

# **LOUISIANA SCIENTIST**

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# LOUISIANA SCIENTIST

BULLETIN OF THE LOUISIANA ACADEMY OF SCIENCES

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### Louisiana Academy of Sciences

#### Abstracts of Presentations

2015 Annual Meeting

Nicholls State University

Thibodaux, Louisiana

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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:

CPMC	Calcasieu Parish Mosquito Control
FHS	Franklinton High School
GSU	Grambling State University
HSCA	Harvard-Smithsonian Center for Astrophysics
LSU-A	Louisiana State University at Alexandria
LSU-BR	Louisiana State University, Baton Rouge
LSU-E	Louisiana State University, Eunice
LTU	Louisiana Tech University
LU-NO	Loyola University, New Orleans
McSU	McNeese State University
NCTR	National Centre for Toxicological Research, Jefferson, AR
NiSU	Nicholls State University
NSU	Northwestern State University
NTHU	National Tsing Hau University
SLU	Southeastern Louisiana University
SU-BR	Southern University, Baton Rouge
SU-NO	Southern University at New Orleans
SUAMC	Southern University and A&M College
TU	Tulane University
UKY	University of Kentucky
ULL	University of Louisiana, Lafayette
ULM	University of Louisiana, Monroe
UTA	University of Texas at Austin
UTEP	University of Texas at El Paso
WRBU/SI	Walter Reed Biosystematics Unit/Smithsonian Institution

## **Division of Agriculture, Forestry & Wildlife**

Davis, S. and C. Corbat. LSU-A. **Movements and habits of the Eastern Woodrat as determined by tracking with fluorescent powder.**—Eastern Woodrats (*Neotoma floridana*) have been described in the literature as displaying extensive use of above-ground habitat for nesting and travel. However, aerial nests had not been observed in previous studies on our site in Central Louisiana. In Spring 2014, we captured 10 woodrats, dusted them with fluorescent powder, and followed the resulting trails with UV blacklights in early morning darkness. We marked the trails and returned in daylight to measure linear distance along the trails. Distance was categorized as being on the ground (including leaf litter), fallen logs/sticks, aerial vegetation, and aerial windthrows/snags. Woodrats on our study site made heavy use of fallen logs at ground level and seldom traveled aerially. In addition, although other authors indicated Eastern Woodrats were solitary animals, we found powder trails leading to multiple nests and entering nests where we had previously trapped other woodrats.

Davis, S., J. Hernandez, S. Redfearin, and C.A. Corbat. LSU-A. **Use of multiple techniques to gather information about Eastern Woodrat home range and nest use.**—Trapping and marking individuals on trapping grids is a standard technique that can be used to estimate home ranges as well as population size of small mammals. In spring 2014, after a couple of seasons of trapping and marking individual Eastern Woodrats, we conducted a study with fluorescent powder tracking to investigate woodrat use of the arboreal portion of their habitat. In the process, we discovered that fluorescent powder tracking led us to new nest locations for almost all woodrats tracked, and provided a much different picture of the woodrats' range and movements than was indicated by their trap records. In Fall 2014, we placed radio transmitters on 4 woodrats, 3 of which had been followed in the fluorescent powder study. Telemetry locations provided additional data on nest locations as well as helped determine primary nest sites. We advocate use of all three techniques to determine a more complete picture of Eastern Woodrat home range, nest use, and potential social interactions.

Hagen, A., M. Hebert, P. Roth, B. Bergeron, C. Koetting, and A. Ferrara. NiSU. **Allelopathic effects of cabbage and garlic slurries on lettuce, radish and cabbage seed germination.**—Allelopathy is the inhibitory or stimulatory influence of one plant on germination, growth, or survival of another. Our purpose was to develop a simple allelopathy experiment for an introductory biology laboratory to test inhibitory allelopathic effects of cabbage and garlic slurries on the germination of cabbage, radish, and lettuce seeds. Five day trials (25 and 30°C) were run in triplicate for each seed type treated with garlic slurry, cabbage slurry or water as a control. Garlic slurry was more strongly allelopathic than cabbage slurry for all seed types and at 30°C allelopathic inhibition of germination was lower than at 25°C.

Hale, A. and J. Walker. McSU. B. Slabach. UKY. **Taking a neuropathic approach to quantify environmental toxicity in an eastern, free range population of Rocky Mountain Elk.**—Kentucky houses the largest free ranging North American Elk (*Cervus canadensis*) population outside of the Rocky Mountains. The majority of the terrain on which the population resides is reclaimed coal mining land. It has been well documented that a parasitic nematode, *Parelaphostrongylus tenuis*, infects this population, however diagnostics in absence of adult worm identification can be tenuous. Due to the ambiguity in diagnostics many deaths are

idiopathic or simply assumed to be resultant from sub-clinical *Parelaphostrongylus tenuis* infection. We hypothesize polioencephalomalacia (PEM) a degenerative neurologic disorder caused by acute sulfur toxicity primarily from water sources in the normal range of the elk population is the cause of some proportion of unexplained deaths. We are using a combination of neuropathic and molecular techniques to quantify neuronal loss in *Parelaphostrongylus tenuis* negative animals. Preliminary histopathology results and quantitative analysis of central nervous system tissue will be discussed.

