-fold in lab trials relative to controls and had a ~95% success in ant nest removal in field trials and nests remained abandoned over the course of the three-week study. These results suggest RatSectPro™ powder is effective as a natural alternative to traditional insecticides for localized ant nest removal and as a deterrent for ant foraging.

Tummala, C., and S. Tewari. LTU. **Developing laboratory-based experimental setups to simulate electro-kinetic fence for salt water intrusion prevention in coastal areas.**—Coastal regions are highly prone to salt water intrusion. Over-pumping of groundwater from wells near the coastline and low rates of ground water recharge can cause salt water intrusion. The use of electro-kinetic fence for controlling salt water intrusion and groundwater protection is an emerging field of study. Electro-kinetic fence is a series of the electrodes inserted in the soil with DC voltage applied across all of them thus creating a barrier the contaminant (salt) transport.

However, the efficacy of the electro-kinetic fence depends on various factors like type of the electrodes used and electrode spacing among other variables. In this presentation, fundamentals of electro-kinetics as applied to prevention of salt water intrusion through porous soil will be discussed. Additionally, laboratory-based experimental setups that are being developed for data collection will be presented and discussed. Design considerations and modeling approach used by various other researchers will also be summarized.

Van Dexter, S., and R. Boopathy. NSU. **Analysis of termite microbiome and degradation of phenol by bacteria isolated from termite gut.**—The subterranean Formosan termite, *Coptotermes formosanus*, is a major insect pest in Louisiana. Termites rely on gut bacteria to fulfill nutritional requirements, but factors affecting the gut bacterial community is not well studied, particularly the effect of a termite colony's natural diet. A study was conducted to examine the termite microbiome and its effect on metabolism of lignocellulosic biomass and their products such as cellobiose, phenol, and acetate. Wild termite colonies were collected from decaying pieces of red maple, tupelo, and oak from the wild in four areas in Louisiana. This study showed that there are more bacteria in termite guts capable of utilizing cellobiose than phenol or acetate. This study also showed that *Acinetobacter tandoii* isolated from termite guts is capable of utilizing phenol as the sole carbon source.

Wallace, E., A. Ferrara, and Q. Fontenot. NSU. **Comparison of finfish community structure between the Atchafalaya River Basin and the upper Barataria Estuary, Louisiana.**—The Atchafalaya River Basin (ARB) experiences an annual floodpulse, but flood protection activities have disconnected the upper Barataria Estuary (UBE) from the Mississippi River. Floodplain inundation of the UBE only occurs with large precipitation events. The difference in hydrology between the two basins may impact habitat availability and could affect the fish community structure. The goal of this project was to compare the fish community structure (relative abundance, diversity, size distribution) between the two basins during a low water period to determine if the altered hydrology in the UBE has affected the fish community structure. Thirty sites in each basin were sampled via electrofishing and MANOVA indicated a difference in the fish community structure between basins. In the UBE, *Amia calva*, *Mugil cephalus*, and *Lepomis macrochirus* were more abundant than in the ARB. In the ARB, *Lepisosteus oculatus*, *Ictiobus cyprinellus*, and *L. megalotis* were more abundant than in the UBE.

Microbiology Section

Baudoin, N., S. Drope, J. Juarez, K. Norman, and C. Lyles. NWSU. **The degradation of acetaminophen under aerobic conditions.**—Acetaminophen, also known as paracetamol, is a medication widely used in the United States to treat pain and fever; however, accumulation of this compound in surface water, treated wastewater, and treated drinking water has raised growing concerns on the possible toxic effects in the environment. Enrichment cultures were established using a defined basal medium amended with PIPES buffer (pH=7.3) and 500 μ M of acetaminophen. The medium was inoculated with 100 μ l of wastewater sludge from a commercial treatment system. Acetaminophen degradation was measured using liquid chromatography. After a four-day lag phase, the acetaminophen degraded at a rate of 82.735

μM/day during exponential growth. Additionally, agar plates were made from the same basal medium described above and spread for isolation using 100 μl of inoculum from the enrichment cultures. The isolates were identified by MALDI-TOF as *Rhodococcus equi* (Log score=2.060) and *Pseudomonas nitroreducens* (Log score=1.926). Further GCMS analysis will help elucidate potential intermediate compounds.

Cutrer, C., A. Simmons, J. Bringedahl, L. Laborde, and C. Lyles. NWSU. **Identifying *Leptospira interrogans* in feral hog populations using MALDI-TOF.**—*Leptospira interrogans* is a zoonotic pathogen that causes leptospirosis. The typical route of infection is exposure to contaminated water. Feral hogs (*Sus scrofa*) carry this microorganism at a greater bacteria load than of humans, and because of the hogs' reproductive prowess their population is beginning to encroach into city water reservoirs creating a human health concern. Blood has been opportunistically collected from 23 feral hogs. Each sample was setup in duplicate and enriched using Fletcher's medium modified with 0.05% hemin. Samples were analyzed using the MALDI-TOF, matrix assisted laser desorption ionization- time of flight mass spectrometer. Currently, we are working on constructing a novel database of *Leptospira* sp. for rapid phylogenetic identification.

Davis, A., Z. Eswani, T. Souza da Costa, and C. Struchtemeyer. MSU. **Monitoring the effects of sunlight on aerobic treatment unit (ATU) effluent quality.**—Aerobic treatment units (ATUs) are used to treat wastewater in rural areas and often discharge effluent into ditches that rely on sunlight for disinfection. Few studies have examined if ATU effluent is disinfected by sunlight. In this study, the disinfection capabilities of sunlight were evaluated by quantifying heterotrophs, fecal coliforms, and *E. coli* in 1) ATU effluent incubated in the presence/absence of sunlight and 2) Ditches that receive ATU effluent. Sunlight did not disinfect any of the ATU effluent that was collected. This observation was further supported by the fact that ditch samples contained high concentrations of heterotrophs (2.4×10^5 - 1.1×10^{10} MPN/100ml), fecal coliforms (1.3×10^4 - $>1.5 \times 10^6$ CFU/100 ml), and in some cases *E. coli* (0 - 8.4×10^4 CFU/100 ml). These results indicate that sunlight does not disinfect ATU effluent and that additional disinfection steps are needed to ensure these systems function properly.

Grabert, R., and R. Boopathy. NSU. **Effect of antibiotics on bacteria in carbon and nitrogen removal from a sewage treatment plant.**—Antibiotics and their overuse has become a huge problem and their future use is under much scrutiny. Antibiotics, antibiotic resistance genes, and antibiotic resistant bacteria have been reported in sewage treatment plants before, and ARGs and ARBs have even been found in the local sewage treatment plant in Thibodaux. These antibiotics and ARGs may be influencing the bacteria that carry out nitrogen assimilation to remove nitrogen as well as removal of carbon. This study was conducted to study the effect of tetracycline on nitrogen and carbon removal in sewage. Samples of sewage were collected from the aerobic ponds and from the anaerobic digester sludge of the Thibodaux Sewage Treatment Plant. Bacteria were isolated from these samples and their ability to assimilate ammonia and nitrate at different concentrations of tetracycline were measured along with carbon removal. Bacterial isolates will be genetically analyzed to determine if they carry any tetracycline-resistant genes.

Jett, H., and C. Doffitt. NWSU. **Proposal for a survey of *Dirofilaria immitis* prevalence and resistance to preventative medications in Natchitoches, Louisiana, USA.**—Heartworms, *Dirofilaria immitis*, are nematode parasites that cause cardiovascular disease in dogs. Mosquito vectors transmit the worms to their definitive hosts. Heartworms are endemic to areas with tropical and subtropical climates where mosquitoes are common, including the Mississippi River Basin. We aim to determine mosquito species in Natchitoches, LA and their heartworm infection rates. The ultimate goal is to determine if the heartworms are resistant to preventative medications. Collections of mosquitoes will be taken from Natchitoches using downdraft UV mosquito traps (John W. Hock Company - Model 912), which will be left out overnight. After collection, mosquitoes will be transported to the Northwestern State University parasitology laboratory and frozen at -4 degrees Celsius until morphological identification is completed. *Dirofilaria* infection rates will be determined using PCR, and a bioassay that measures juvenile heartworm locomotion will be used to determine resistance to heartworm preventatives.

Jones, C., and P. Hindmarsh. LTU. **The use of reactive oxygen sensitive green fluorescent protein to determine reactive oxygen species production in *E. coli* and *Candida albicans*.**—*Candida albicans* is an opportunistic fungal pathogen commonly found in the mucosal tissue of the human body. It is currently treated with broad-spectrum anti-fungals, but anti-fungal resistant strains are emerging. Reactive oxygen species (ROS) are produced as a stress response by the cell to antifungal drugs, making it possible to test the effectiveness of drug therapies. A reactive oxygen sensitive yeast enhanced GFP (royGFP), with mutations at S147 and Q204 where the amino acids are replaced with cysteine (S147C and Q204C), make it possible to measure the production of ROS by the change in fluorescent excitation. In the presence of ROS agents we have observed changes in excitation confirming the functionality of our royGFP construct. In testing, *E. coli* had high levels of expression of the yeast codon optimized royGFP. We are currently working to optimize the ROS experiments in *C. albicans* and further develop ROS experiments in *E. coli*.

Lange, M., Z. Gauthier, U. Neketan, S. Allen, and C. Doffitt. NWSU. **Presence of helminthic parasites in northwestern Louisiana.**—Trematodes are parasitic flatworms that can negatively affect ecologically and economically important hosts, including piscivorous birds, aquatic snails, and freshwater fish. Potential piscine hosts were collected from three ponds at the Natchitoches National Fish Hatchery in March 2017. Channel catfish were collected and examined for metacercariae. Muscles, eyes, gills, and internal organs were examined and no metacercariae were detected in the 12 catfish (0%). However, two of the 12 catfish (16.6%) were infected with a myxozoan parasite on the gill tissue. In September 2017, largemouth bass were collected from Shad Lake, near Larto, LA. All 10 bass (100%) examined were infected with helminthic parasites, including juvenile and adult trematodes and nematodes. All parasites were kept in 70% ethanol until stained with acetocarmine for identification. Identification of these species will contribute to the knowledge of trematodes potentially affecting fish populations in Louisiana.

Rutz, R., T. Cavenah, and C. Struchtemeyer. MSU. **Monitoring the potential environmental impacts of aerobic sewer systems.**—Aerobic treatment units (ATUs) are used to treat wastewater in rural areas and often discharge non-disinfected effluent into ditches that empty into major water bodies. Very little is known about the effectiveness/environmental impacts of ATUs. In this study *E. coli*, fecal coliforms, and heterotrophs were quantified in ATU effluent and

ditches impacted by ATU effluent. The numbers of *E. coli*, fecal coliforms, and heterotrophs in effluent ranged from BDL - 7.3×10^7 CFU/100 ml, 1.1×10^5 - 1.4×10^8 CFU/100 ml, and 1.1×10^5 - 1.1×10^9 MPN/100 ml, respectively. The numbers of *E. coli*, fecal coliforms, and heterotrophs in ditches impacted by ATU effluent ranged from BDL - 8.35×10^4 CFU/100 ml, 1.3×10^4 - $>1.5 \times 10^6$ CFU/100 ml, and 2.1×10^6 - 1.1×10^9 MPN/100 ml, respectively. This study shows that ATUs often contain and release large numbers of *E. coli*, fecal coliforms, and heterotrophs into the environment.

Scull, C., and A. Corbin. NSU. **Bacteriophage capable of lysing drug resistant *Klebsiella pneumoniae* isolated from external nares.**—Multi-drug resistant bacteria have become a global health crisis both environmentally and in health care facilities. Antibiotic resistant bacteria (ARBs) evolved through excessive exposure to antibiotics and through the development of antibiotic resistant genes (ARGs). Transient colonization of the external nares with gram negative rods has been reported. Bacteriophages have become a new prospective resolution to the growing number of pathogens. Cultures of the external nares of thirty microbiology students were tested against two isolated strains of *Klebsiella pneumoniae* carbapenemase (KPC) for lytic bacteriophage. Student's samples were separated into three groups based on health care exposure: health care workers, family in health care, and non-health care associated. Bacteriophages were found to be capable of lysing each of the *Klebsiella pneumoniae* strains, ARLG 1332 and ATCC BAA 1705. Four samples demonstrated lytic bacteriophage. The recovery of lytic bacteriophage was highest with KPC ARLG 1332 in the non-health care associated group.

Soileau III, L. MSU. C. Gomez. USUHS. W. Dees. MSU. and A. Jerse. USUHS. **Improving a mouse model of upper genital tract *Neisseria gonorrhoeae* infection by supplementing host restriction factor human transferrin (hTF).**—The increasing antimicrobial resistance of *Neisseria gonorrhoeae* (Gc) raises a growing public health concern. This sexually transmittable pathogen often ascends from the lower genital tract (LGT) to the upper genital tract (UGT) causing pelvic inflammatory disease (PID) and infertility. Ultimately, the development of new drugs for gonorrhea treatment is necessary but requires further knowledge of host restriction factors such as human transferrin (hTF). Accessible iron sources are not abundant to Gc in host UGT but Gc can use hTF as an iron source. Here we characterized UGT Gc infections in hTF-treated and untreated mice. Bacterial culture of UGT and LGT was performed. Histopathology of UGT and immunological studies of blood serum via enzyme-linked immunosorbent assays were conducted. Results showed a greater number of UGT culture positive mice and associated post-infection immune responses (e.g. UGT inflammation) that support the use of hTF supplemented mice as a model of Gc PID.

Woods, D., S. Browning, A. Corbin, and R. Nathaniel. NSU. **A survey of antibiotic resistance and characterization of the *mecA* gene of *Staphylococcus aureus* in a student population.**—*Staphylococcus aureus* is an increasingly problematic bacterium in the world today. Methicillin resistant *Staphylococcus aureus* (MRSA) is a public health issue. This study tested 46 students at Nicholls State University for the presence of *Staphylococcus aureus* by traditional bacteriological culture and also tested the profiles of antibiotic resistance. Thirteen nasal swabs tested positive for *Staphylococcus aureus* (28%), in addition there were 5 (10.8%) were MRSA, and 3 (6.5%) showed erythromycin-clindamycin inducible resistance. The thirteen positive

samples proved to show a varied spectrum of antibiotic resistance to the antibiotics tested. The MRSA isolates were typed by PCR in order to characterize the *mecA* and Panton-Valentine leucocidin (PVL) gene. This study shows the prevalence of MRSA in a small sample size of college students and could help understand the risk factors associated with the spread of this organism.

Molecular and Biomedical Biology Section

Ashworth, K., V. Stewart, and W. Dees. MSU. **A five year review of Middle East Respiratory Syndrome Coronavirus (MERS-CoV) outbreaks.**—Five years ago, Middle East Respiratory Syndrome (MERS) emerged as a significant human viral respiratory illness on the Arabian Peninsula. Since 2012, the World Health Organization (WHO) has reported MERS outbreaks on its website (www.who.int) via Disease Outbreak News (DON). Using DON and other sources, we reviewed MERS outbreak occurrences throughout the world. Each disease outbreak was categorized by country, continent, region, and biome. A review of the literature indicated that one of the first outbreaks occurred in Jordan. Outbreaks which did not occur on the Arabian Peninsula were due mainly from individuals contracting MERS-CoV while traveling from/visiting this area. The majority of MERS cases mainly occurred in desert temperate climates. Since MERS-CoV transmission is not fully understood, further information regarding human-human/animal-human interactions in specific biome units may aid in preventing and controlling the spread of this disease.