Hernandez, J. and C. Corbat. LSU-A. **Do male and female Eastern Woodrats (*Neotoma floridana*) exhibit differences in nest use?**—Eastern Woodrats were trapped at nests in a bottomland hardwood forest in Rapides Parish, LA, in Fall 2014. Nests were characterized as typical or atypical based on structure. Thirty-two distinct individual woodrats were captured. Gender was known for 31 of them. There was no difference in the proportion of males and females captured overall, or in the proportion of males and females captured at multiple nests versus only one nest, or in the proportion of males and females captured at typical versus atypical nests. Capture rates (individuals per adjusted trap night) also were similar for males and females. However, overall, captures were higher at typical nests than would be expected based on the proportion of those nests in the overall population.

Ivey, B. and B. Storer. McSU. **Brahman influence on estrus behavior and conception rate in heifers.**—An experiment was conducted to evaluate the influences of temperament and Brahman influence (BI) on feminine behavior and conception rate in peripubertal heifers. Heifer temperament was evaluated in long yearling heifer calves (n=121, 259±150 kg) by individual chute scores (CS) and chute exit velocity (EV). Phenotype was evaluated to determine BI. Individual weight and average daily gain (ADG) were measured. Heifers were scanned by ultrasound to determine carcass characteristics. Intramuscular fat and rib fat decreased in heifers with greater BI (P<0.05). Cattle greater than 25% BI had lower ADG (P<0.05) and final weights than did heifers with 0 to 25% BI. Heifers were fitted with electronic estrus detection transmitters to monitor estrus behavior. Brahman influence did not influence duration of estrus or estrous cycle length (P>0.1). Temperament did not influence duration of estrus or estrous cycle length (P>0.1). In 59 heifers, there was no relationship (P>0.1) between conception and estrous cycle length, duration of estrus with RF, REA, ADG, or BW. Temperament and breed did not affect conception rate (P>0.1). This study aided in clarifying the relationships of ADG, carcass characteristics, temperament and BI on feminine behavior and conception rate in heifer calves.

Ledet, E. and A. Pierce. NiSU. **Diet composition of hunter-harvested waterfowl at the White Lake Wetlands Conservation Area.**—Coastal Louisiana is an important wintering ground for North American waterfowl and has over 16,187 km<sup>2</sup> of coastal wetlands. Coastal Louisiana traditionally supports 19% of the waterfowl wintering in the United States. However waterfowl wintering habitat in coastal Louisiana is being lost and degraded as a result of several factors including: erosion, increases in invasive species, and saltwater intrusion. Quality wintering habitat has been linked to higher survival rates, higher body conditions, and higher reproduction in ducks. Diet studies are used to improve habitat management for waterfowl but none have occurred in the southwest region of Louisiana in recent years. The objective of this study is to determine important food resources of wintering waterfowl at the White Lake Wetlands Conservation Area (WLWCA). Our focal species included: Mallards (*Anas platyrhyncho*),

Northern Pintail (*Anas acuta*), Gadwall (*Anas strepera*), Blue-winged Teal (*Anas discors*), Green-winged Teal (*Anas crecca*), and Ring-necked Ducks (*Aythya collaris*). We collected the upper digestive tracts (esophagus, proventriculus, and gizzard) of 938 ducks harvested at the WLWCA during the 2013-14 wintering season. Diet items were washed, dried, sorted by taxonomic groups and then weighed. Preliminary results will be presented and compared between species.

Redfearin, S. and C. Corbat. LSU-A. **Do Eastern Woodrats (*Neotoma floridana*) use multiple dens and can counting typical or active dens provide an accurate index for population abundance?**—Eastern Woodrats are known for building large conspicuous dens, and are described in the literature as being solitary and antisocial. Counts of woodrat dens have been suggested as possible indices to woodrat abundance. Woodrat dens were located in Rapides Parish, LA, and characterized as typical or atypical based on their structure. Woodrats were then trapped at the dens to determine how counts of typical or total active dens compared to unique individuals trapped. Several woodrats were caught at more than one den. Twice, two individuals were trapped at the same den during the same night. Radio telemetry of four woodrats also produced evidence of woodrats sharing a den. Despite evidence of use of multiple dens and of more than one woodrat using a given den, counts of typical active dens may provide a reasonably good index to woodrat abundance.

## Division of Biological Sciences

### Environmental Sciences Section

Bergeron, S. and R. Boopathy. NiSU. **Does the drinking water contain antibiotic resistance genes in Lafourche and Terrebonne Parishes?**—The Barataria-Terrebonne Estuarine (BTE) basins encompass an area of approximately 6500 square miles with the Mississippi River to the east, the Atchafalaya River to the west, and the Gulf of Mexico to the south. The BTE system consists of two different estuaries, Barataria and Terrebonne separated by Bayou Lafourche in the middle. Bayou Lafourche gets its water from the Mississippi River and it is the major source of drinking water for nearly 300,000 people. Because of numerous sewage outfalls in the Bayou Lafourche, the potential for the presence of antibiotic resistant bacteria and antibiotic resistance genes (ARGs) are significant. So far no study has been conducted for the presence of ARGs in Bayou Lafourche, which is the main source of drinking water in Southeast Louisiana. This study was conducted for one year to find the presence of ARGs in water samples. The results showed the presence of numerous ARGs in the raw intake water but not in the treated water. The treated drinking water is safe from ARGs due to the degeneration of DNA in the water treatment plants.