Ashworth, K., V. Stewart, and W. Dees. MSU. **A review of influenza outbreaks worldwide since 1996.**—Since 1996 researchers with the World Health Organization (WHO) have reported information on their website about influenza (www.who.int). Using Disease Outbreak News (DON), we reviewed influenza A outbreak occurrences, and categorized each disease by country, continent, virus subtype and anthropogenic biome. Influenza A strains reported by DON include: avian and swine influenza subtypes. The four most reported strains were H1N1, H3N2, H5N1 and H7N9. Swine influenza H1N1 was reported worldwide and declared a pandemic in 2009. Avian influenza subtypes were reported from regions in Asia and occurred in rural settlements/urban-rural fringes. Two timelines were constructed to show the progression of influenza A viruses H5N1 and H7N9. An anthropogenic biome map was used to show disease transmission trends. Understanding influenza A transmission in relation to anthropogenic biomes may provide further information for controlling and preventing the spread of disease outbreaks.

Ashworth, K., V. Stewart, and W. Dees. MSU. **A review of select major viral disease outbreaks worldwide since 1996.**—Since 1996 researchers with the World Health Organization (WHO) have reported information on their website about viral diseases (www.who.int). Using Disease Outbreak News (DON), we reviewed information about select viral diseases, and categorized each disease outbreak by country, continent, region, and biome. Three timelines were constructed to show disease outbreak occurrence over a duration of time. The five most prevalent diseases reported by DON include: Ebola, Lassa fever, Marburg, polio, and severe acute respiratory syndrome (SARS). The majority of the five diseases occurred in tropical and temperate regions in Africa and Asia. Ebola, Lassa fever, and Marburg occurred mainly in tropical humid regions; whereas, polio mainly occurred in tropical semi-arid regions and desert

(tropical) regions. Severe acute respiratory syndrome mainly occurred in temperate humid regions. Understanding viral disease transmission in relation to biomes may provide further information for controlling and preventing the spread of disease outbreaks.

Barnett, H. LTU. **Investigating the role of extracellular cues of PEGDMA hydrogel biomaterials on stem cell fate.**—Our research focuses on the design of an innovative and adaptable hydrogel biomaterial to advance the clinical potential of cell-based regenerative therapies to create a more reproducible, efficient, and tailorable scaffold. Poly (ethylene glycol) dimethacrylate (PEGDMA) hydrogels were synthesized to mimic the natural extracellular matrix of different tissues by varying matrix elasticity. Human bone marrow-derived mesenchymal stem cells were seeded on the PEGDMA hydrogel scaffolds and cellular properties were analyzed under standard culture conditions and chemically induced differentiation. Differences in cell proliferation and differentiation were observed between the elasticities studied, demonstrating an impact of physical environment on cell behavior. Our project will continue to study the effects of biomaterial-cell interactions by varying surface chemistry of the hydrogels, then observing the effect on cell state. The data obtained from these studies impacts the scientific community by increasing the knowledge of cell-microenvironment interaction, while creating a platform for future cell-scaffold interaction experiments.

Bencosme, E., and L. Porter. NWSU. **Comparative analysis of the silencing effects of putative immune genes in *A. americanum* during bacterial infection.**—*Amblyomma americanum* is a health burden for both humans and animals in the Southern part of the United States. Despite decades of research on these ticks and their transmission of pathogens, little is known about their immune response mechanisms after bacterial infection. In this study, we mined Illumina RNA-sequencing data from LPS-injected and non-injected ticks. Using this data and the GenBank database, we identified a list of putative infection-responsive genes for PCR-validation of the in silico data. To functionally validate the role of two of the genes, Alpha 2-macroglobulin and Lipocalin, in the tick immune response, we conducted RNAi silencing experiments in adult *A. americanum*. We prepared expression constructs for dsRNA synthesis using the *E. coli* system. Tick response to challenge with and without dsRNA-mediated depletion of putative immune system genes is discussed.

Branch, J. SEL-MSUB. **Molecular dynamics simulation of spider toxin.**—This experiment examined the stability of funnel web spider venom in water at varying dynamics conditions. The venom is a neurotoxin that causes paralysis and will eventually lead to death, and has been used in medicines to fight cancer and to find cation channels. Using NVT molecular dynamics (MD) simulation, I ran the toxin through energy minimization to lower the potential energy to the proper levels. I made sure that the temperature and potential energy could stay stable in different conditions. Then I maintained constant pressure to the system by using NPT MD simulation. I measured pressure, temperature, potential energy, density, and volume. During the analysis stage, the radius of gyration and the RMSD were calculated and were found to maintain constant average values. The stability of the toxin in water means that it can be mixed in water-based solution which is a very important property for its medicinal applications.

Cambre, J., A. Bryan, and H. Logan. LTU. **The role of Notch 3 in regulation of adipose derived stem cell state.**—Adipose-derived stem cells (ASCs) are multipotent adult stem cells capable of self-renewing. However, the mechanism of adipogenesis remains poorly understood

and can be better characterized through inducing differentiation of ASCs and investigating the role of individual factors and pathways. The Notch signaling pathway is involved in cell proliferation, development, and differentiation, making it a target for investigation. We have successfully performed knockdown of Notch3 with Notch3-targeted siRNA and observed increased adipogenesis through oil red O staining and increased levels of gene expression of adipocyte markers ppar γ and srebp-1c. However, we do not see significant effects of Notch3 knockdown on cell viability and proliferation, suggesting the role is confined to differentiation. In the future, we will perform co-immunoprecipitations to investigate protein-protein interactions between Notch3 and adipocyte transcription factors. With the progress of our research, we will have a better understanding of cell fate control during tissue regeneration and differentiation.

Dantzler, M. SEL-MSUB. **Does D1S6, D2S6, or cysteine play a role in slow inactivation of voltage-gated sodium channels?**—The purpose of this study was to study the effect(s) of cysteine substitution on the gating kinetics of the mutant N440C in the human skeletal muscle voltage-gated Na⁺ channel hNav1.4. We used site-directed mutagenesis to substitute cysteine in place of the native asparagine (N) at position N440 in segment 6 of domain 1 (D1-S6) to produce the mutant N440C. The mutant was expressed in cultured human embryonic kidney (HEK) cells, and Na⁺ currents were recorded under voltage clamp using the single electrode patch clamp technique. I found that the fast gating kinetics in the mutant N440C were not different compared with wild-type hNav1.4. However, I found that slow inactivation was greatly enhanced in N440C compared with wild type hNav1.4. I conclude that the 440 residue in D1-S6 of hNav1.4 channels plays a significant role in the kinetics of slow inactivation, but is not critically important for normal fast gating kinetics.

Decuir, F. and B. Hollins. LTU. **Novel sleep deprivation method using vibration table.**—This project aims to work with a novel SD method which can be used in sleep studies. Sprague Dawley rats of 3-6 month old were implanted with EEG and EMG for sleep recording. There was a recovery time of 1 week to allow for healing before experiments were able to begin. A special vibrating table was constructed in order to apply a stimulus to the rats. The EEG and EMG electrode is connected to a specially designed LabView program which can detect whether the rat has fallen asleep. The program is also designed to be user friendly in that a researcher does not need a background in coding to use. A vibration stimulus is applied by the table to rat until the program has detected that the rat is awake. Twelve and 24 hour experiments were performed and analyzed whether the rats reached an acclimation time and if sleep deprivation was achieved.

Dorsey, W., D. Nelson, C. Taylor, and A. Wyke. GSU. **p38/MAPK modulation of TNF- α and ATF-2 gene expression in TIB-73 mouse hepatocytes.**—The mitogen-activated protein kinase (MAPK) pathway is a key signaling transduction cascade that is provoked by inflammatory cytokines, environmental stress, and mitogen stimulation. When mutations in genes occur, their products interact with MAPK biomolecules and cause cancer. Previous findings from our laboratory demonstrated that pentachlorophenol (PCP), an organochlorine pesticide, has the ability to upregulate biomolecules in three MAPK pathways: ERK, JNK, and p38. We have also published that high levels of PCP have the ability to cause growth arrest and DNA damage (GADD153), cell cycle arrest as a consequence of DNA damage (p53), and apoptosis (caspase 3) in human liver carcinoma cells. Tumor necrosis factor-alpha (TNF- α) and activating transcription factor (ATF-2) are gene proteins that contribute to the inflammatory response and

are highly involved in various cancers. TNF- α has been strongly associated with tumor metastases and cancer. In this study, we hypothesized that the transcriptional activity of TNF- α and ATF-2 is modulated through p38/MAPK activity. We assessed ATF-2, phospho-p38/MAPK, and TNF- α in PCP-treated hepatocytes at concentrations of 0 μ g PCP/mL, 4 μ g PCP/mL, 8 μ g PCP/mL, and 16 μ g PCP/mL following 48 hr of exposure. Employing the Western immunoblotting technique, a dose-dependent upregulation of the 54 kDa ATF-2, 38 kDa phospho-p38, and 25 kDa TNF- α was observed in 4 μ g PCP/mL, 8 μ g PCP/mL, and 16 μ g PCP/mL. We also observed that as the overexpression of phospho-p38/MAPK increased, the transcriptional activity of ATF-2 and TNF- α was enhanced. These data suggest that p38/MAPK activity is a fundamental requirement for optimal upregulation of ATF-2 and TNF- α .

Dorsey, W., and A. Wyke, GSU. **Pentachlorophenol orchestration of NF- κ B, and p38/MAPK and the inflammatory response in human A549 airway cells and TIB-73 mouse hepatocytes.**—Pentachlorophenol (PCP) is a manufactured organochlorine herbicide and prevalent wood preservative in the United States (U.S.). The biocidal action of PCP protects timber from fungal rot and wood-boring insects, thus extending the life of wood products. PCP is one of the most heavily used organochlorine pesticides in the U.S. and has been established as a probable human Group B2-carcinogen by the U.S. Environmental Protection Agency. Noticeable interest is drawn to PCP for its ability to induce systemic toxicity and carcinogenesis. Previous findings from our laboratory demonstrated that PCP has the ability to upregulate phospho-p38/MAPK in TIB-73 mouse hepatocytes. Deregulated proteins in the p38 MAPK pathway have been seen in about 40% of human cancers while the actual signaling is closely linked to the inflammatory response. In this study, we hypothesized that PCP would induce an inflammatory response in human A549 cells and TIB-73 mouse hepatocytes through the upregulation of phospho-p38. Upon 48 hr of exposure, we observed the upregulation of the NF- κ B transcription factor in PCP-treated- A549 airway cells and TIB-73 mouse hepatocytes. A dose-dependent degradation of the I κ B α inhibitor was demonstrated in PCP-treated TIB-73 mouse hepatocytes. This degradation event frees the NF- κ B transcription factor to translocate to the nucleus where it induces the transcription of proinflammatory mediators. The proinflammatory cytokine (IL-1 β) and chemokine (MCP-1) in PCP-treated TIB-73 mouse hepatocytes were observed in a dose dependent manner at concentrations of 0 μ g PCP/mL, 4 μ g PCP/mL, and 8 μ g PCP/mL. A dose dependent upregulation was also observed in A549 cells with the chemokine, CCL2, and cytokines IL-1 β , IL-6, and IL-8 at concentrations of 1 μ M PCP, 5 μ M PCP, and 10 μ M PCP. These findings demonstrate that PCP has the ability to induce inflammatory responses in human A549 cells and TIB-73 mouse hepatocytes by soliciting key targets that facilitate the release of cytokines and chemokines.

Edavettal, J. LTU. **Characterizing hippocampal oxidative stress in sleep restriction.**—Sleep restriction is a well-documented, unhealthy burden that has a myriad of detrimental neurocognitive consequences. Documenting and analyzing neuro-biochemical changes that result from a lack of sleep may lead to negating the impediment caused by sleep restriction and discovery of biomarkers, aiding in the progression of available treatment for various neurodegenerative diseases. Specifically, this research aims to assess sleep-deprivation related oxidative stress by quantifying relative carbonylation in rat hippocampal proteins and identifying the distinct proteins that can become oxidized. To quantify and compare the abundance of carbonylated proteins, the Smith assay and Brady's DNPH test is used, while SDS PAGE,

ELIZA, and mass spectrometry facilitate the identification of proteins. It is crucial to present data comparing rats that have been sleep deprived and those who have not been. Correlating quantitative data from the Smith assay with data representing relative carbonylation will show a depiction of experienced oxidative stress, and mass spectrometry performed on the different proteins captured from the hippocampus of sleep-deprived rats will add to a proteome that indicates mental impairment. Ultimately this research will conclude by exposing some of the differences between a healthy rat brain and one that has experienced sleep deprivation, by portraying a comparison of carbonylated proteins and determining the particular proteins that become oxidized.

Eddy, R., I. Pursell, H. Barnett, A. Whitehead, M. Lieu, and M. Caldorera-Moore. LTU. **Optimization and characterization of the osteogenic differentiation of human mesenchymal stem cells on tailorable hydrogel scaffolds.**—This project seeks to determine the effects of scaffold elasticity on the osteogenic differentiation capabilities of human adipose-derived mesenchymal stem cells (hASCs) using tailorable polymer hydrogels. hASCs provide a clinically-relevant and abundant cell source from which to develop osteogenic tissue patches for clinical use in autologous tissue grafting. hASC growth and differentiation was first optimized to determine ideal cell culture conditions and characterization techniques, including immunofluorescent (IF) staining of osteogenic marker RUNX2. To further investigate interactions between osteogenesis and hydrogel scaffolding, this project now attempts the phenotypic rescue of osteogenesis in NOTCH3 knockdown hASCs by seeding these cells on hydrogels of osteogenic tissue-mimicking stiffness, as preliminary studies have suggested that NOTCH3 may play a critical role in the regulation of stem cell state and differentiation. These initial studies provide the foundation for the overall goal of synthesizing functional osteogenic tissue to repair bone damage and disease.

Francis, T., R. Xavier, and H. Leung. GSU. **Study of the functional domains and their organizations of ten proteins in six vertebrates.**—The functions of a protein are characterized by the functional domains and their organization in a protein. We studied ten proteins found in six vertebrates (three mammals, one bird, one amphibian and a fish) to see if there are major differences in the functional domains and their organization. Our preliminary study revealed that six proteins showed no major changes, two with minor changes, and two with major changes in the amino acid sequence identities. However, we found only minor changes in the functional domains of these proteins.

Hale, A., and M. Merchant. MSU. **Characterizing the autophagy pathway in the American alligator.**—American alligators fast in response to cooler temperatures, which is accomplished by decreasing metabolism and body temperature depression. Nutrient scarcity, at the cellular or organismal level, may promote autophagy. Autophagy is a well-conserved sub-cellular catabolic process that cells activate to maintain energy homeostasis during periods of stress. It is our hypothesis that alligators upregulate the autophagy pathway during their winter anorexia. We have used published genomic data to perform bioinformatic analysis of the autophagy pathway and adapted molecular methods to this non-traditional animal model. We have compared protein sequences, domain conservation, and regulatory data to the human orthologues. The autophagy pathway is highly conserved, and alligator amino acid sequences exhibit high identity with human homologues. Several autophagy proteins have been detected in multiple tissue types by

western blot analysis. As we move forward, we plan to utilize these detectable proteins to identify differences among tissues and seasonally driven regulatory changes.

Jones, S., and P. Kim. GSU. **Drosophila model of obesity and endoplasmic reticulum stress.**—Understanding the underlying mechanisms that cause disruption in the endoplasmic reticulum (ER) thus leading to ER stress remains elusive. In humans, insulin resistance and inflammation are thought to be induced by ER stress because of obesity. To study the relationship between obesity and ER stress, *Drosophila melanogaster* was placed on various concentrations of high sugar diets, both during their larval stage and adult stage of development to induce obesity. The genes which are involved in glucose metabolism, ER stress, and unfolded protein response will be analyzed in comparison to flies on a regular diet with use of qPCR.

Li, M. LTU. **The role of Notch3 in regulating stem cell state.**—Adipose-derived stem cells (ASCs) are multipotent adult stem cells capable of self-renewing. However, the mechanism of adipogenesis remains poorly understood and can be better characterized through inducing differentiation of ASCs and investigating the role of individual factors and pathways. The Notch signaling pathway is involved in cell proliferation, development, and differentiation, making it a target for investigation. We have successfully performed knockdown of Notch3 with Notch3-targeted siRNA and observed increased adipogenesis through oil red O staining and increased levels of gene expression of adipocyte markers *ppary* and *srebp-1c*. However, we do not see significant effects of Notch3 knockdown on cell viability and proliferation, suggesting the role is confined to differentiation. In the future, we will perform co-immunoprecipitations to investigate protein-protein interactions between Notch3 and adipocyte transcription factors. With the progress of our research, we will have a better understanding of cell fate control during tissue regeneration and differentiation.

Lourigan, D. SEL-MSUB. **Hen egg-white (HEW) lysozyme in water: molecular dynamics simulation.**—The purpose of my research with the egg white lysozyme in water is to see if the water causes any denaturation, such as changes in structure, due to being in the water. My hypothesis is that being submerged in water will cause some denaturation within the molecule due to the interaction between the molecule and water. My constants are pressure, temperature, and the number of water molecules. My variable is the volume of the system. The hypothesis was tested utilizing computer modeling of these molecules and water, mainly using two programs GROMACS and VMD. The results of this experiment were conclusive, and we observed that the molecule being submerged in water caused slight denaturation in the period of submergence.

Mounts, K., and H. Leung. GSU. **Identification of proteins that may distinguish the efficacy of memory processing between mammals and non-mammals.**—CAMKII has long been known to be involved in long-term memory. Recently, RGS7 was found to be necessary for long-term memory in mice. We wonder if the two proteins are conserved in all vertebrates which are commonly used in the study of learning and memory. Both proteins are found to be highly conserved among vertebrates. We then checked the proteins downstream of the pathways. There is a significant drop in protein identities between mammals and non-mammals in three proteins: CAMKK in the CAMKII pathway; R7BP and GIRK4 in the RGS7 pathway. We hypothesize that diversity of CAMKK, R7BP and GIRK4 may play a role in the different efficacy of memory processing in mammals and non-mammals.

Ostrowski, A., and E. Zou. NSU. **Post-ecdysial carbonic anhydrase activity in the epidermis of the blue crab, *Callinectes sapidus*, is controlled by the molting hormone.**—The crustacean exoskeleton is composed of chitin, proteins and various inorganic compounds. The enzyme carbonic anhydrase (CA) is suggested to aid in metal deposition to the exoskeleton of crustaceans, resulting in mineralization. A similar pattern of fluctuation between CA and the molting hormone, 20-hydroxyecdysone (20-HE), observed throughout the molting cycle of the blue crab, *Callinectes sapidus*, led to the hypothesis that post-ecdysial epidermal CA is controlled by the molting hormone. Epidermal tissues from postmolt and intermolt crabs were used to quantify epidermal CA mRNA expression when exposed to 20-HE in vitro. CA activity in the epidermis was quantified 4 days after injection of 15 ng/g dose 20-HE. We found that 100 nM significantly induced epidermal CA expression in cultured epidermal tissues from early intermolt crabs and 20-HE injection significantly elevated epidermal CA activity. These two lines of evidence support the notion that post-ecdysial epidermal CA is controlled by the molting hormone.

Pursell, I. LTU. **The use of biomimetic hydrogels to direct stem cell differentiation for tissue engineering applications.**—Human mesenchymal stem cells (hMSCs) are a multipotent stem cell often used in cell based regenerative therapies. These cells have the ability to self-renew and the potential to differentiate into many cell types, including those that make up bone, fat, and cartilage. By creating a biomimetic scaffold, we can create an extracellular matrix-like material that is able to be tailored to match properties of different types of tissues. Analysis of these cells seeded on poly (ethylene glycol) dimethacrylate (PEGDMA) hydrogels was performed to compare how the cells behave on materials of different elasticities. Attachment studies, immunofluorescence staining, and qRT-PCR were used to quantify and verify adipogenesis of hMSCs. Future studies will use mouse embryonic stem cells (mESCs), a class of pluripotent stem cells, to continue deepening our understanding of cell-biomaterial interactions, furthering the field of tissue engineering and regenerative medicine.

Smith, S., and L. Porter. NWSU. **Identification, inter-specific sequence analysis, and cloning of the delta-latroinsectotoxin in the brown widow spider (*Latrodectus geometricus*).**—The brown widow spider, *Latrodectus geometricus*, is an invasive widow species that was first detected in Louisiana in 2007 and has an expanding distribution. Widow spiders produce various classes of toxins including the insect-specific latroinsectotoxin. Our bioinformatic analyses revealed no previously annotated latroinsectotoxins for this species, however our previous studies identified a partial sequence for this toxin. Using homology-based methods we sequenced the putative full coding sequence of this toxin. Comparisons of this sequence with other widow toxins show low genus conservation except for 5' and 3' ends. Cloning of this latroinsectotoxin and recombinant protein expression construct design is discussed. Functional studies of widow latroinsectotoxins contribute to the understanding of venom evolution and specialization in this medically important species, and could represent a potential source for future insecticides.

Stewart, V., K. Ashworth, and W. Dees. MSU. **A world-wide review of bacterial disease outbreaks: 1996-2017.**—We reviewed bacterial disease outbreaks (less vectorborne pathogens) occurring since 1996 from the World Health Organization using Disease Outbreak News (DON; www.who.int) and other sources. Only the bacterial disease outbreaks that were reported through DON are included in this review. Each outbreak was categorized by disease, continent/region, and anthropogenic biome. For each disease, a timeline was constructed to show outbreak

occurrence. The bacterial diseases reported by DON include: anthrax, bacterial meningitis, botulism, cholera, diphtheria, enterhemorrhagic *E. coli*, Legionnaire's disease, leptospirosis, listeriosis, pertussis, shigella/dysentery, and typhoid fever. The three most reported diseases were cholera, bacterial meningitis, and Legionnaire's disease. Cholera and bacterial meningitis were reported ten times more often than any other bacterial disease. The majority of disease outbreaks reported occurred in crop and rangelands. Understanding environmental conditions that affect disease transmission may provide further information to prevent and control bacterial outbreaks in the future.

Stewart, V., K. Ashworth, and W. Dees. MSU. **A world-wide review of vectorborne disease outbreaks: 1996-2017.**—We reviewed vectorborne disease outbreaks occurring since 1996 from the World Health Organization using Disease Outbreak News (DON; www.who.int) and other sources. Each outbreak was categorized by disease, region, and anthropogenic biome. For each disease, a timeline was constructed to show outbreak occurrence. The vectorborne diseases reported by DON include: chikungunya, Crimean-Congo hemorrhagic fever, dengue, Japanese encephalitis, leishmaniasis, malaria, O'nyong-nyong fever, plague, relapsing fever, Rift Valley fever, St. Louis encephalitis, tularemia, typhus (louse-borne), Venezuelan equine encephalitis, West Nile fever, yellow fever, and Zika. The five most reported diseases were yellow fever, dengue, Zika, plague, and Rift Valley fever. The anthropogenic biome which three of the five most reported diseases occurred was rangelands. *Aedes* species vectored the majority of diseases reported. Plague was the only non-mosquito-borne pathogen reported of significance. Understanding how disease transmission is affected by environmental conditions may provide further information to prevent and control vectorborne disease outbreaks.

Straub, J., E. Beadle. LTU. B. Bunnell. TU. J. Newman. LTU. **The role of MED31 in the regulation of mesenchymal stem cell state.**—The Mediator complex is a master regulator of cell-type specific gene expression. Mediator functions as a molecular adaptor that connects activators bound at enhancers to the transcription pre-initiation complex (PIC) located at the promoter where it recruits RNA Polymerase II. Our research focuses on how Mediator influences the state of differentiating bone marrow-derived mesenchymal stem cells (MSCs). In addition to self-renewal, MSCs can differentiate down chondrogenic, osteogenic, and adipogenic lineages. Published research demonstrates that Mediator complexes with major coactivators in the adipogenesis pathway. We performed siRNA-mediated knockdowns of MED31 prior to inducing adipogenic differentiation assays to determine the role of MED31 in directing proper differentiation. The MSCs remained viable post-transfection but displayed reduced adipogenic differentiation as demonstrated by morphology, staining, and gene expression. These results suggest MED31 is important for appropriate Mediator function in regulating human MSC adipogenic differentiation. Such information elucidates the biomolecular requirements for regulation of MSC differentiation.

Xavier, R., T. Francis and H. Leung. GSU. **Identification of proteins unique in each of six model organisms.**—Accumulated changes of amino acids are found in protein homologs among organisms that were thought to diverge more recently. We studied eleven proteins in six vertebrates by data mining the corresponding amino acid sequences from the NCBI website. We used a ten percent difference in identity as a criterion to identify proteins that are specific for a particular organisms. We have identified three proteins specific for rhesus monkey, six for

mouse, four for chick, and three for frog. We will continue to data mine hundreds of proteins to find a set of proteins that would characterize a particular vertebrate.

Zoology Section

Akobi, N., M. Tsaliki, H. Meyer, K. Jackson. MSU. C. Johansson. FCC. and R. Miller. BU. **A new species of water bear (tardigrade) from The Old Dominion?**—Tardigrades are microscopic, segmented, eight-legged animals that are found in mosses or lichen. Though tiny, these creatures can appear to be indestructible due to their ability to withstand harsh environments. *Diploechiniscus oihonnae* is the only known member of its genus. Originally *Echiniscus oihonnae*, it was redescribed in 2016 from European samples. In 2017 we collected samples from Virginia of what initially appeared to be *D. oihonnae*. After careful morphological observation and measurements, we have observed several differences between European and Virginia specimens. The most significant variance was that Virginia specimens have spines in several places where *D. oihonnae* has filamentous appendages. This variation suggests that our Virginia specimens are not the same species as the European ones. Additional molecular data should allow a more definite conclusion. We also plan to investigate museum specimens identified as *D. oihonnae* that were collected in California and Georgia.

Beachy, C., J. Bynum, S. Wells, and J. Incandela. SLU. **The larval life history of the Southern Two-lined Salamander, *Eurycea cirrigera* (Caudata, Plethodontidae) in southern Louisiana.**—The family Plethodontidae has more diversity in life cycle than the other eight families of salamanders combined. There are three basic variations of life cycle: metamorphic, paedomorphic, and direct-developing. Those plethodontid species that are metamorphic differ from most amphibians in that larval growth is very slow and the larval period is long (9-60 months). There are few studies of species that occupy the coastal plain of the southeastern United States. We collected bimonthly samples of larval *Eurycea cirrigera* from a locality at Bogue Chitto State Park in Washington Parish, Louisiana for a full year cycle to estimate larval density, larval growth rate, timing of oviposition, timing of hatching and timing of metamorphosis. Larval growth is slow, although faster than many montane populations of *E. cirrigera*. Hatching takes place in early summer month in and metamorphosis occurs in late summer. We estimate the larval period to be 12-15 months.

Bierbaum, E. SLU. **Comparative morphology of terminal limb development in amphiuma salamanders (Amphibia: Amphiumidae).**—The postaxial polarity skeletogenesis of salamanders limbs (Order Caudata) follows a reversed pattern compared to other extant tetrapod groups. Within the Order Caudata, the Family Amphiumidae underwent the reduction of limbs. The three species within the family, *Amphiuma pholeter* (One-toed Amphiuma), *Amphiuma means* (Two-toed Amphiuma), and *Amphiuma tridactylum* (Three-toed Amphiuma), vary in digit number, and their limb structures have not been compared. *A. tridactylum* is the most ancestral species, so observing the skeletal elements could help understand the fate of the mesopodial elements and its influence on the digit number in the derived species *A. means* and *A. pholeter*. Wrist and ankle bones of tetrapods vary drastically, so I will clear and stain the limbs to examine the variation in skeletal composition of the three amphiuma species to understand the assembly

of the autopodium, and how *A. means* and *A. pholeter* evolved from *A. tridactylum* to vary in digit number.

Cone, N., and N. Clay. LTU. **Temperature and density-dependent effects on growth and survival of a common generalist butterfly.**—Warming temperatures could alter species interactions, phenology, and ranges. Butterflies impact ecosystem productivity via pollination and herbivory. The painted lady (*Vanessa cardui*) is a common generalist butterfly that ranges from Texas to Michigan in the US and lays eggs in variable densities. We predicted that higher temperature would increase growth and reduce mortality via increased metabolism. Similarly, intraspecific competition should increase growth rates in high density treatments but also increase mortality. We set up four treatment groups to test these predictions: 1) low density + low temperature, 2) low density + high temperature, 3) high density + low temperature, and 4) high density + high temperature. Contrary to predictions, high temperature had the highest mortality and high densities had no impact on survival, but increased growth rates. These results suggest that painted ladies could have higher mortality in their southern range, and with warming temperatures may shift their range north.

Gauthier, Z., M. Mayeaux, M. Lange, and C. Doffitt. NWSU. **Survey of molluscan hosts for infection by juvenile digenetic trematodes.**—Trematodes are parasites that negatively affect ecologically and economically important hosts. Identification of infections can help reduce losses. Potential aquatic snail hosts were collected from a total of three ponds at the Natchitoches National Fish Hatchery (Sample 1 - October 2016, Sample 2 - March 2017) and Larto Lake (Sample 3 - October 2017). The snails from each collection were housed in water and fed lettuce. Snails were monitored daily to detect juvenile trematode parasites (cercariae). In collection one, seven of the 125 (5.6%) *Physa* sp. snails harbored armatae-type cercariae. In sample two, two of the 97 (2.1%) *Physa* sp. harbored armatae-type cercariae. In collection three, 23 of the 69 (33.3%) *Cipangopaludina* sp. harbored armatae-type cercariae. The presence of trematode-infected snails indicates the potential for fish infections within the Hatchery and Larto Lake populations. Further sampling is needed to see if these infection rates are consistent.

Jackson, K., and H. Meyer. MSU. **Intra- and interspecific genetic and ontogenetic variation in water bears (Tardigrada) of the genus *Milnesium*.**—*Milnesium granulatum* is a microscopic tardigrade from Europe and North Carolina. In moss from New Hampshire we found *Milnesium* specimens morphologically similar, but not identical, to *M. granulatum*. NH eggs hatched into juveniles whose claw configuration, unlike other *Milnesium* species, is identical to the adult. We examined the internal transcribed spacer DNA region (ITS2), whose rapid evolution should allow differentiating among closely related species. DNA from 20 NH adults was 96-100% identical over a 407 bp region of ITS2. However, NH ITS2 is only 80-84% similar to three European *Milnesium* species (*M. berladnicorum*, *M. tardigradum*, and *M. variefidum*; no DNA data are available for *M. granulatum*). DNA sequences between siblings isolated from eight NH egg clutches showed the same sequence variability as in adults, suggesting sexual reproduction

Jackson, K., and H. Meyer. MSU. **Molecular analysis of the ITS2 region of *Macrobotus acadianus*.**—Tardigrades are animals found in moss and lichen. In 2010 Meyer and Domingue described a new species from southwest Louisiana, *Minibiotus acadianus*. Later it was transferred to the genus *Macrobotus* as a member of the *hufelandi* species group. For this study, *M. acadianus* specimens were collected on the campus of McNeese State University and used for

molecular analysis. We examined the internal transcribed spacer DNA region (ITS2), whose rapid evolution should allow differentiating among closely related species. DNA from 8 specimens was 99-100% identical over a 312 bp region of ITS2. However, *M. acadianus* is only 62-84% similar to other species in the *hufelandi* group (*M. polonicus*, *M. polypiformis*, *M. sapiens*, *M. scoticus*, and *M. paulinae*). The DNA of one specimen, identified as *M. acadianus* based on morphology, was more closely related to *M. polonicus*. At present, it is unknown if this is a new species or a known species.