Bledsoe, R. and R. Boopathy. NiSU. **Bacterial amendments enhance growth of the wetland grass, *Spartina alterniflora* by increasing soil nitrogen and phosphorous availability.**—Soil bacteria colonizing rhizosphere of plants can increase nutrient availability and produce plant hormones that improve growth and pathogen resistance. Bacterial amendments are a potential fertilizer alternative without deleterious effects of pollution and water eutrophication. Soil microbes including *Actinobacillus capsulatus*, *Bacillus lichenformis*, *Bacillus sonorensis*, *Bacillus subtilis*, *Paenibacillus zanthoxyli*, and *Pseudomonas putida* were isolated from wetland sediments. The objective was to understand the impact the isolated soil microbes has on plant performance without added fertilizer. A greenhouse study was conducted with pure culture and microbial consortium. Plant growth and soil nitrogen and phosphorus content were measured over 60 days then plants were sacrificed to quantify biomass. Treatment receiving consortia plus salt water had most growth (41.1±4.4 cm) and greatest biomass (108.03 g) followed by pure culture and fresh water (34.9±3.2 cm, 96.25 g), consortia and fresh water (39.7±5.0 cm, 89.04 g), and finally the control (7.7±1.5 cm, 51.85 g). Plant growth in all treatments differed significantly from the controls. Consortia and saline water treatment had most growth but growth difference between treatments was not significant. Results indicate a positive relationship between microbial activity and growth in *S. alterniflora*. Future research would investigate if treatments could improve success of environmental restoration by stabilizing soils.

Booth, A. and E. Zou. NiSU. **A partial sequence of the N-acetyl-β-glucosaminidase gene in the Blue Crab (*Callinectes sapidus*): A biomarker for molting hormone signaling.**—Crustaceans go through molting, a multi-stage process primarily regulated by the endocrine system. Ecdysteroid molting hormones cause a cascade effect that ultimately leads to the expression of enzymes such as N-acetyl-β-glucosaminidase (NAG) that are directly responsible for exoskeleton degradation. As NAG is one of the terminal enzymes expressed in this cascade, the gene that produces NAG can be used as a biomarker to validate the molting hormone effect. This study sought to partially sequence the NAG gene in the Blue Crab (*Callinectes sapidus*) in order to use NAG as a biomarker for ecdysteroid signaling. Using RNA collected from

epidermal tissue and reverse transcription PCR techniques, a partial sequence of NAG gene was identified. The 731 bp sequence was found to have a 99% similarity with NAG genes in the Gazami Crab (*Portunus trituberculatus*), Whiteleg Shrimp (*Litopenaeus vannamei*), and Chinese Shrimp (*Fenneropenaeus chinensis*). A derived amino-acid sequence was found to have 100% similarity with NAG in *P. trituberculatus*, *L. vannamei*, and *F. chinensis*. The high similarity between the gene and gene product from *C. sapidus* tissue and those already sequenced in similar organisms is evidence that the acquired PCR product is indeed a partial sequence of the NAG gene of *C. sapidus*.

Buter, K. and E. Melancon. NiSU. **Seston removal by bivalves on fabricated oyster reefs in Terrebonne Bay, Louisiana.**—An *in situ* experimental design was developed to quantify changes in seston associated with fabricated oyster reefs in Terrebonne Bay, Louisiana. The fabricated reefs are seven years old and well established. We sampled A-Jack structures that were placed adjacent and parallel to the marsh shoreline. Tidal flow around the structures and along the open-bay shorelines is very dynamic and always in flux. Therefore, to facilitate upstream and downstream flow measurements, a portable visqueen sheathing flume was used to direct water flow across the reefs. The dominant benthic filter feeders are oysters (*Crassostrea virginica*) and hooked mussels (*Ischadium recurvum*). Initial *in situ* measurements for chlorophyll-a, turbidity (TSS and NTU), dissolved oxygen and water temperature across the reefs began in June 2013 through October 2013, and sampling continued from May 2014 to August 2014. Continuous 30-second interval data for up to 1.5hr duration were taken with Hach DS5X sondes, one placed upstream and one 10m downstream. Reef biomasses also were collected in winter 2014-2015 to estimate the current filtering bivalve population among sampling sites. Preliminary results suggest that clearance rate per individual bivalve across sample sites was 0.59 L/hr, and ranged from -1.27 L/hr to 2.57 L/hr.

Chauvin, G. and G. Lafleur. NiSU. **The maculata apple snail in the BT national estuary: Vegetation consumption trials and update of range expansion.**—The Apple Snail (*Pomacea maculata*) is an invasive species that is rapidly migrating across the U.S. To date, we have documented their presence at several sites along the GIWW, extending west from Houma, including Mandalay National Wildlife Refuge, South to Lake De Cade, and West Gibson. Snails have also been documented within Bayou Lafourche, Lake Bouef, and Bayou Petit Caillou. We conducted a study to determine if juvenile snails have any dietary preference between Alligator Weed, Water Pennywort, Water Hyacinth, and Common Salvinia. After five days measuring plant mass consumption in triplicate Petri dishes, each containing ten snails, we found a significant difference for Common Salvinia over Water Hyacinth. Salvinia had a mean consumption of  $1.2\text{g} \pm 0.06$  (SD). Hyacinth had a mean consumption of  $0.7\text{g} \pm 0.06$  (SD). Mean root consumption in Salvinia was  $0.9\text{g} \pm 0.06$  (SD) while leaves were  $0.3\text{g} \pm 0.00$  (SD). Mean root consumption in Hyacinth was  $0.6\text{g} \pm 0.06$  (SD) while leaves were  $0.1\text{g} \pm 0.00$  (SD). This work is being supported by grants from NOAA and the Coypu Foundation, with the support of the Nicholls Institute for Seafood Science.