Jackson, K., H. Meyer, and J. Hinton. MSU. **Low genetic variation in the tardigrade *Multipseudechiniscus raneyi*.**—Tardigrades are minute relatives of arthropods found in mosses and lichen. *Multipseudechiniscus raneyi* is endemic to the American West Coast. Originally described as *Pseudechiniscus raneyi* in 1964, it was transferred to *Multipseudechiniscus* in 2011, and remains the only species in the genus. The aim of this study was to collect molecular data on *M. raneyi* to determine the level of genetic diversity within the species, and to compare it to other species of Echiniscidae. We examined the internal transcribed spacer region (ITS2), whose rapid evolution should allow for differentiation between closely related species. Five specimens of *M. raneyi* collected from a California lichen were analyzed. Their DNA was 100% identical over a 396 bp region of ITS2, suggesting that they may reproduce by parthenogenesis. However, the ITS2 region of *M. raneyi* is only 65% similar to *Echiniscus blumi* (from Greenland) and 66% similar to *E. testudo* (Germany).

Merchant, M., and A. Hale. MSU. J. Breuggen. CSG. C. Harbsmeier. TLPZ. and C. Adams. G-PZ. **Crocodiles alter skin color in response to environmental color conditions.**—Many species alter skin color to varying degrees and by different mechanisms. Here, we show that some crocodylians modify skin coloration in response to changing light and environmental conditions. Members of the genus *Crocodylus* transitioned from dark enclosures, lightened substantially when placed in white enclosures. The Gavialids showed an opposite response, lightening under darker conditions, while Alligatorids showed no changes. Observed color changes were rapid and reversible, occurring within 60-90 minutes. The response is optically-mediated and modulated by serum α -melanocyte-stimulating hormone (α -MSH), resulting in redistribution of melanocytes within melanophores. Injection of crocodiles with α -MSH caused the skin to lighten. These results represent a novel description of color change in crocodylians, and have important phylogenetic implications. The data support the inclusion of the Malay gharial in the Family Gavialidae, and the shift of the slender-snout crocodile from the genus *Crocodylus* to the monophyletic genus *Mecistops*.

Meyer, H., and N. Akobi. MSU. **Predator and prey behavior in two species of tardigrade, *Milnesium lagniappe* and *Macrobotus acadianus*.**—We investigated whether predatory tardigrades are attracted to, and potential prey avoid, areas previously occupied by another species. We used *Milnesium lagniappe*, a tardigrade that preys on nematodes, rotifers, and small tardigrades like *Macrobotus acadianus*. Petri dishes with non-nutrient agar were used as experimental chambers. We allowed 21 *M. acadianus* to roam over half of a petri plate for 20 hours, leaving the other half free of *M. acadianus*, removed them, and added 24 *M. lagniappe*. After 20 hours *M. lagniappe* were significantly concentrated in the area previously occupied by *M. acadianus*. In a control treatment *M. lagniappe* were randomly distributed. We also tested whether *M. acadianus* avoided areas previously occupied by *M. lagniappe*. After 20h *M. acadianus* were significantly concentrated in the area never occupied by *M. lagniappe*; the

control distribution was random. These results suggest that both species can detect the other without physical contact and react accordingly.

McDade, K., C. Ardizzone, and D. Johnson. MSU. J. Hightower. CPMC. W. Dees. MSU. **Mosquito surveillance in a residential park: A six-year seasonal survey.**—We are conducting a seasonal longitudinal survey of mosquitoes at a 24-acre woodland park in an urban area of Lake Charles, Louisiana. The park is separated into two distinct areas: one is an open area with playground equipment, picnic tables, open shelters, a small conference center, wetland ponds, and walking paths; the other is a preserved forest with nature trails. The mosquito survey was initiated in the summer of 2011. We use Centers for Disease Control and Prevention (CDC) light traps baited with CO₂ in the form of dry ice to collect mosquitoes. Mosquitoes are collected in the open area near the preserved forest in each of the four seasons. Temperature and humidity data are recorded during each trap night. To date, the predominant species collected (i.e. >50 in one trap night) are *Aedes atlanticus*, *Ae. taeniorhynchus*, *Ae. vexans*, *Coquillettidia perturbans*, *Culex erraticus*, *Cx. nigripalpus*, *Cx. salinarius*, and *Psorophora columbiae*.

Montgomery, M., and M. Franklin. GSU. **The effect of acetyl-L-carnitine on planarian behavior and motility.**—Planarians possess a surprisingly-sophisticated nervous system, with many of the same neurotransmitters found in mammals. Acetyl-L-carnitine (ALC) has been proposed as a treatment for several neurological diseases. In this study, we exposed the planarian *Dugesia dorotocephala* to ALC to evaluate its potential effects on motility and memory. ALC produced dose-dependent hypokinesia in the worms, which was enhanced by atropine (ATR). We tested the ability of planarians exposed to ALC during a prior conditioning period to remember the petri dish (target) quadrant in which a food source had been present during the conditioning period, as evidenced by the amount of time the animals spent in the target quadrant. Planarians demonstrated a preference for the target quadrant 2:1 over the normally-preferred quadrant ($p < 0.01$). Studies are continuing to further characterize these effects of ALC. To our knowledge this is the first report of ALC effects in planarians.

Nguyen, S. SLU-MSUB. **Communal egg-laying in *Scincella lateralis* (Ground Skinks) pilot study.**—*Scincella lateralis* (Brown Skinks) eggs are laid in clutches of 1 to 7 in moist soil or rotten logs. Mothers leave the eggs once they are laid. Communal nesting reduces time spent searching for sites so more time can be spent searching for food and has been documented within the species, but underlying factors are unknown (numbers of nesting sites, predators, or safety). This is a pilot study to establish the feasibility of a larger study to test the hypothesis that ground skinks will lay eggs communally based on the amount of available nesting sites. Skinks were collected from the same area in the wild and put into a Waterland Tub land enclosure with a controlled environment. The preliminary data showed that 50% of the skinks communally laid eggs demonstrating this study design will be useful for a larger study examining the communal nesting behavior of skinks.

Partin, M. SLU. **A puzzle to piece together- Does traffic noise cause physiological stress in *Hyla chrysoscelis* (Anura: Hylidae)?**—Noise pollution is an increasing concern throughout the world due to potential impacts it could have on the environment and wildlife, particularly in those species using acoustic communication. Anurans are among the organisms that have been affected, mainly by traffic noises because many ponds and temporary pools are near roads, some of which have heavy traffic. Changes in calling characteristics in anurans and other animals in response to noise have been well established in the literature. Traffic noise has been shown to

cause physiological stress in different organisms, including some anuran species. During the breeding season in summer of 2016, blood samples were taken from *Hyla chrysoscelis*, the Cope's gray tree frog, through cardiac puncture with heparinized hypodermic needles, and corticosterone concentrations and neutrophil/lymphocyte ratios were measured. There were no differences detected in corticosterone concentrations or cell ratios throughout all sites tested.

Rixner, A., and Q. Fontenot. NSU. **Comparison of bowfin *Amia calva* diets and reproductive activity in the upper Barataria Estuary and Atchafalaya River Basin.**—The Atchafalaya River Basin (ARB) is inundated each spring, but the upper Barataria Estuary (UBE) has been separated from the Mississippi River and does not receive an annual flood pulse. The hydrologic difference between the two basins may lead to a difference in diets and gonad development for species such as bowfin, *Amia calva*. The goal of this project was to determine if bowfin diet and gonad development in the UBE is similar to bowfin in the ARB. The mean percent of empty stomachs was similar between the basins, and bowfin in the UBE had a more diverse diet. Based on histological analysis, it appears that the majority of ARB basin bowfin spawned earlier than UBE and that spawning is related to water level. This study provided a baseline to evaluate the effect of floodplain inundation on trophic dynamics, gonad development, and can be used to evaluate restoration success.

Simoncini, P., R. Philobos, C. Robicheaux, and D. Shepard. LTU. **Phylogeography and cryptic diversity of Slimy Salamanders (*Plethodon glutinosus* complex) in the Interior Highlands.**—Cryptic species can underestimate biodiversity and hamper conservation efforts. The 16 species of Slimy Salamanders (*Plethodon glutinosus* complex) are distributed throughout the eastern United States and show little to no morphological variation, having been described primarily using genetic data. Three species, *P. albagula*, *P. kiamichi*, and *P. sequoyah*, are known from the Interior Highlands (Ozark Plateau and Ouachita Mountains), but our knowledge of species diversity and distributions in this region is based on genetic analysis of only 15 populations. Using mitochondrial DNA sequences, we found: 1) the range of *P. kiamichi* is broader than previously recognized, 2) *P. sequoyah* is nested within *P. albagula*, 3) the range of *P. kisatchie*, a species from the West Gulf Coastal Plain of Louisiana and southern Arkansas, extends into the region, and 4) an undescribed cryptic species may be present. Future work will incorporate nuclear loci and employ explicit analyses for delimiting species.

Stumpf, C. LSU-A. **Biological barcoding as a means to attract students to research projects with arthropods.**—LSUA is a small liberal arts college with a total enrollment of 3378 students in fall 2017. With a teaching load of 12h/semester, keeping up an active research program is challenging and time-consuming, but it is one of the best ways of retaining and engaging students in their chosen fields of study. Most students in the Biological Sciences Department are interested in careers in medicine or related health sciences. One possible means for finding students for research projects with arthropods is biological barcoding that offers students an opportunity to work with a relatively straight-forward scientific method. The poster describes research projects with crawfish that can be easily performed in a college setting. Biological barcoding allows for the discovery of many novel gene sequences, for the asking of novel scientific questions, and for attempting new techniques. Therefore, publishing exclusively undergraduate research in both research and teaching outlets becomes a strong possibility.

Taylor, J-G., and M. Franklin. GSU. **Characterization of potential behavioral and toxicological effects of a succinic acid/ethylene glycol polymer in *Dugesia dorotocephala*.**—Planarian flatworms are increasingly recognized as alternative animal models for assessment of fresh water environmental quality. We tested the potential behavioral and toxic effects of a novel succinic acid/ethylene glycol polymer (SAEG) synthesized at Grambling State University in the common brown planarian *Dugesia dorotocephala*. In the toxicity studies, planarians were exposed to 0.1, 1.0, 10.0, and 100 mg SAEG/L Ozarka Spring Water. Although no lethality was observed, several animals exposed to the highest concentration attempted to escape from the petri dish, suggesting a negative chemotactic response. Higher concentrations of SAEG were not tested because of its limited water solubility. Planarians exhibited 300 and 500% increases in activity over controls after two and three minutes' exposure to 100 mg/L SAEG, respectively, although their activity returned to control levels after five minutes. Studies are in progress to further characterize the behavioral effects of SAEG in these flatworms.

Tsaliki, M., N. Akobi, H. Meyer, and J. Hinton. MSU. **An interesting, albeit frustrating, water bear (Tardigrada) from Hawaii.**—Tardigrades, also known as water bears, are microscopic animals commonly found in mosses and lichens. *Echiniscus africanus* Murray, 1907, is a tardigrade from southern Africa. We acquired 27 slides from the Bohart Museum, University of California-Davis, of tardigrades resembling *E. africanus* that were collected in the Hawaiian Islands in the 1980s by Schuster and his colleagues. Examination and measurement of these specimens revealed exceptional variation in the presence/absence and length of appendages; in some cases spines found on one side of an animal were missing on the other. Unfortunately all original specimens of *E. africanus* have been lost, and the Hawaiian specimens cannot be definitively assigned to the species; therefore we identify them as *Echiniscus* cf. *africanus*. This research underscores that when describing a new tardigrade species it is essential to use a sufficient number of specimens to account for variability and abnormalities.

Division of Physical Sciences

Chemistry Section

Bista, R., and S. Murru. ULM. **Rational design and synthesis of substituted chiral BINAM ligands for asymmetric catalysis.**—Numerous binaphthyl-derived ligands have been employed as chiral auxiliaries in catalytic reactions. We recently synthesized a set of substituted binaphthyl ligands using Suzuki-Miyaura coupling reaction as a key step. These ligands are currently being tested for asymmetric catalysis reactions. We will present the multi-step synthesis of the ligands and their catalytic activity.

Gallo, A. ULL. C. Perdrier. UP. P. Tran, V. Nguyen, and B. Huynh. ULL. A. Neslon. UTMC. **Studies in the synthesis of L-fructose from L-arabinose.**—In 1996, Shi et al. reported on the asymmetric epoxidation of olefins using a chiral catalyst derived from D-fructose. Since then the Shi asymmetric epoxidation of olefins has found widespread use in the total synthesis of natural products and biologically active molecules. The reaction uses a mild oxidant and it generally gives a high percentage yield with high enantiomeric excess from inexpensive reactants. One major limitation of Shi's epoxidation is that the enantiomer of the catalyst, which requires L-fructose, is difficult to prepare. We will present our initial research on the synthesis of L-fructose starting from inexpensive L-arabinose. The treatment of the aldehyde functional group L-arabinose (1) with 1,3-propanedithiol gives the dithiane (2). Protection of the OH groups with acetone yields the protected dithiane and diketal of L-arabinose (3). Similar reactions have already been carried out by Pearson. The results of our reaction with spectral characterization will be presented. The next step in our synthesis is the reaction of the protected dithiane (3) with strong base and formaldehyde to yield the ring-expanded protected sugar alcohol (4). This step should proceed via Corey- Seebach reaction. Several attempts on this reaction to date have failed and we will present our findings.

Ganguly, S., R. Gaudet, and S. Jones. NWSU. **Colloidal synthesis of ZnO nanoparticles and their biological importance.**—Zinc oxide (ZnO) nanoparticles have been used for myriad of applications: starting from solar cells to sunscreen lotions. Having said it has been an ongoing debate whether usage of these nanoparticles are biologically favorable or not. Researchers from all over the world are trying to investigate the biological implications of the nanoparticles. However, the studies have not been concrete as of yet. This presentation will describe firstly, the colloidal based strategies to produce ZnO nanoparticles as well the effect of the nanoparticles in bacterial cells specifically *E.coli*. In addition, the effect of size of the nanoparticles on the bacterial cell will be described.

Godwin, H., S. Jones, and R. Gaudet. NWSU. **Metal oxide nanoparticles and their assembly onto macroscopic structures.**—Metal Oxide nanoparticles such as ZnO, TiO₂ have been the topic of interest in the scientific community in the last decade. Their application as nanoparticles is versatile. Be it as transparent conductors, electrochromic windows, materials in sunscreen lotions etc. The major hurdle for the nanoparticles are usually how to assemble them together so that they could be fabricated into devices without altering a lot of their individual optoelectronic properties. This presentation will describe a cheaper and viable mode of synthesis of ZnO

nanoparticles of varied shapes and sizes. In addition, it will also demonstrate easier methods of assembling the nanoparticles into thin films as well as into macroscopic materials. Further, the transparent conducting capabilities of the materials will also be addressed.

Junk, T., B. Larson, and J. Patel. ULL. **Recent advances in the synthesis of organic tellurium compounds: potential building blocks for supramolecular frameworks.**—Some heterocyclic tellurium compounds are known to undergo self-assembly to supramolecular frameworks, notably ribbons, chains and rings. These include the tellurazoles, which are highly stable to air, moisture and light. Supramolecular frameworks have potential applications ranging from catalysis and selective binding of metals to applied materials sciences. While tellurium is a congener of sulfur, the equivalent sulfur compounds lack the ability to self-assemble in this fashion. A major challenge standing in the way of applying organotellurium compounds is limited access. Thus, synthetic methods developed for the preparation of sulfur compounds cannot be directly adapted for the preparation of the tellurium analogs. Progress towards the development of synthesis of novel benzotellurazoles and their precursors is presented, as well limitations of these approaches. Novel compounds prepared in the course of our studies were characterized by X-ray crystallography, and their ability to undergo supramolecular self-assembly was determined.