Mire, M. and E. Zou. NiSU. **Acquisition of a partial sequence of a cytochrome P450 gene in the Blue Crab, *Callinectes sapidus*.**—Cytochrome P450 enzymes (CYPs) are responsible for the metabolism of organic environmental pollutants, such as polycyclic aromatic hydrocarbons (PAHs) commonly found in petroleum contamination. Because CYP activities are inducible by

PAHs, expression of CYP genes in the Blue Crab, *Callinectes sapidus*, can potentially be used as biomarkers in long-term biomonitoring of petroleum contamination in salt marshes. The objective of this study was to acquire a CYP gene sequence in the blue crab hepatopancreas, using reverse transcription-PCR technique. Three pairs of degenerate primers designed on the bases of conserved regions of invertebrate CYPs were used, and one primer pair resulted in a DNA band of about 400 bp. The band was excised from agarose gel, purified, and commercially sequenced. The BLAST analysis revealed this partial sequence, consisting of 412 bp, is indeed part of a CYP gene with an open reading frame of 136 amino acids. To our knowledge, this is the first CYP gene sequence of the blue crab. In the next experiment, the utility of this CYP gene as a biomarker for petroleum contamination in salt marshes will be tested through examining whether the expression of the CYP gene is inducible by petroleum PAHs using quantitative real-time PCR.

O'Malley, P., Q. Fontenot, C. Bonvillain, C. Gothreaux, and A. Ferrara. NiSU. **Movement of largemouth bass *Micropterus salmoides* in response to episodic hypoxic conditions in the upper Barataria Estuary.**—Movements of largemouth bass *Micropterus salmoides* (LMB) in the upper Barataria Estuary (UBE) in response to episodic hypoxic conditions are currently unknown. To describe the movements of LMB in the UBE, we attached radio telemetry tags to bass collected by electrofishing from Lac des Allemands. Fish were weighed (g) and measured (mm) for standard length and only fish weighing more than 450 g were fitted with radio tags. Using hypodermic needles to pass through the body wall of the fish, saddle mount radio tags were attached to 40 fish with stainless steel leader and sleeves. Tagged LMB were released into Lac des Allemands and tracked using radio telemetry at least once every other week for a year. Dissolved oxygen (mg/L), water temperature (°C), pH and specific conductance (µS/cm) were measured and GPS coordinates were used to map average weekly movement for each fish. Tagged bass weighed an average of  $981 \pm 69$  g and measured an average of  $399 \pm 7.5$  mm SL. Fifty radio tracking trips have been completed and currently 30 of the 40 tagged fish are still detectable. Understanding the response of LMB to episodic changes in water quality can aid in management of this species.

Varvaro, M. and J. Carlson. NiSU. **Which South Louisiana *Hibiscus* species is the most resilient under human-induced stresses?**—In South Louisiana, development near rivers and coastal wetlands has greatly altered the hydrology and fertility of the area. The objective of this study was to test how two species, *Hibiscus laevis* and *Hibiscus moscheutos*, react to increased saltwater intrusion and higher fertility levels. The two species were grown from seed that was collected in South Louisiana. Four-week old plants were assigned to four treatments, fresh water with high nutrients, fresh water with low nutrients, 10 ppt salt water with high nutrients, and 10 ppt salt water with low nutrients (n=282). At the end of the seven-week trial, we measured survival, biomass, and leaf area divided by mass (SLA), and we analyzed differences between species and treatments using ANOVA. The survival of *H. moscheutos* under either salt treatment was lower than its survival in either of the freshwater treatments. In both species, above ground and below ground biomass were greater in the freshwater treatments and lower in the salt water treatments. These results show how *H. laevis* and *H. moscheutos* react across a range of stresses, and it shows that altered hydrology and rising sea levels are a threat to both of these species in coastal areas.

## Microbiology Section

Clause, D.A., H. Deshotel, and J. Al-Dujaili. LSU-E. **Water, ethanol and methanol extraction of *Rhus glabra* (sumac): Their antimicrobial activity against Gram-negative and Gram-positive food-borne bacteria.**—Six Gram-negative and Gram-positive food-borne bacteria: *E. coli*, *Proteus vulgaris*, *Salmonella typhi*, *Staphylococcus aureus*, *Bacillus cereus*, and *Listeria monocytogenes* were used in this study. Three methods were used to extract *Rhus glabra* (sumac): water, ethanol, and methanol extracts. Disk diffusion and pour plate techniques were used to determine the antibacterial activity of water, ethanolic and methanolic extracts of sumac against three Gram-negative bacteria. The zone of inhibition varies depending on bacterial species and type of extract, using 1, 2 and 4 mg/ml of each of water, ethanol, and methanol extracts of sumac resulted in an inhibition activity (mm diameters) of the growth of these bacteria. The average diameter of inhibition zones ranges from 2-16 mm, 3-16mm and 2-15 mm for water, and ethanolic and methanolic extracts, respectively. A complete inhibition of the growth (100%) was demonstrated at the highest concentrations used (1.2 mg/ml nutrient agar for sumac for all six bacteria). These levels also are found to be the MIC for sumac extracts. Heat treatment at 70°C for 3 min did not affect the antibacterial activities of the water extracts.

Grabert, R., J.P. Daigle, and R. Boopathy. NiSU. **Presence of *Vibrio vulnificus* and *V. parahaemolyticus* in Louisiana seafood.**—Louisiana seafood is a multi-million dollar industry. Every year there are few *Vibrio* associated outbreaks in oysters or crabs. *Vibrio vulnificus* and *V. parahaemolyticus* are the common gastroenteritis causing pathogen in estuarine environments. *Vibrio* species are gram-negative halophilic bacteria that are commonly associated with bivalves such as oysters. Ingestion of undercooked shellfish or wound water exposure can result in gastroenteritis, wound infection, and septicemia. Louisiana state public health laboratories conduct routine surveillance for oysters for the presence of *V. vulnificus*, which shows sporadic low-level detection of this bacterium. Global warming contributes to increase in water temperature, which promotes the growth of *Vibrio* populations in the Gulf of Mexico. There seems to be no continuous monitoring of various *Vibrio* species in Louisiana seafood such as crabs, oysters, fish, and shrimp. Therefore, this study was conducted in order to monitor vibrio pathogens in Louisiana seafood. Various vibrio bacteria including *V. vulnificus*, *V. parahaemolyticus*, *V. cholerae*, and *V. harveyi* were monitored every week in various local seafood for nine months using vibrio specific chrom agar medium and by molecular method using various vibrio primers. The results showed the presence of *V. vulnificus* and *V. parahaemolyticus* in oysters in every sampling period. *Vibrio cholerae* was observed on specific occasions when the water was polluted with sewage and high nutrients. *Vibrio harveyi* was present in many fish samples on different sampling events.

Sauce, M., A. Naquin, J. Clement, R. Grabert, and R. Boopathy. NiSU. **Presence of methicillin, tetracycline, erythromycin, and sulfonamides resistance genes in Thibodaux sewage treatment plant.**—Increasing uses and disposals of antibiotics to the environment have increased emergence of various antibiotic resistance. One of the sources for the spread of antibiotic resistance is wastewater treatment plants, where bacteria and antibiotics can come in contact and can acquire antibiotic resistance. There are very few studies on this subject from a small town sewage treatment plant. Therefore, this study was conducted using raw sewage as well as treated sewage from a sewage treatment plant in Thibodaux in rural southeast Louisiana.

Samples were collected monthly from the Thibodaux sewage treatment plant and the presence of antibiotic resistance genes was monitored. The study showed the presence of antibiotic resistance genes in both raw and treated sewage in every month of the study period. The genetic transformation assay showed the successful transformation of methicillin resistant gene, *mecA*, to an antibiotic sensitive *Staphylococcus aureus*, which became antibiotic resistant within 24 hours.

Trouth, T., B. Clements, D. Gary, B. Joseph, and C. Struchtemeyer. McSU. **An assessment of the microbiological impacts of aerobic sewer systems in southwest Louisiana.**—Aerobic septic systems are commonly used to treat wastewater in rural areas. These systems contain an air pump, which stimulates aerobic bacteria that degrade the solid wastes associated with the wastewater. The aerobic treatment process generates effluent that either flows or gets pumped into the environment. In spite of the importance of aerobic septic systems, very little is known about the microbial quality of their effluent. In this study we collected samples of effluent from 16 aerobic septic systems in southwest Louisiana. The microbial quality of these effluent samples was assessed using plate count assays that estimated the numbers (CFU/ml) of *E. coli*, total coliforms, and total bacteria in each sample. The numbers of *E. coli*, total coliforms, and total bacteria varied from system to system and ranged from  $0-2.0 \times 10^3$  CFU/ml,  $7.5 \times 10^1-6.7 \times 10^3$  CFU/ml, and  $1.2 \times 10^3-1.0 \times 10^5$  CFU/ml, respectively. The majority of the effluent samples (13 of the 16 collected) contained *E. coli* concentrations that exceeded recommended guidelines for treated sewage. These results suggest that effluent from aerobic septic systems could potentially have a negative impact on the environment.

## Molecular & Biomedical Biology Section

Beadle, E. and J. Newman. LTU. B. Bunnell. TU. **The role of mediator in regulating mesenchymal stem cell state.**—Mediator is a highly conserved, eukaryotic protein complex that regulates transcriptional processes by facilitating interactions between transcription-factor bound enhancers and RNA polymerase bound promoters. Mediator is composed of ~30 subunits that regulate transcriptional processes. Alterations in any of these subunits may result in disease and developmental defects due to faulty transcriptional regulation. We seek to understand Mediator's role in the maintenance and differentiation of human mesenchymal stem cells (MSCs), a multipotent stem cell harvested from adipose tissue and bone marrow. MSCs have great medical potential, including drug development and autologous transplants for cellular therapies, but much remains to be understood about their basic biology. We will investigate the Mediator subunit, MED31, to better understand how Mediator regulates MSC cell state. We have successfully shown Med31 gene expression in MSCs, and have induced gene knockdown through transfection of small interfering RNAs. We have also differentiated MSCs toward osteogenic and adipogenic lineages. Future steps of this project will involve gene knockdown of Med31 followed by monitoring the self-renewal and differentiation capacity of MSCs. This project will help understand Mediators role in healthy gene expression and its influence on the differentiation pathways of MSCs.