Lewis, C., LSU-A. G. Bello. IC. and, G. Dumancas. LSUA. **Direct determination of oil content in binary mixtures of peanut and canola oils using partial least squares and attenuated total reflectance-Fourier-transform infrared spectroscopy.**—An attenuated total reflectance-Fourier-transform infrared spectrophotometric and partial least squares (PLS) method was developed for the direct determination of percent content by mass of peanut and canola oils. We compared the performance of commonly used signal processing techniques (first derivative, binning, standard normal variate, Savitzky-Golay) prior to PLS. Savitzky-Golay outperformed the aforementioned techniques with a root mean square error of calibration for peanut oil of 2.81×10^{-2} and 2.71×10^{-2} for canola oil. The root mean square error of prediction (RMSEP) was 1.53×10^{-1} for both oils. The relatively small RMSE indicated that the differences between the actual and predicted values of both the training and testing set were minimal. An $R^2 = 0.999$ with an RMSEP = 1.53×10^{-1} for both edible oils were obtained implying that the probe could potentially provide an avenue for the direct determination of oil content in binary mixtures of peanut and canola oils.

Major, D., C. Walton, and M. Franklin. GSU. **Biodegradability of four novel polyesters.**—The ideal plastic consumable would hold up to its intended function, but disintegrate into harmless substances in the landfill. We determined the ready biodegradability of four biopolymers synthesized at Grambling State University: succinic acid/ ethylene glycol, adipic acid/ethylene glycol, adipic acid/ethylene glycol prepared with titanium catalyst, and adipic acid/1,3-propanediol. The ready biodegradability test is the most stringent test of biodegradability. We utilized the manometric biochemical oxygen demand (BOD) test, in which the polymer is incubated with a commercial mixture of microbes commonly found in landfills. Biodegradation occurs when microbes secrete enzymes that initiate the process, absorb the intermediate products, and oxidize the products to carbon dioxide and water. The order of polymer biodegradability in order from highest to lowest, is: succinic acid/ethylene glycol, adipic acid/ethylene glycol, adipic acid/ethylene glycol with titanium catalyst, and adipic acid/1,3-

propanediol. Biodegradability was dose-dependent. Chemical oxygen demand (COD) determinations are in progress.

Roberson, K., C. Bailey, and F. Pittman. GSU. **Application of the USDA starch research method to improve measurement of amylose in starches.**—Amylose/amylopectin ratios dictate the properties and suitability for end-uses of starch based foods (i.e. cereal and rice). Thus, measurement of amylose content of starches is an invaluable quality parameter for starch processing. The current method used to measure starch content is time consuming and relies on special solutions. Here, we apply the USDA Starch Research Method and drastically reduce the time, complexity, and improve the output capacity of multi-sample analysis.

Setijadi, C., LSU-A. G. Bello. IC. and, G. Dumancas. LSUA. **Development of a facile, convenient, and economical method for the direct determination of five carbohydrate sugars using partial least squares and Fourier transform infrared-attenuated total reflectance spectroscopy.**—Sugar plays a role in the appeal of many products having been found to produce addiction-like responses in consumers including craving effects. Determination of sugar content in low-moisture confectionaries often represent a challenge since typical methods are expensive and time consuming. We attempted to develop an original, rapid, and efficient method of simultaneously predicting the percent content of five sugars (glucose, fructose, sucrose, galactose, and lactose) using Fourier transform infrared-attenuated total reflectance (FTIR-ATR) and chemometric partial least squares (PLS1) methods without any need for analytical separations. We compared the performance of several signal processing techniques including first derivative, binning, standard normal variate (SNV), and Savitzky-Golay smoothing prior to PLS1 analysis. Our results show comparable performance between binning and SNV techniques. Results of our study can provide an avenue to further develop a method that can simultaneously determine the aforementioned sugars in low-moisture confectionaries.

Srivastava, R., S. Swisher, and M. Miller. ULL. **Ruthenium (II)-pyrazole complexes as potential anticancer agent.**—The discovery of new metal-based antitumor drugs, whether cisplatin derivatives or those based on other metals, has been largely based on cell viability assays (IC50 values) and compounds that bind to DNA. The Pt(II) compounds currently the most widely used anticancer drugs. Today there is hardly any clinical regimen or combination of chemotherapy that does not contain either cisplatin or carboplatin. Cisplatin, is one of the three most widely utilized anticancer drugs in the world and has annual sales of approximately \$500 million. Despite the resounding success of cisplatin, the drug exhibits several side effects. This has led researchers to develop anticancer drugs utilizing other metals. We have recently developed several Ru (II) complexes for the same purpose. The synthesis and biological assay will be discussed.

Tran, K., M. Kim, and S. Murru. ULM. **Synthesis and anti-microbial evaluation of five membered nitrogen heterocycles.**—Nitrogen heterocycles exhibits extraordinary reactivity patterns and most importantly they can be fine-tuned to achieve desired electronic and steric effects. Thus, isoxazolines and pyrazoline compounds are gaining more attention for drug discovery research. This underlines the purpose of our experiments, to develop novel methods of synthesizing new sets of pyrazolines with different substitution patterns. Our current approach involves the synthesis of 3,4-dialkyl-1-aryl-2-pyrazoline-5-ones using β -ketoesters and

substituted hydrazines as the starting materials. Alternatively, 1-3-diketones and substituted hydrazines were used to obtain 3,5-dialkyl-1-aryl-pyrazolines, which will then be further converted into 3,4,5-trisubstituted-1-aryl-pyrazolines via cross-coupling reactions. We will present the synthetic methods and the antimicrobial activity results.

Computer Science Section

Antoine, K., J. Richards, and P. Sreekumari. GSU. **A secure platform for sharing confidential files using two-factor authentication.**—In this research, we designed and developed an efficient solution for sharing sensitive files using two-factor authentication. Two-factor authentication is a security feature that helps protect your files in addition to pre-defined login account. Using two-factor authentication, the users can login using their unique company id and password and can access, upload and share their encrypted and password protected files that contain sensitive information to their teams, partners or customers. For decryption, the receiver enters the correct password encrypted in the shared file. At the time of sharing files, the receiver receives the password of the shared file directly to recipient mobile. This unique feature of our solution can ensure that you are the only person who can see the contents of the received confidential file.

Ayeni, O. SUAMC. S. Adubi, O. Sowunmi. CU. V. Mbarika. SUAMC. **From standalone computers to big data technology: Proposing a new model for information technology infrastructure change management.**—This paper describes the journey of ITI from standalone computers to cloud of things, the motivation for their transition alongside merits and demerits. It also discusses each of this method in brief and also provides their applications. It states the importance of computer networks today using fast and novel approaches. Finally, this paper presents a new model for managing change in ITI.

Bandaru, V., and M. Salam. SUAMC. **Development of web based online quiz system.**—In colleges, universities and corporate offices, organizing exams is difficult and managing the time by the administration is also hard. Giving multiple question papers and evaluating them is a difficult task for the instructors. To avoid all such inconsistencies of traditional quiz conducting programs, an automated application is under development after analyzing the requirements. This application allows the instructor to set up time for an individual question, the total time for the quiz, start time and end time of the quiz. Also, the available question types will be multiple choice, fill in the blank, true/false, and descriptive. There will be various options for instructors to make the feedback available after the quiz. The main goal is to develop an online quiz system that will reduce the burden of paperwork evaluation for instructors and provide flexibility to the student to take the quiz from anywhere and anytime with an immediate feedback.

Baniya, B., D. Thomas, N. Parrott, and D. Davis. GSU. **Knowledge extraction and classification of music genre.**—This method is used to explore the class label of different music genre (style of music) based on knowledge extraction. The class label helps to make similar music in particular group to improve the user experience in a music information retrieval system. It also reduces the retrieval time in an online system. The fundamental assumption is that music under the same category composed of similar musical instruments, having a similar rhythmic

pattern and similar pitch distribution. First, we extracted several features from audios and then calculated the different statistics (i.e., mean and standard deviation) to represent the music audio. Later, the extreme learning machine is used to predict the class label of each music. We performed the ten-fold cross-validation for performance measure and overall accuracy of our proposed method is comparatively high.

Clough, J. GSU. **Alarming the ethical hacking.**—For the safety of critical information being transferred or stored in the IT world, hacking is a major concern. Whether you are a college student using your school’s internet access or the head of Human Resources of a large company, the threat of your data being stolen is present and precautionary actions must be taken. During my research on ethical hacking, numerous techniques were learned on how hackers attack computer systems, such as pre-connection attacks including creating a fake access point and retrieving the password of an access point, and post connection attacks that include gathering information. Also discovered were precautionary actions. Anyone who uses wireless connections is vulnerable to these attacks. An Ethical Hacker’s job is to warn users of the vulnerabilities they are exposed to. My hope is that this research brings awareness to the importance of having protected computer system and critical stored personal information.

Drozdenko, B. LTU. **Enabling protocol coexistence via FPGA design techniques for wireless transceivers.**—The increasing number of wireless devices in our interconnected world causes heavier congestion on particular bandwidths. Existing wireless devices are inflexible, unable to coexist with devices using other protocols. This work proposes new FPGA-based design techniques to receive multiple protocols on the same computing platform. Methods use tunable parameters to explore design tradeoffs regarding clock cycle, resource utilization, power consumption, and accuracy. This research incorporates techniques for practical resampling to accommodate different protocol rates, hardware-friendly matched filtering for pattern detection, and use of a single FFT to handle different numbers of frequency subcarriers. Results aim to optimize FPGA resource utilization. LTE PDSCH and 802.11a PHY protocols are implemented to test. Simulink is used for modeling and auto-generating HDL code. In future work, these building blocks can be used to achieve high-performance wireless transceiver implementations on FPGA fabric for multiple cutting-edge protocols.

Ekanoye, F., F. Ayeni, SUAMC. F. Yusoff. UTM. V. Mbarika. SUAMC. **Promoting the concepts of Internet of Things with Smarthome in North Baton Rouge: A case of Scotlandville.**—Mobile telecommunication service consumers have experienced dynamic changes provided by the mobile network operators in the past years. Radio Network providers have helped to close the gaps of distance and have helped people to stay in touch with families, friends and colleagues either on voice, data or video platform. Beyond the typical voice, data and video communication between humans is the addition of connectivity to home appliances, sustained with an effective managed service approach and supported with devices for home owners. The Smarthome concept may be relatively new but it possesses the potential to be the most significant consumer lifestyle development of this decade. As more people approach retirement age and are becoming frail in moving round their houses, the idea of making their home smart becomes an important imperative, coupled with being able to fully control and secure their property with the aid of mobile devices and automation controllers. The aim of this study is to promote the concept of IoT with use of technologies in smarthome delivery within vicinities ravaged with insecurity whilst unfolding the advantages the IoT provides.

Gade, A., and M. Salam. SUAMC. **Survey on Internet of Things applications.**—We are entering a new era of computing technology that is known as the Internet of Things (IoT). This technology communicates machine-to-machine, machine to infrastructure, and machine to the environment. We can also call it as the Internet of everything, the Internet of intelligent things, and intelligent systems. The potential applications of IoT are huge. With the rapid development of the Internet of Things, there are constantly new applications are occurring. To ensure the research remained relevant, there is a need to present a thorough understanding of the advancements and applications of the Internet of Things. The main objective of this research is to find various applications of IoT and characterize them according to their areas of applications. We have found many applications of IoT in different sectors such as agriculture, smart cities, traffic monitoring, industrial control, and many more. We have classified them according to their applications types.

Hendrix, M., and Smiley, P. GSU. **Object recognition using H2O -R language.**—We are working on deep learning (DL) undergraduate project using H2O and Spark packages in R languages. DL is a process that consists of a set of methods which classifies the raw data to meaningful information fed into the machine. Deep convolutional nets composed of various processing layers to learn and represent the data. H2O deep learning architecture has many features that include supervised training protocol, memory efficient Java implementation, adaptive learning, and with related CRAN packages. In this undergraduate research project, a MNIST database is used to benchmark classification performance.

Katchoua, G. SUAMC. N. Omoregbe. SUAMC, CU. F. Ayeni, S. Onyeidu, and V. Mbarika. SUAMC. **Design of a cloud based Blood Bank Management Information System (BBMIS) for Cameroon's health care system.**—Despite increasing requirements for blood, only about 5% of the Cameroonian population donates blood. Even when blood is donated, the current manual method of storing the blood bank details further leads to inefficiencies in the health care systems. In this work, we propose a new and efficient way to overcome such scenarios with the introduction of an information system. The system will store, process, retrieve, and manage blood bank records from patients, donors and care providers. The Blood Bank Management Information System (BBMIS) which will be cloud based will simplify and automate the process of searching for blood in case of emergency and maintain the records of blood donors, recipients, blood donation programs and blood stocks in the bank. BBMIS will enable voluntary blood donors to register themselves in the system anywhere at any time and be contacted for blood donation in case of need using the system. This proposed system will reduce the time for the search of blood donors during emergency cases. The system consists of a central repository containing various blood deposits available along with related details and accessible via mobile and Web platforms. Web development tools such as PHP-Laravel Framework and Java/Ionic framework will be used for the mobile application. These frameworks are supported by structured query language (SQL) database to store blood and user specific details.

Khadka, L., A. Findley, and P. Wiedemeier. ULM. **A desktop tool that identifies discrepancies between the PhagesDB and PET actinobacteriophage databases.**—Phage Enzyme Tools (PET) is a tool for researching and identifying bacteriophages. It provides visualizations of known phages and identifies new phages by comparing their cut counts with the restriction enzymes with that of the already known isolated phages. PET was developed at the University of

Louisiana at Monroe and uses the data from the PhagesDB, which is maintained by the University of Pittsburgh, to perform those tasks. This data had to be manually inserted into PET's database through its web interface whenever PhagesDB added a new phage or updated the existing phages. My multiplatform desktop tool automates this tedious job by syncing and querying the two databases, finding the new phages and inserting them into PET. My future goal for the tool is to add the feature for finding changes in existing phage's data and to make those changes in PET.

Lea, B., F. Ekanoye, F. Ayeni, and V. Mbarika. SUAMC. **Cybersecurity in Russia: Challenges and prospects.**—Cybercrime is at an all-time high in recent years and it is the greatest threat to every company in the world. This paper demonstrates various types of cybercrimes, explores existing and proposed strategies to minimize these crimes through current and prior research. The focus shall be on the effects of cybercrime in Russia. This study seeks to unfold the preventative methods of cybercrime in Russia and the role lawmakers, government officials and the intelligence agencies play.

Maharjan, R., A. Findley, and P. Wiedemeier. ULM. **Web based tool to show restriction endonuclease digestions of actinobacteriophages.**—Phage Enzyme Tools (PET) is a small suite of tools meant to assist in the research and identification of bacteriophages. It can help identify an unknown phage by comparing results of actual enzyme applications to an unknown phage against the values in the database of known phages. However, this tool currently shows only the number of cuts that a certain enzyme makes to a particular phage. So, we have built a tool, which is an extended function of PET that graphically shows a linear DNA sequence of a phage and the position of cuts a particular enzyme makes to that phage.

Reddy, Y., and J. Mesit. GSU. **Primary user emulation attack detection techniques in cognitive radio network.**—Cloud computing helps to improve the performance of cognitive radio networks (CRN) through spectrum sensing and management. Since the CRNs are reconfigurable with adaptive learning, they have a capability of process large volume of data. To process the large size of data and adaptive learning, CRN requires cloud-based environment due to the limited capacity of current mobile devices. Combining the cognitive networks with cloud raises security problems. One of the security problems for cloud-based CRN (CCRN) is primary user authentication. In this research, we discuss the “Primary User Emulation Attack Detection Techniques in Cognitive Radio Network.”

Sarkar, T., and J. Noguera. SUAMC. **Student Tracking in Academic Years (STAY) System: Putting mobile analytics in students hands to ensure career success.**—An innovative cutting-edge Student Tracking in Academic Years (STAY) System is presented using combined native apps for iPhone® and iPad® with the capabilities of the SAP HANA Cloud Analytics Platform. We use the iOS software development kit (SDK) so that we can develop the native iOS apps. This tracking system focuses on providing students, faculty and/or administrators the ability to have access to not just their academic data performance (grades and coursework) but also their academic financial status to predict risk so that advising and mentoring interventions are strategically effective/efficient and produce expected increase in student retention, completion and satisfaction in STEM programs. In addition, it is expected that STAY will positively impact student outcomes such as higher GPA, lower attrition, increase self-efficacy, and better defined

academic goals. The end result will be higher students' academic performance and social integration.

Tillery, C., C. Cummings, F. Ayeni, F. Ekanoye, and V. Mbarika. SUAMC. **A review of cybersecurity in the United States of America.**—Cybersecurity deals with the techniques and steps taken to protect the integrity of networks, programs, and data and prevent attack, damage, and unauthorized access. Since technology has become such a big part of our everyday lives, compromising data in anyway is considered a threat and can be dangerous. Government agencies, financial institutions, hospitals, and other groups collect, process, and store a numerous amount of confidential information daily and this information is usually transmitted from one computer to the next across networks. The United States government is working to strengthen laws to ensure that organizations take a great deal of responsibility for cybersecurity and cyber breaches. The United States Government believes that it is extremely important to have security of computer systems for two reasons.

Turner, S., and P. Sreekumari. GSU. **Security issues associated with Big Data in cloud computing and its counter measure.**—Big Data has rapidly developed into a hot research topic that attracts attention from academic and industry around the world. With the rapid development of cloud computing, cloud storage has enabled the provision of high data availability, high reliability, fast access to data and reduced infrastructure costs from outsourcing of data to remote servers. However, the security of Big Data in cloud is a major concern. This research mainly deals with the security issues associated with Big Data in cloud computing and the counter measure which can be taken to resolve the issues of Big Data security in cloud.

Williams, D., and J. Gardner. GSU. **Transmitting and receiving critical information from a mobile device to the cloud.**—With the recent transition of computer functions migrating to the mobile environment, users are now equipped with portable computer systems in the palm of their hand. Because mobile devices are limited to the resources as compared to those of a PC environment, the objective is to remove strenuous processes from the mobile device. As a result, mobile devices are most often connected to the internet and cloud servers. With this construction, security plays a vital role in sharing and storing files and protecting information. This research provides a proposed method for transmitting and receiving critical information from a mobile device to the cloud utilizing the Shamir Secret Sharing Scheme alongside the Android framework.

Wutofeh, W. ICTU. N. Omoregbe. SUAMC, CU. S. Nicholas-Omoregbe, F. Ayeni, and V. Mbarika, SUAMC. **The role of ICTs in socio-economic development of the northwest region of Cameroon.**—This paper aimed at evaluating the contributions of ICTs to the socio-economic development of North West Region of Cameroon. Qualitative and qualitative research methods were used for the study. The data collected were analyzed to come out with the following findings: Firstly, ICTs have contributed to the promotion of agricultural activities and employment within the region. Secondly it has promoted the culture of the people as well as the general sensitization of the people. ICTs assist in tourism promotion through entertainment, advertising and security of goods and people. Thirdly, ICTs have contributed to improving the educational sector of the region, through training in the ICT domains and scholarships offered by the ICT stakeholders such as MTN and Orange. Fourthly, ICTs interactions have contributed in

sensitizing the public on health issues focusing on AIDS prevention, vaccination and family planning. It also facilitates consultation, diagnosis and treatment.

Yari, F., S. Omoregbe, and V. Mbarika. SUAMC. **The Impact of Information and Communication Technology on Socio-Economic Development of sub-Saharan Africa.**—Of late, studies in international development perceive information and communication technology (ICT) as a huge contributor to inclusive growth and socio-economic development (Dalberg, 2013). Not only could it increase productivity and contribute to the overall GDP of an economy, but it could also help connect remote populations to markets, promote citizens' access to social services, expand educational opportunities, create platforms for innovation and increase people's freedoms and access to government services (Madon, 2000).

Yusoff, F. UTM. J. Landor. SUAMC. S. Nicholas-Omoregbe. CU. R. Mungwe, R. Ufaro Chirewa, C. Donald, F. Ayeni, and V. Mbarika. SUAMC. **Social media presence among small businesses: A comparative study between Baton Rouge and New Orleans.**—Evaluating social media usage of small businesses is very important since social media has the potential to contribute towards business growth (Guynn, 2017). While Pew Report indicates expansion of social media usage (Greenwood et al., 2016) and social media benefits had been highlighted by various researches such as Srinivasan et al. (2016), Jones et al. (2015) and Vásquez and Escamilla (2014), a question remains on how the report is truly reflected empirically on the ground. Williams-Morgan (2017), Srinivasan et al. (2016), and Adegbuyi et al. (2015) conducted empirical research in Mississippi, India and Nigeria respectively. More locations need to be studied to ensure that the positive claims as reported by researches above are widespread. This paper will compare the usage of social media among small businesses in Baton Rouge and New Orleans, Louisiana, two major cities in Louisiana.

Yusoff, F. SUMAC, UTM. J. Landor, O. Ayo, G. Katchoua, F. Aquegho, T. Pruitt, H. Alaba, F. Ayeni, and V. Mbarika. SUAMC. **Social media presence growth among small businesses: A case study.**—Social media usage to market products plays an undeniably large role in a company's success. However, Jang's (2015) study discussed how the business community did not openly embrace social media usage. This study was conducted in a city located in North Texas having 12,905 small businesses. On March of 2014, Jang concluded that only one-fifth of small shops and service providers had Facebook business pages. Since Jang's study, both U.S. and Canada Facebook usage has grown from 202 to 231 Million (Constine, 2016; Ingram, 2017). Today, given the growth of social media, particularly Facebook, it is interesting researching business sentiments towards social media as more business entities are using this powerful medium to market their products. This paper conducted a study in Baton Rouge, Louisiana to assess social media presence among small businesses. Number of Likes and Comments were recorded together with several other parameters to assess companies' social media presence. Descriptive statistics were utilized to analyze the data with some of the results compared with Jang's finding. Results from the study revealed only five percent increment in term of adoption rate compared to original study and mixed outcome for other measurements.

Materials Science and Engineering Section

Ahmed, M., and S. Tewari. LTU. **Effect of acid treatment and metal coating on the performance of carbon aerogel/fiber paper electrodes in capacitive deionization.**—Capacitive deionization (CDI) has been the focus of interest by researchers in recent years as it is a novel technology that can be an energy efficient and effective alternative for energy intensive reverse osmosis. Carbon aerogel/fiber based electrodes are used in this study because of high conductivity, relative inertness in chemical environment, porous structure, and ideal shape for the capacitive deionization based experiments. The change in their adsorption capacity and extent of regeneration is investigated by acid treatment and conductive-metal coating. The characterization of the electrodes before and after treatment were conducted and compared. Experiments were conducted in semi-batch mode for adsorption as well as desorption phase. The adsorption phase experiments were conducted to desalinate water and to measure ion removal capacity of electrodes. Desorption experiments were conducted to regenerate electrodes that were saturated in adsorption phase. Results are compared to demonstrate the effects of surface treatments of these electrodes.

Elien, L., K. Oates, and A. Nunsett. GSU. **Development of device to increase pedestrian safety on crosswalks at Grambling State University.**—Our work reports presents the design and development of a device to increase pedestrian safety on the crosswalks on R.W.E. Jones drive on the campus of GSU. Pedestrian safety is a major component of efforts to prevent road traffic injuries. Pedestrian collisions are not only predictable but preventable. There are different devices designed to help prevent collisions on crosswalks such as radar speed signs with display of the speed and LED flashing beacons. The device developed senses when a pedestrian is near the crosswalk and alerts drivers to the presence of the pedestrian. The main components are microcontroller, an infrared sensor, and amber lights. The main tasks done for this project were circuit design, microcontroller programming, circuit fabrication, testing, and package design. Hopefully this device will help to improve pedestrian safety at GSU.

Elkins, B., C. Tummala, M. Ahmed, and S. Tewari. LTU. **Investigating efficiency of a do-it-yourself biosand filter for removal of disinfection byproducts from water.**—Slow sand filtration is a common step in the secondary phase in wastewater treatment. Over time, a biological predatory layer will develop at the top of the filter. When this occurs, the filter is known as a biosand filter (BSF). The effectiveness of this biological layer in a small scale do-it-yourself BSF is investigated against chosen contaminants and is the main subject of this study. Specifically, the performance of BSF is compared with a low-cost activated carbon based do-it-yourself filter and another hybrid BSF. The chosen contaminants are disinfection byproducts (DBPs) and other commonly found contaminants. Many DBPs may be classified as carcinogens, so this method may have health benefits on a municipal scale. The effect of initial contaminant concentration on quality of filtered water will also be tested. The results of this study will be compared to existing research on BSFs efficiency.

Farrar, K., and B. Hollins. LTU. **Evaluating the selectivity of CTP-capped gold nanoparticles for calcium in paper based microfluidic devices.**—Microfluidic paper-based analytical devices (micro-PADs) are a growing class of low-cost chemo/biosensing technologies designed for point of care applications. Calcium is an important cation in numerous fields, from environmental

monitoring to biomedicine. The goal of this project is to develop a paper-based microfluidic sensor for calcium using immobilized gold nanoparticles. The device is fabricated utilizing a solid ink printer that creates hydrophobic barriers and hydrophilic channels on chromatography paper. The fluid is applied to the device and through capillary action, the fluid flows toward the detection region, which contains the immobilized gold nanoparticles. We use immobilized functionalized gold nanoparticles as the sensing method for calcium. These nanoparticles are “tunable”, enabling detection of calcium at different concentrations in a sample. In this work, we investigate the “tunability” and selectivity of gold nanoparticles when capped with cytidine triphosphate (CTP) to Ca^{2+} ions over various cations including magnesium, potassium, and zinc. The investigation into these properties sought to determine the detection range of the CTP capped gold nanoparticles when they are immobilized into the chromatography paper. This proof-of-principle work establishes the foundation for a rapidly deployable microfluidic platform for assessing calcium in resource-limited environments in a point-of-care testing device.

Green, H., and B. Hollins. LTU. **Controlling hydrophobic barrier depth in paper based microfluidic devices.**—Paper-based microfluidic devices are rapidly becoming an alternative to traditional polymeric microfluidic devices as powerful analytical tools. Paper-based microdevices are created by placing hydrophobic barriers in paper, creating hydrophilic microchannels. Our device is fabricated using a solid ink printer and chromatography paper. Once the design is printed onto the paper, the paper must be heated in order to melt the wax through the paper. Controlling the temperature and the time of heating dictates the depth of the wax through the paper. Factors affecting the time and temperature of the heating process are the wax color and the printed design dimensions. We are attempting to quantify the wax depth in the paper, using an equation that accounts for physically measured parameters, including the volume of fluid loaded into the paper and the surface area of the fluid in the device. We use a colored fluid for simple qualitative affirmation of fluid loading into the paper. We use ImageJ to quantify surface area. Precise control of wax penetration depth could lead to the development of intricate, three dimensional paper-based microfluidic devices within a single sheet of paper, and provide a foundation for novel micromixing methodologies in paper-based analytical devices and advanced point-of-care diagnostic tools.

Gyawali, S. LTU. **Interaction of metal nanoparticles on silica surface: A DFT study.**—Interaction of metal nano-particles with support like silica plays an important role towards the activity, selectivity, and other characteristics of many heterogeneous chemical reactions. Most of the CO oxidation and CO hydrogenation reactions are catalytic reactions which use transition metal as a catalysts and silica, rutile, and alumina as a support for catalysts. Weak interaction between metal particles and the support may lead towards the aggregation of the particles on its surface under certain reacting condition thus resulting in the reduction of active surface and affecting the catalyst’s activity. On the other hand, most metals show strong interaction with the oxidic supports which may result in the formation of metal oxides, which is not good for some reactions such as Fischer Tropsch. Therefore, surface properties of support somewhat alters in the dispersion and the reducibility of the metal particles, thus affecting the performance of the catalysts. The interaction of cobalt, iron, and ruthenium cluster consisting of 13 atoms on different planes of crystalline silica surface has been investigated using density functional theory. DFT study shows that ruthenium strongly adsorbs on the silica interface with the binding energy of -23.57 eV. Similarly, DFT study shows that cobalt cluster strongly adsorbs on the silica

surface with the binding energy of -13.82 eV and iron cluster strongly adsorbs on the silica surface with the binding energy of -16.41 eV.

Henderson, D., and N. Seetala. GSU. **Magnetization studies of $Mn_xZn_{1-x}Fe_2O_4$ ferrites nanoparticles***.—MnZn-ferrites are widely used for high-frequency magnetic core materials because they have low power loss and high permeability high frequency range up to several MHz. $Mn_xZn_{1-x}Fe_2O_4$ ($x= 0.5, 0.6, 0.7$) ferrite nanoparticles were prepared using chemical co-precipitation methods in order to be used as a feed stock for additive manufacturing magnets. A vibrating sample magnetometer (VSM) was used to study the magnetization characteristics of these ferrite nanoparticles at various temperatures between 20°C and 300°C. At room temperature (~20°C), the magnetization increased with increasing concentration of Mn. As the samples were heated, the magnetization decreased till about 225°C and followed by a small increase for all compositions. The magnetization is non-symmetric for positive and negative applied fields. The asymmetry increased with increasing temperature. This study helps us to determine the range of the operation temperature of the magnet. *Work supported by CIMM grant from NSF EPSCoR.

Hossain, M., N. Mueller, and A. Prabhu. LTU. **Development of a multiplexed electrochemical microsensor array for simultaneous monitoring of reactive oxygen species and antioxidants.**—OS (oxidative stress) is caused by an imbalance between overproduction or inadequate detoxification of reactive oxygen species (ROS). Several methodologies are currently available to determine OS, e.g. redox measurements, immunohistochemical marker detection, quantification of oxidative damage markers and the quantification of the strength of the antioxidant defending system (HPLC, antioxidant capacity, TAC). Among them, the evaluation of TAC through voltammetry measurements is the only technique that can determine OS levels real-time in bodily fluids and tissues. In this work, we propose an innovative electrochemical approach towards the detection of ROS by assaying TAC. Platinum microelectrode arrays will be microfabricated and surface-modified with carbon nanomaterials and polymer coatings to achieve simultaneous monitoring of H_2O_2 (long-lived ROS) and multiple oxidants (a measure of TAC) with high sensitivity and selectivity. This new enabling microsensor technology will also allow characterization of the influence of several other low molecular weight antioxidants on ROS in cells and rodents.

Kharashi, K. LTU. **Enhanced composite porous electrolytes NO_x sensors.**—Partially-stabilized zirconia is commonly used as the electrolyte to fabricate NO_x exhaust gas sensors, due to the temperature tolerance and high mechanical integrity to stringent exhaust gas conditions. Recent porous electrolyte NO_x sensor studies found that adding up to 2 wt.% Al_2O_3 to PSZ electrolyte increased the sensitivity of the sensor to NO_x , and further increased mechanical durability. In other NO_x sensor works, PSZ-FSZ composite electrolytes were studied as PSZ provided mechanical strength and FSZ enhanced the NO_x sensing response of the sensor. This study also found, PSZ-FSZ based sensors demonstrated higher sensitivity to NO_x compared to previous study as well as less cross-sensitivity to water, which typically interferes with the sensing response when present in the exhaust gas. Given the beneficial properties of PSZ, FSZ and Al_2O_3 , the present work explored the potential of a PSZ-FSZ- Al_2O_3 composite electrolyte for NO_x sensing fabricated based on standard ceramic power processing methods.