Blanchard, A., L. Gladney, G. McInnis, L. O'Rear, and K. Jackson. McSU. **MMP2 and MMP9 expression in green anoles.**—Matrixmetalloproteinases (MMPs) are a family of extracellular

matrix degrading enzymes with more than 20 family members. Proteins from this family are involved in a number of cell processes including cell differentiation, proliferation, and apoptosis. Members of this family are also involved in cell migration including the immune response. Various MMPs also have been studied for their potential role in some pathological processes. For example, MMP2 and MMP9 have long been studied for their roles in cancer metastasis. MMPs have been identified in a wide variety of species from humans to invertebrates as well as to plants. Thus far, MMP family members have not been studied in reptiles other than snake venom. The present study begins the process of identifying MMPs expressed in green anoles. We begin by examining the expression of MMP2 and MMP9 in multiple organs of the green anole.

Cardin, D., Y. Dong, Y. Qi, and C. Gissendanner. ULM. **Using BRET to study protein-protein interactions of the *C. elegans* PAN-1 protein.**—PAN-1 is a divergent member of the extracellular leucine-rich repeat family of proteins and is important in stage specific events during the development of the nematode *Caenorhabditis elegans*. Earlier studies have shown that truncations in the cytoplasmic domain of PAN-1 exhibit a dominant negative phenotype which is indicative of many dimerizing receptors. Studies also have shown when performing pan-1 RNAi in Iron-12 mutants, an enhanced phenotype is observed, which indicates that these two proteins may interact with each other to perform important signal transduction events inside the cell. Based on these previous studies, we hypothesize that PAN-1 acts as a dimerizing receptor and LRON-12 is a potential co-receptor for proper function of these proteins. To test our hypotheses we used the BRET technique. Our results show a significant BRET signal once PAN-1 was tested for interactions with itself; however, we did not see any significant BRET signals when we tested the PAN-1 and LRON-12 interactions. Since little is known about the role that extracellular leucine rich repeat proteins have during development, our studies may help identify a novel signaling pathway exhibited by this family of proteins.

Dadhania, V. and H.M. Mehendale. ULM. L. Muskhelishvili and J.R. Letendresse. NCTR. **Role of annexin A1 and calpastatin in heteroprotection by thioacetamide against a lethal dose of acetaminophen in mice.**—This study was aimed at investigating the mechanisms of compensatory tissue repair (CTR)-mediated heteroprotection in mice. Male Swiss Webster mice were primed with a low dose of TA [40 mg/kgbw, in 10 ml normal saline/kg, intraperitoneally (i.p.)]. TA-induced liver injury, CTR, and expression of annexin A1 (ANX1) and calpastatin (CAST), the endogenous inhibitors of death proteins secretory phospholipase A2 (sPLA2) and calpain, respectively, were measured over a time course of 84 h after TA-priming. Both centrilobular necrosis and CTR peaked at 36 h after a priming dose of TA as indicated by significantly increased alanine transaminase (ALT) and aspartate transaminase (AST) activities, histological findings, and proliferating cell nuclear antigen immunostaining. TA-priming resulted in overexpression of ANX1 and CAST at 36 to 84 h and 12-84 h, respectively. Overexpression of ANX1 and CAST in TA-primed mice protected them against a lethal dose of APAP (600 mg/kgbw in 10 ml 0.45% NaCl pH 8.2, i.p.) given at either 12, 24, or 36 h after TA-priming. Biochemical markers of liver injury (ALT and AST) and histology were consistent with the 100% survival of the APAP-overdosed TA-primed mice as compared to non-primed mice which suffered 100% mortality. In conclusion, ANX1 and CAST overexpression abolishes APAP-induced expansion of liver injury.

Gladney, L., M. Klumpp, A. Fusilier, J. Hinton, H. Meyer, and K. Jackson. McSU. **Comparison of tardigrade populations in Louisiana and Mississippi using morphological and genetic data: A preliminary report.**—Tardigrades are microscopic 8-legged invertebrates that can be found living in most environments. Classic methods of differentiating tardigrade species have been based on morphological differences including the numbers of claws per foot. Recently, researchers have begun the process of sequencing the genome of specific tardigrade species. With this work, species also can be differentiated based on DNA sequences in conserved genes. We have collected specimens of the genus *Milnesium* from a number of sites in Louisiana and Mississippi and have detected morphological variation within and among these populations. At this point it is not clear whether these different populations represent the same or different species. For this study, we have begun the process of characterizing these populations genetically. We are determining the DNA sequences of the 18S rRNA and ITS-2 genes from *Milnesium* specimens collected at these sites.

Howie, R., A. Adams, K. Johanning, and A. Ferrara. NiSU. **Alligator gar perfusion: A protocol for alligator liver perfusion for *in vitro* assessment of bioaccumulation potential.**—Bioaccumulation of chemicals such as pharmaceuticals, pesticides, and personal care products may pose human and animal health threats. These potential health threats led to development of *in vitro* metabolic methodologies in Rainbow Trout, *Oncorhynchus mykiss*, to test bioaccumulation potential. In addition to trout, a cold water species, methodologies for warm-water species must be developed. The purpose of our study was to determine if trout liver perfusion methodologies can be used for Alligator Gar, *Atractosteus spatula*, a native warm-water fish. Based on previous work with trout, we adapted methodologies to perfuse alligator gar livers for the isolation of liver hepatocytes and subcellular liver fractions to test liver metabolic enzyme activity and bioaccumulation potentials. Sixty-nine juvenile alligator gar were injected with 0.5 cc of heparin 1000 IU/mL and an incision was made from the vent to the ismuths. Ten mL of perfusion buffer containing HBSS with EDTA and HEPES were injected into the liver of the gar for perfusion of the organ. Livers were successfully perfused and void of blood that may interfere with or inhibit metabolic studies in the isolated hepatocytes and subcellular liver fractions. To our knowledge, we performed the first successful perfusion of alligator gar livers for liver metabolic and bioaccumulation potential.

Khanal, J., A. Sitaula, P. Shockett, and R. Kraemer. SLU. **Decline in relative plasma cell-free mitochondrial DNA levels in response to prolonged moderate aerobic and eccentric exercise.**—Elevated plasma levels of cell-free mitochondrial DNA (cf-mDNA), a cell damage-associated molecular pattern (DAMP), contribute to neutrophil activation and inflammation in trauma patients, and may occur in cancer and autoimmunity. To further understand relationships between cf-mDNA released by tissue injury, inflammation, and health benefits of exercise, we conducted trial-by-time experiments for plasma cf-mDNA response to prolonged moderate aerobic exercise, and eccentric exercise. Seven healthy moderately-trained young men completed treadmill exercise trials for 90 min at 60% VO<sub>2</sub> max, and resting control trials. Blood was sampled immediately prior to (Pre), during (at +18, +54, and +90 min), and after (R40) trials. A significant difference in cf-mDNA response was observed between exercise and control trials. Specifically, cf-mDNA levels differed at +54 and +90 (w/or w/out plasma volume shift correction). A significant time effect was observed, with relative cf-mDNA levels declining at +54 and +90 during exercise. These results suggest increased clearance or reduced release of

plasma cf-mDNA with exercise. Declines in cf-mDNA also were seen after eccentric exercise. Our finding of cf-mDNA decline with prolonged moderate treadmill and eccentric exercise contrasts with studies by others involving exhaustive short-term treadmill exercise, where cf-mDNA levels were unchanged, and highlights differences between exercise- and trauma-induced inflammation.

Lombardo, G. and E. Zou. NiSU. **Procurement of a partial gene sequence of cytochrome P450 in the Fiddler Crab, *Uca pugilator*.**—Cytochrome P450 (CYP) enzymes catalyze metabolism of exogenous and endogenous substrates and are often critical in detoxification. Polycyclic aromatic hydrocarbons (PAHs) compose a portion of the chemical makeup of crude oil released during spills and can pose a critical threat to organisms and their environment. This is attributed to these chemicals' ability to linger in the environment and bioaccumulate in organisms exposed to them. Coastlines and salt marshes are utilized by *Uca pugilator* for habitat and feeding, and are also the areas primarily affected by oil spills. Therefore, studying the enzymes responsible for detoxification may produce a biomarker to monitor the effects of petroleum contamination in coastal environments. The hepatopancreas was selected for study because this is the major site of detoxification in crustaceans. Using degenerate primers, a PCR product in the 400 bp range was obtained and commercially sequenced. The BLAST analysis revealed that the obtained sequence, 409 bp in length, shared most similarity to CYP4C (86% identity to *Portunus trituberculatus*). This is the first CYP gene sequence in the crab, *Uca pugilator*. Future research will utilize this partial sequence to obtain the full sequence using RACE-PCR. Functional characterization of this CYP gene also will be performed.

Murphy, K., D. Wassaf, A. Koehler, and M.L. Bulyk. McSU. **Identifying novel small molecules for improved antifungal drug treatment.**—Invasive fungal infections (IFIs) are associated with high rates of morbidity and mortality and pose a serious health concern for severely immunocompromised patients. Fungal resistance to current drug therapies is largely due to the transcriptional upregulation of membrane associated efflux pumps. The fungal-specific zinc cluster (Zn<sub>2</sub>Cys<sub>6</sub>) family of transcription factors (TFs) are primarily responsible for the upregulation of these efflux pumps and thereby mediating pleiotropic drug resistance (PDR) in yeast. Thus, these TFs offer an attractive and rational target for the development of new antifungal drugs. In pursuit of this goal, we aimed to identify small molecules capable of inhibiting the DNA-binding ability of Zn<sub>2</sub>Cys<sub>6</sub> TFs regulating PDR in yeast. An initial screen utilizing small molecule microarrays (SMM) was employed to identify compounds capable of binding the DNA-binding domain of Zn<sub>2</sub>Cys<sub>6</sub> TF Pdr1p from *Candida glabrata*. In our initial SMM-based screen, a library of 15,000 different compounds was examined and yielded 76 unique compounds that specifically bound to Pdr1p. Small-molecule “hit” compounds consisted of several different structural classes, including 44 azetidine and sulfonamide-based compounds. Future studies will examine the potential of these lead compounds for development of improved antifungal drugs in the treatment of IFIs.

Ogbonnaya, N., D. Sandel, and J. Newman. LTU. **The role of notch signaling in mesenchymal stem cells.**—Mesenchymal stem cells (MSCs) are bone marrow-, adipose tissue-, and umbilical cord tissue-derived adult stem cells that are multipotent, self-renewing, and immunocompatible. Notch is a developmental signaling pathway that plays a role in differentiation and maintenance of stemness. Studies have shown that misregulation of the Notch pathway is involved in

developmental disorders and in cancer progression. This research seeks to understand the role that Notch plays in differentiating and self-renewing MSCs. Using RT and quantitative PCR, we will characterize the Notch genes expressed in self-renewing and differentiating cells, and then inhibit the Notch pathway to evaluate the role of the Notch pathway in the MSCs. Data from our study shows that two Notch receptors (Notch 2 and Notch 3) and two target genes (*hes1* and *hey2*) are expressed in differentiating MSCs and that the expression levels of each of the genes increases as differentiation progresses, suggesting that Notch signaling plays a role in differentiating MSCs. As the use of MSCs in therapeutics evolves, there is need to characterize the signaling pathways involved in the maintenance of their differentiation and self-renewing capability to ensure the stem cells pool continues to proliferate and maintain the specific gene profiles they are primed to express.