Matthews, S. LTU. **Design and optimization of a thermal-actuated microvalve.**—We are currently engaged in designing and developing thermal-actuated microvalves for microfluidic devices. The valve incorporates a heat source that causes a change in the density of a thermal-sensitive fluid located next to a “pushdown” membrane. When the fluid expands as it is heated, it presses against the membrane closing the channel; as the fluid cools, the membrane relaxes and the channel opens up again. We believe this method should reduce the occupied space needed for traditional pneumatic valves. We aim to optimize the design to achieve power requirements and response time equivalent to those for pneumatic-controlled systems. We will show that the selection of a fluid that undergoes vaporization should significantly decrease the density at a low power expense and may decrease response times. We are also modeling these microvalves in a series configuration to demonstrate their potential to be used as a micro-pumping system.

Miraz, A., R. Ramachandran, and C. Wick. LTU. **Computational study on failure near the interfacial regions of metal-ceramic systems under shear loading.**—A thin metal interlayer is often deposited between the substrate and the ceramic coating to strengthen the adhesion between these layers applied in gears, rotating cutting tools, electronic packaging systems etc. In this work, first principles ab-initio Density Functional Theory (DFT) calculations have been performed on 9 metal/ceramic systems- combining three metal phases (Ti, Cr and Cu) and three ceramics phases (TiN, CrN, VN) separately to each other. Calculations of the work of adhesion (WoA), 2-D generalized stacking fault energy (GSFE) and electron density near the interfacial region were performed for these systems having nano-sized dimensions. Our findings qualitatively conform to the recent experimental reports on Ti/CrN and Cu/CrN micro-pillars that the failure under shear loading occurs within the metal phase near the interfacial region. Electron density profile has been found to be an excellent initial diagnosis of the strength of the interfacial region deforming under shear force.

Tranter, S. LTU. **Selective capture of nitrosylated proteins via a PMMA microfluidic platform.**—A basic physiological response, such as inflammation as a result of exposure to an outside agent, can be difficult to manage in spaceflight. Nitrosylated proteins occur in the human body as a byproduct of natural physiological events, but occur in high quantity in response to inflammation. Tracking levels of nitrosylated proteins can enable the tracking of inflammation to help isolate the cause and potential dangers. I propose to develop a microfluidic chip that is capable of selectively capturing nitrosylated proteins from a sample. These proteins will be eluted from a PMMA chip following capture and will be processed using a standard analytical technique to demonstrate the method’s applicability for downstream analysis. The proposed device is inexpensive, easy to use, and disposable, reducing the possibility of cross-sample contamination. Minimizing the size of this assay to a microfluidic platform will eliminate the need for a central lab and make spaceflight testing for nitrosylated proteins a simple procedure. In this presentation, focus will be on the surface chemistry of the device that enables protein capture, as well as channel modelling for the chip design and fluid dynamics. There are currently no microfluidic techniques that selectively capture nitrosylated proteins.

Van Houten, S., and B. Hollins. LTU. **Evaluating paper pretreatment for optimization of paper-based microfluidic calcium detection.**—Paper-based microfluidics are becoming an attractive alternative to traditional microfluidics for the purpose of conducting molecular assessments, due to their low cost and relatively simple fabrication techniques. In this work, we are developing a microfluidic device to detect calcium ions in samples using immobilized gold

nanoparticles. However, because of the chemical composition of the paper, pretreatment is required to ensure the calcium can be delivered to its target location on the paper. This work is focusing on utilizing different paper pre-treatment for the effective delivery of calcium to the gold nanoparticles for detection. The three pretreatments used were Tween 20, polyethylene glycol (PEG), or polyvinyl alcohol (PVA) as 1% w/v solution. Results indicate Tween 20 is the best paper treatment method for containing the gold nanoparticles. We also considered the paper pretreatment being coupled with anime-coated chromatography paper to increase the sensitivity of the calcium detection method. Successful development of a method to detect calcium on paper-based microdevice can advance molecular diagnostic capabilities in resource-limited environments using point of care lab on chip devices, such as long-term space flight applications.

Yan, H., and J. LaCoste. ULL. **Synthesis and characterization of mesoporous CeO₂.**—Ordered mesoporous metal oxides has been of interest, due to the controllability of structure, surface area and pore volume of the mesoporous structures, and they serve as excellent supports for water gas shift reaction (WGSR). Mesoporous CeO₂ was synthesized using hard casting method by infiltrating Ce(NO₃)₃•6H₂O to the mesoporous silica template SBA-15 and then calcinating in air, and the SBA-15 template was then removed by NaOH. This material was then impregnated with tetraammineplatinum (II) nitrate and calcinated in a furnace to synthesize the catalyst (Pt-doped CeO₂) for the WGSR. The mesoporous CeO₂ and Pt-CeO₂ were collected and characterized using a variety of methods such as infrared spectroscopy, scanning electron microscopy, tunneling electron microscopy, and Brunauer-Emmett- Teller surface area analysis. Future work for this project may include determining the reaction pathway of WGSR on the synthesized catalyst.

Math and Statistics Section

VanderSchaaf, C. LTU. **Developing a simple longleaf pine plantation growth and yield model for the Gulf region.**—Despite its timber value, only a few growth and yield models have been developed for longleaf pine (*Pinus palustris* Mill.) plantations. This study examined the ability of four modeling approaches to estimate merchantable volume in the Gulf region. Data from USDA Forest Service Forest Inventory and Analysis (FIA) annual surveys conducted in the Gulf were used. Two approaches predicted volume as a function of previous volume. A third approach first estimated basal area as a function of age and previous basal area and then predicted volume as a function of the predicted basal area. The fourth approach first predicted a diameter distribution and then stand-level volume was estimated. Based on independent validation data from four different studies in the Gulf, the approach predicting volume as a function of initial volume and age and the approach that first predicts basal area and then volume produced the best predictive statistics.

Curdy, A. LTU. **Incorporating spatial hysteresis damping into a flexible wing micro aerial vehicle model.**—Unmanned aerial vehicles have been an area of interest in both research and industry for the past several decades. In order to accurately model for a composite, flexible wing aircraft, there is need for a more complex framework which takes into account the non-linear, spatially varying components associated with the frame. In this case, the application under consideration is the internal damping coefficients. We wish to improve upon previous internal

damping models by introducing spatial hysteresis damping, a non-local internal form of damping, into the beam model. In order to compare damping mechanisms, experiments were conducted in which a time history of the displacement at the tip of a cantilevered beam was measured. The optimal parameters were found for each model using a least squares cost equation for comparison with the measured data. These damping parameters were then incorporated into the generalized beam equation so that performance could be evaluated.

Physics Section

Chen, Y., and R. Beminiwaththa., LTU. **Simulation of the radioactivity for the Moller experiment using FLUKA.**—The MOLLER experiment is designed to precisely measure weak charge of the electron from the parity violating asymmetry in electron-electron scattering (Moller scattering) at the Jefferson Lab and test the Standard Model. In this research we studied the material activation of the target area, beam intercepting collimators and the whole experimental hall where the MOLLER experiment is located. Activation measurements were obtained at 1 hour, 1 day, and 1 month after the electron beam is incident on the hydrogen target continuously for 7 days. Simulation of the radiation was performed using FLUKA, fully integrated particle physics Monte Carlo simulation package with many applications in high energy experimental physics and engineering, cosmic ray studies, dosimetry, medical physics and radio- biology. The results can help us to better understanding the radioactivity after running the MOLLER experiment.

Ismael, T. LTU. A. Robinson, and J. JnoBaptist. GSU. P. Derosa. LTU. **FT-MD investigation on oxidation in CrCoFeNi high entropy alloy surfaces.**—Remarkable corrosion resistance, structural strength and mechanical performance at high temperatures are prevalent properties of high entropy alloys (HEAs). However, subject to extreme temperatures such as during the selective laser melting (SLM) process, oxidation resistance is affected. Cr is known to migrate and precipitate to form protective chromium oxide layer on HEA surfaces. In this work, we study CrCoFeNi surfaces via ab-initio quantum mechanics and density functional theory - molecular dynamics (DFT-MD) to understand its microstructural properties and oxide formation patterns in HEAs. An FCC lattice structure for CrCoFeNi is maintained with geometric parameters in good agreement with experimental data. Furthermore, oxygen-to-alloy surface binding energy is higher at Cr rich sites, then Fe sites, thirdly at Co sites and the least at Ni rich sites indicating that chromium and iron oxide formation is energetically favorable. These findings provide for further computational studies on surface oxidation mechanisms in HEAs.

Pathak, D., and R. Beminiwaththa. LTU. **Optimizing shielding for the MOLLER experiment: An ultra-precise measurement of the weak mixing angle.**—The MOLLER experiment is proposed to measure the parity-violating asymmetry in the scattering of longitudinally polarized 11 GeV electrons off unpolarized electrons in a hydrogen target at Jefferson Lab. The proof-of-concept shielding design for the MOLLER experiment is very large in size and very expensive to build. Therefore, the next step to optimize the shielding which will reduce radiation level to a safe limit with less material and low cost. The rate (Hz/ μ A) and power (W/ μ A) of the electrons, photons, and neutrons are estimated for different thicknesses and different materials of the shielding using Geant4, a free software package which can be used to accurately simulate the

passage of particles through matter. We have used the data from PREX (Lead Radius Experiment) as our reference radiation level for MOLLER. The progress of the shielding optimization will be provided in the talk.

Stroud, A. LTU. C. Muratore. UD. R. Berry, G. Leuty, and R. Rao. AFRL. P. Derosa. LTU. **Molecular and electronic interactions at the graphene, MoS₂, SiO₂ interface.**—Over the past decade two dimensional (2D) materials have shown to possess both unique electrical and mechanical properties that make them strong candidates for next-generation applications in ultra-thin electronics, biosensors, and 3D printing. In this study, classical molecular dynamic (MD) and density function theory (DFT) simulations were used to investigate the electronic properties of system consisting of graphene and molybdenum disulfide (MoS₂), while on amorphous silica (SiO₂) and in the presence of biomolecules. The binding mechanics of protein adsorption on 2D materials was examined by analyzing the displacement, Van der Waal and Coulombic interactions of each amino-acid residue in a polypeptide chain to a given surface. Once adsorbed onto the surface, charge transport characteristics at the molecule/material interface and between surface materials in a heterojunction structure were identified using density of states, electron density, and potential energy curves provided from DFT calculations.

Taylor, J., and F. Ohene. GSU. **Density functional theory approach in using FTIR/NMR computational methods in evaluating the degradation behavior of epoxy polymers.**—The degradation reaction mechanism of polymers derived from ethylene glycol and 1, 3 propane diol, 3-(pyridine-4-yl) pentane 1,5-diol and 5-phenyl methoxy-pentane 1,3-diol were investigated using density functional theory methods with 6-31G(d) basis set. A number of pyrolytic reaction pathways were proposed and these were followed by FTIR and NMR spectroscopic computation study methods providing vibrational and NMR patterns. The FTIR and the NMR patterns of the degraded products were compared to that of the parent polymers. This allowed the evaluation of the mechanism of the degradation of these polymers. The energy of activation computed for the polymer synthesized from (ethylene glycol and 1, 3 propane diol) degradation using the Transition State Optimization with opt=TSQ2 proceeded with 18 cycles. Each cycle, however, gave an activation energy of EA=-8.525 kJ. The results do show that the degradation processes are energetically favorable indicating two possible weak sites susceptible to H⁺ or OH⁻ attack.

Division of Science Education

Higher Education Section

Ayeni, F., S. Craig, M. Adewunmi, V. Mbarika, and J. Caldero. SUAMC. **A mixed methods inquiry into the quality of instructional designs and use of Moodle learning management systems: Case study of an Historically Black College and University.**—There is no doubt that the demand for e-learning has increased tremendously across the globe. Our main observation is that both students and faculty have expressed overall satisfaction in the use of E-learning systems and educational technologies. From concept to content, there have been calls for quality assurance in E-learning most especially in the area of instructional designs (IDs) and use of learning management systems (LMS). Quality management is a vital part of any E-learning application. Tertiary institutions have spent heavily and are soon expecting return on investments which cannot be undermined. The purpose of this study is to investigate quality in instructional designs and use of Moodle LMS. Faculties of Southern University, an historically black college and university (HBCU) were interviewed to identify current state and perceived challenges as well as helpful components based on their online experiences. A survey was also carried out to further support our qualitative inquiry. Results of this study indicated that most students and faculty need an open mindset, motivation, standardized course design, time management and comfortableness with online educational technologies to achieve quality. Interviewees also indicated difficulty in understanding the use, technical problems, cost and lack of training as challenges. Suggestions for addressing the challenges were provided.

Ayeni, F., M. Diack, and V. Mbarika. SUAMC. **A Review of learning techniques: Evidence from practice testing.**—The global system of education has suffered a lot of setbacks which have yielded little or no positive outcome but backwardness for aspiring scholars and students. Enormous efforts have been made to improve educational objectives and outcomes through various solutions, at the heart of these solutions are the use of effective learning techniques developed by cognitive and educational psychologists. These techniques include but are not limited to practice testing, keyword mnemonic, rereading, imagery use for text learning, interleaved practice, highlighting, self-explanation, elaborative interrogation, summarization and distributed practice. The above mentioned techniques were selected based on usability index and general acceptance and adoption by students. Some of these techniques have received high and moderate assessments. Distributed practice and practice testing were presumed as the best due to their fit-for-all purpose, because they can be used in K-12 through Higher Ed and have been proven to increase performance of students in different contexts and platforms. Interleaved practice, self-explanation and elaborative interrogation received normal utility assessment due to limited evidence in efficiency and effectiveness, evaluation and exploration. Moreover, these techniques have proven to be useful in various situations and circumstances where applicable. Meanwhile the remaining 5 techniques received low utility ratings owing to numerous reasons such as limited benefits and extent to which research has been carried out. This article focuses on practice testing as one of the techniques that received high utility assessment, its effect on student learning, generalizability, practical application in educational contexts, issues and application.

Division of Sciences and Humanities

Alonzo, L., E. Varela, A. Gonzalez, R. Dupont, B. Harris, and A. Hart. LU-NO. **The relationship between interpretive biases and autonomic system response.**—Background. Individuals who interpret ambiguous scenarios as dangerous or threatening are more likely to experience cognitive and behavioral symptoms of anxiety than those who do not make such interpretations. The purpose of this study is to examine if an increase in such danger or threat related interpretations is also associated with physiological symptoms of anxiety. Methods. 30 college students will be administered questionnaires to assess anxiety, interviewed to assess interpretation biases, and exposed to three video stressors while their heart rate, blood pressure, and galvanic skin response are being measured using the Biopac MP160 system. Participants will also rate their mood before and after the video stressor. Data collection is ongoing; it will be complete and all analyses done by the time of the conference. Current n = 7.

Boudreaux, M., and J. Doucet. NSU. **Medical forensics of an historical cypress mill town pharmacy in Lafourche Parish.**—We report on a series of pharmacy inventory ledgers from the historical cypress mill town of Bowie, Louisiana, active 1895-1917 and located north of Raceland, Louisiana. Three inventory ledgers, dating up to 1917 when fire destroyed the largely wooden town, were donated for preservation by successors of the historic J.J. Ayo Pharmacy of Bowie to the Archives and Special Collections at Nicholls State University. Ledger information consists of three end-of-year shelf inventories from the town pharmacy. We transcribed, sorted, and assessed usage of specific historical pharmaceuticals and other treatments. These inventories provide insight on the state of medical practice and pharmacy in rural southeastern Louisiana during in the early years of the 20th century. Analysis of this information provides a unique picture of Louisiana medicine and contemporary during the period of U.S. history toward the end of WWI, as well as of life in rural bayou cypress swamplands.

Doucet, J. NSU. **Lincoln's thalamus and other gray matters--A third 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 frequent, scientists writing in poetic forms (Maxwell, Oppenheimer, Huxley), not to mention the all-too-frequent use of terms like “DNA” and “electrons” in popular communication. In revival of the tradition, this presentation is a third 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 include GPS-mapping of the Faroe Islands using wandering sheep, as well as a little-known and unoccupied chamber carved in the backside of Mount Rushmore.

Giguette, R., and R. Alexander. NSU. **Zeno's paradox: How accurately does geometry model 3-dimensional space?**—Imagine you are traveling from point A to point B. If your strategy is to travel half the distance, then half of the remaining distance, then half of that remaining distance, and so on, you will never reach point B. The Greek Philosopher Zeno described this apparent paradox in approximately 500 BC, and several explanations have since been proposed. In ours,

we claim the problem results from the misapplication of concepts such as “point”, “line”, and “distance”. Zeno’s Paradox may be that geometry imperfectly models 3-dimensional space.

Gonzalez, A. LU-NO. **The Relationship among parental conditional positive regard, emotion dysregulation, and anxiety in college students.**—Parental conditional positive regard (PCPR) is an approach used by parents that promotes internalization of valued behaviors by giving their children more regard when they meet parental expectations. However, research has identified a relationship between this parental strategy and emotion dysregulation in children and adolescents. Emotion dysregulation can be characterized as poorly modulated emotional responses, including introjected motivation, and has been previously linked to the development of anxiety. The purpose of this study is to further investigate the consequences of PCPR and to determine if there is a relationship between this parenting practice, emotion dysregulation, and anxiety. It is hypothesized that the positive correlation between PCPR and anxiety will be explained by emotion dysregulation. Furthermore, because a causal relationship between interpretative biases and anxiety vulnerability has been established, it is also hypothesized that interpretative biases moderate the relationship between emotion dysregulation and anxiety.

Menendez, S., and K. Yurgil. LU-NO. **Brain activity associated with gender and racial occupational stereotypes.**—Women and racial minorities have been consistently underrepresented in high-salaried occupations. This lack of diversity within certain occupations may contribute to occupational stereotyping, which in turn may lead to unfair hiring practices. Prior research has shown that changes in electrical brain activity may be associated with stereotype biases. This is the first study to examine the neural correlates of gender and racial bias as they relate to occupational stereotypes. Thirty undergraduate students will read sentences containing a name followed by an occupation that is stereotypically congruent (i.e., female name + stereotypically female occupation) or incongruent (i.e., female name + stereotypically male occupation). Names will vary by gender (male, female) and race (white, black). An electroencephalogram will be used to record electrical brain activity during the sentence reading task. It is hypothesized that incongruent pairs will evoke larger brain responses compared to congruent pairs.

Morris, A. LTU. **Digital painting and medical illustration.**—Medical illustration is an effective tool that allows people to more clearly and accurately visualize medical and other scientific information. There are many applications in the medical illustration field, but one of the most common is education, whether the artwork is used in textbooks, courtrooms, or online. The Visual Integration of Science through Art (VISTA) program at Louisiana Tech University aims to use art to more effectively communicate scientific material. One class offered by this program is a Digital Painting class which teaches students how to “paint” entirely digital pieces using Photoshop software. This class and medium gives students an experience similar to working in the medical illustration field. The final project in the class is a biological illustration piece that depicts a process or structure that is being researched at the university. The goal of the project is to create a visually pleasing design while remaining scientifically accurate.

Nerbovig, M., and K. Yurgil. LU-NO. **Musical interventions and brain activity associated with attention.**—As anxiety disorders remain a frequent health concern, one potential treatment is music therapy. However, there is little research on the neural activity associated with music and its relation to anxiety. This study investigates the effects of music activities on anxiety, as

measured by an Emotional Stroop Task. Forty-five non-musician students from Loyola University will be recruited and will complete music history and anxiety questionnaires before being randomly assigned to one of three music activity conditions: no music (control), passive listening, or drumming. After the activity, participants will complete an Emotional Stroop Task in which participants respond to the color of neutral and negative valence words. Response time and brain activity associated with neutral vs. negative words will be measured using an electroencephalogram. It is hypothesized that brain activity and response time to negative words will be reduced in the music conditions compared to the control conditions.

Division of Social Sciences

Abam, C., and V. Mbarika. SUAMC. **Causes of poverty in developed nation states “Case study of the USA”**.—The goal of this paper is to identify the key elements that cause poverty in developed countries, in slightly different words, countries that are industrialized or a nation state that have a highly developed economy and an advanced technological infrastructure, for example the United States, England or France, relative to other less industrialized nations, generally known as the developing countries, to which the term poverty is usually used as a stigma to describe them.

Ayeni, F., A. Lawson, and V. Mbarika. SUAMC. **The effect of tobacco use by parents on high school students in USA**.—According to the National Institute of Drug Abuse (NIDA, 2016), the use of tobacco is the leading preventable cause of disease, disability and death in the USA. The Center for Disease Control (CDC) also concluded that about 16 million people suffer with a serious illness caused by smoking (CDC, 2016). In fact, for every individual that dies from tobacco use, about 30 more suffer from at least a smoking-related illness. The office of smoking and health in 2016 reported that approximately 80% of tobacco use occurs for the first time among aged < 18 years. It is expedient to note here that high school students fall in between the ages of 11-18. The prevalence of cigarette smoking among adolescents increased during the early 1990s. The CDC concluded that smoking among high school students in the USA rose from 27.5% in 1991 to 36.4% in 1997 (CDC, 2016). This paper aims at exploring the extent to which parents’ tobacco smoking affects high school students in the USA.

Brousse, C., and C. Nichols. LU-NO. **Effects of mortality salience on risky decision making**.—Based on propositions derived from terror management theory (TMT), the effects of mortality salience have different implications on judgments and behavior. The purpose of this study is to investigate the effects of mortality salience on participants’ decisions whether to engage in risky behavior in recreational, health/safety, financial, and ethical decisions. It is hypothesized that individuals in a mortality salient condition, as opposed a non-mortality salient condition, will be less likely to engage in behaviors that involve dangerous recreational activities, hazardous health/safety decisions, and negative ethical decisions and more likely to engage in behaviors that involve financial risks. Participants in one condition will be provided with a writing prompt asking them to write about the feelings they experience when thinking about their death, while participants in the second condition will be asked to write about the feelings they experience while undergoing a painful dental procedure.

Chirewa, R., N. Omoregbe, F. Ayeni, and V. Mbarika. SUAMC. **Bridging the gap on financial inclusion: A review on mobile money in Kenya**.—The evolution of the mobile money platform has made financial inclusion possible across different classes of people, and across different demographic regions in Africa. Mobile money as a digital repository of electronic money allows peer-to-peer transaction between mobile device users. The platform has made it feasible for people to send and receive money at a lower cost without the use of the internet, or without users physically having to travel far to the bank. It has facilitated financial inclusion in most African countries. People in the rural areas and in the outskirt communities in developing countries can partake in trading, and can make payments through the mobile money platform. This new form of financial inclusion, has stimulated employment. The demand for mobile phones and its

accessories (such as airtime and phone repairs), has increased tremendously. Despite the challenges that this platform may face such as security and poor infrastructure, this platform continues to grow in many developing countries, providing more important service that provides financial inclusion. The paper using the M-Pesa case study has provided some insights into what other countries need to evolve novel platforms that could facilitate financial transactions and boost economic development.

Mbah, R. SUAMC. **Cruel Choice: The ethics and morality of the death penalty.**—The death penalty has been and will continue to be a highly debated issue in society. The question remains: Is it right to take something you did not give or own? In this context, is it right to take life? It puts into question ‘the natural right of man to life’ enacted by most of such governmental constitutions who still consider death penalty as a form of punishment. What if a blood relative was savagely murdered by someone, would the humanistic instinct of revenge not come to play? As a critical aspect, the state frowns at vigilantism in order to avoid such disorder in society. Although there are views in favor of the death penalty, many consider it as a ‘Cruel Choice’. Aristotle giving an answer to his question on what is the end of the state said the end of the state is to produce ‘good’. Picking up from this question, Jeremy Bentham, an advocate of utilitarianism asked a similar one. Jeremy asked what was the end of legislature and answered it by saying the end to legislature is to produce the greatest happiness for the greatest number. He was a force behind the abolition of the death penalty in England. This paper gives a background history of death penalty, the various forms of death penalties and crimes that lead to it. It brings out the moral/ethical views and justifications that oppose death penalty. It brings out stories of murder victim families who regret or deny death penalty as punishment to the murderers of their loved ones. More so, it brings out reactions from family members who have lost their love ones through death penalty. America is used as the prime case study for this paper and the paper concludes with the moving trend of opinions in favor or against the death penalty in America.

Mbah, R., and A. Appeaning. SUAMC. **An evaluation of Louisiana state agencies understanding and usage of LaPAS.**—Every Louisiana agency who receives an appropriation in the general appropriation act or the ancillary appropriation act is supposed to produce a number of performance reports according to the Louisiana Government Performance and Accountability Act (Act 1465 of 1997). The Louisiana Performance Accountability System (LaPAS) is an electronic performance database used to monitor every agency's actual performance vs. standard performance. The question is: how well do these agencies understand or effectively report the various components in this system and most especially the indicators? This research focuses on getting secondary data from various agencies LaPAS report to in order to examine how well they understand its components and procedures. It was discovered that many agencies still do not know how to use the LaPAS database, most cannot differentiate the various indicators and their period of reporting and a lot more errors were noticed. Conclusively, a proper training needs to be established on LaPAS.

Mireille, M., and V. Mbarika. SUAMC. **Imbalance of health workers in Sub-Saharan Africa.**—Health workers or health personnel are all people whose main activities are aimed at enhancing health. They include the people who provide health services. Imbalance of health workers/personnel according to the World Health Organization, is a growing concern in Sub-Saharan Africa. Imbalance of health workers in Sub-Saharan Africa is a complex issue which sometimes results in poor health care delivery. This paper aims to contribute to a better

understanding of the issues related to imbalance through a critical review of its definition and nature. This paper also places emphasis on the different factors affecting health workforce imbalances in Sub-Saharan Africa. There are a number of reasons for the shortfall, including a lack of funding for education and training, international migration and career changes among health workers, illness, premature retirement, and even premature deaths.

Mungwe, R., G. Lisanawati, F. Yari, J. Noguera, and V. Mbarika. SUAMC. **Fintech aspects in money laundering: What can law and IT do to control.**—The penetration of technology through Fintech has created huge impact in payments and transfer, personal finance, alternative financing, and insurance. (Information Technology & Innovation Foundation, 2016). An illegal transaction is made (drug dealings, sale of arms etc.) and huge profits are generated and re-invested into legal transactions (multiple wiring, complex legal purchases, etc.) through financial institutions (banks, digital/mobile payment services, life insurers etc.). According to the United States Treasury Department, “Money laundering is the process of making illegally-gained proceeds appear legal”. Money laundering destroys value. It facilitates economic crime and nefarious activities such as corruption, terrorism, terrorist financing, tax evasion, illegal drugs, and human trafficking, by holding or transferring the funds necessary to commit these crimes. The precise number and volume of money laundering itself is difficult to be defined since there is no availability of reliable data. Fintech in its existence is recognized as an Information industry where money will straightforwardly be represented by money value. The prosecution process of Liberty Reserve has dragged the problem of Fintech Industry compliance to Anti Money Laundering compliances. This paper seeks to evaluate the extent of cross border payments and money laundering. This paper develops and elaborates on the following hypotheses: The development of Fintech; opportunity and challenges, Compliance and due diligence role, Technology accelerating pace in Fintech, and ICT and Law collaboration to control money laundering.

Nicholas-Omoregbe, O., N. Omoregbe, T. Pruitt, S. Okuboyejo, and V. Mbarika. SUAMC. **Technology adoption in a Historically Black College and University: An empirical study.**—Technology adoption theories examine the decision of individuals to either accept or not to accept a particular technology for use or for integration into the whole organization. Traditionally, the models of technology adoption identified a number of factors that could predict the adoption of a particular technology. However, the factor of technology culturation which may influence technology adoption has not been given a proper place. A few studies have been carried out to predict the level of influence of technology culturation factor on technology adoption, but there seem to be no existing study that ascertains its influence in an HBCU. The concept of technology culturation which is a critical factor for the adoption of e-learning tools and facilities in higher institutions of learning will be empirically examined in this study. The concept of technology culturation asserts that individuals who had previous exposure to relative technologies such as cable satellites, television, video games, etc. are already tuned in their minds or acculturated to the use of technology; the concept assumes that this can affect an individual’s acceptance of other ICTs or other advanced technologies afterwards. Drawing upon the Unified Theory of Acceptance and Use of Technology (UTAUT), and the variable of technology culturation, an empirical based model will be developed to identify the predictors of technology acceptance/adoption. The study will use Smart Partial Least Square-Structured Equation Modeling (PLS-SEM) to examine the pattern of inter-correlation among the constructs.

Survey research method involving 250 respondents who are undergraduate students of an historically black college and university in the US would be engaged.

Pruitt T. SUAMC. S. Nicholas-Omoregbe. CU. V. Mbarika. SUAMC. **Improving educational outcomes for African-American males in Louisiana through equal educational technology access: The missing link.**—The educational landscape in the United States is transforming with the advancement of technology and innovation. According to Cox, Cougan, & Little (2017), education is experiencing a digital renaissance, with new ideas and strategies that are constantly emerging and reshaping our schools’ cultural landscapes. Research from the center for social inclusion found that our economic future depends on everyone having access to this vital resource, and poor communities and communities of color should not be left behind. Unequal access to internet and technology is an urban problem because people of color who live in urban communities, tend to live in older buildings and communities due to years of housing discrimination and poverty. Federal statistics show that on average 69% of American households have broadband access at home, but only 59% of African-American homes and 49% of Latino homes have broadband access. The lack of infrastructure to be able to provide broadband equity is keeping these groups in a state of “digital dark”, which blocks them from being able to keep up in schools and lose their competitive edge in the job market. The purpose of this research is to examine the academic achievement gap between African-American males and their peers from the lens of unequal access to internet and technology. Through research, policy recommendations will be made to attempt to provide a model for broadband equity both domestically and abroad to improve the educational outcomes for African-American males.

Twitchell, P., and E. Zucker. LU-NO. **Personality and drug use by ADHD and non-ADHD students.**—Relatively little is known about drug and alcohol use by college-aged students diagnosed with Attention Deficit Hyperactivity Disorder (ADHD). A modified version of the American Drug and Alcohol Survey will be used to assess frequencies of nicotine, alcohol, cocaine, amphetamine, and marijuana use by college students with and without ADHD diagnoses, with “Big Five” personality also measured. Differences in drug use and personality traits will be assessed between students with and without ADHD, as will differences between those with ADHD taking prescribed medications and those not. It is hypothesized that students with ADHD will use alcohol and illicit drugs more frequently than those without ADHD, and those diagnosed with ADHD but not taking medication will use alcohol and other drugs more frequently than those without ADHD diagnosis. Further, students who use illicit drugs more frequently will have higher scores for neuroticism, openness, and extroversion and lower scores for conscientiousness.

Yari, F., V. Mbarika, and S. Omoregbe. SUAMC. **The Impact of information and communication technology on socio-economic development of Sub-Saharan Africa.**—Of recent, studies in international development perceive information and communication technology (ICT) as a huge contributor to inclusive growth and socio-economic development (Dalberg, 2013). Not only could it increase productivity and contribute to the overall GDP of an economy, but it could also help connect remote populations to markets, promote citizens’ access to social services, expand educational opportunities, create platforms for innovation and increase people’s freedoms and access to government services (Madon, 2000). The study will examine the role of ICT on the economy of some Sub-Saharan African countries in the domain of health, education, unemployment and crime. These key indicators were selected from World Bank reports. It also

examined the trend of ICT innovation and further looked at the role of globalization on the emergence of ICT innovation in Sub-Saharan Africa. This paper aims to contribute to a better understanding of the impact ICT has on Sub-Saharan Africa through a critical review of relevant facts and literature and also reports from the World Bank, International Telecommunications Union. Keyword: ICT, SSA, Socio-economic Development References World Bank Report. (2015). Transforming Africa. The promise of broadband.

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