Patel, N., A. Whitehead, C. Tran, J. Newman, and M Caldorera-Moore LTU. **Microtopographical effects on differentiation of embryonic stem cells into cardiomyocytes.**—Cardiovascular disease is the leading cause of death in the United States and its prevalence is increasing with time (CDC 2013). During a heart injury, such as myocardial infarction, cardiomyocytes are damaged and cannot be regenerated. Left untreated, this damage can have fatal results. Due to the limited regenerative capacity of the heart, considerable efforts have been directed towards regeneration and repair of myocardium through cardiac tissue engineering. In the context of cardiac tissue, surface topography is vital for ensuring a highly ordered alignment of cardiomyocytes for effective transduction of electrical signals. Our objective is to understand the effect of surface topography on the differentiation of mouse embryonic stem cells (mESCs) into functional cardiomyocytes. To accomplish this objective, hydrogels will be employed as the supporting matrices due to their tailorability, viscoelastic nature, and tissue-like characteristics, while mESCs will be the cell source, as they have the ability to differentiate into cardiomyocytes. Validation of cell attachment and differentiation on micropatterned substrates will be completed using surface morphology analysis, histochemical analysis, and PCR to detect expression of cardiac specific genes. Understanding the microenvironment necessary for efficient generation of cardiomyocytes is vital for successful development of cardiac tissues *in vitro*.

Shobowale, N. GSU. **Analyses of parkin RBR E3 ubiquitin protein using FlyBase and NCBI websites.**—Parkin RBR ubiquitin protein has been shown to play a part in the cell machinery that degrades unneeded proteins which tend to be accumulated in neurons of Parkinson patients. We obtained the gene information from FlyBase which shows that it has two annotated transcripts and one unique polypeptide. The protein features include an ubiquitin-protein ligase domain and zinc finger. NCBI protein BLAST analysis of parkin RBR E3 ubiquitin protein showed that mouse, followed by zebra fish, expresses a protein with high homology to the corresponding human protein. The surprising result is that the corresponding protein found in fruit flies shares a higher identity than that of frog and round worm to the human protein. Six *Drosophila* mutants have been generated to model Parkinson's disease and two for cardiomyopathy. We will study ways to generate mutants deleting one or more of the conserve domains.

Stacker, J., D. Saint-Jean, and F. Ohene. GSU. **Analysis of bovine vitreous humor constituents using capillary zone electrophoresis.**—Capillary electrophoresis of bovine vitreous humor was

carried out in an uncoated fused silica glass capillary of 75  $\mu\text{m}$  internal diameter and 59.5 cm total length and 49.5 cm effective length using a run buffer of 40 mm sodium tetraborate buffer of pH 9.4 that contains 0.40 g/L of methyl cellulose. Detection of the separated zones was by ultraviolet absorption at 220 nm. A number of well resolved reproducible peaks were obtained using nanoliter quantities of the vitreous humor sample. This preliminary study has demonstrated the potential use of capillary electrophoresis in the separation of vitreous humor samples.

## Zoology Section

Adams, A., R. Nathaniel, M. Thiaville, and J. Doucet. NiSU. **Efficiency of catfish *Ariopsis felis* complement.**—Complement is a family of membrane soluble serum proteins which lyses bacteria through three pathways: alternative pathway, mannose-binding lectin pathway (MBL), and the classical pathway. Most immunological research has been done on mammalian species. More recently, these immune components have been studied in fish. These components are less understood in saltwater (hardhead) catfish *Ariopsis felis*. Antibacterial activity of catfish serum was tested by incubating serum with bacterial species for activation of putative complement proteins. Mixtures were plated on bacterial media and incubated overnight, and colonies were enumerated. Complement protein can be blocked with antibody to show specific activity of the cascade. Bacterial activity of serum against *E. coli* and *B. subtilis* was found to be 97% and 29%, respectively. Hemolysis by complement was tested by adding fish serum to rabbit red blood cells (RRBCs). Ethylene diamine tetra-acetic acid (EDTA) chelating agent was added to sequester essential ions and prevent hemolysis, and calcium (Ca) and magnesium (Mg) ion surplus was added to restore hemolysis by the complement cascade. *Ariopsis felis* complement-like hemolysis of RRBCs was found to be 98%, and 6% with EDTA. Hemolysis with addition of ions was >92%. These results provide evidence of antibacterial activity present in hardhead catfish.

Ardizzone, C., and W. Dees. McSU. **A longitudinal survey of adult mosquitoes in a city park.**—A seasonal longitudinal survey of adult mosquitoes is underway at a residential 24-acre woodland park. The park is separated into two distinct areas: one is an open area with playground equipment, picnic tables, open shelters, a small conference center, exhibits, wetland ponds, and concrete walking paths with benches; the other is a preserved forest with nature trails. The mosquito survey was initiated in summer 2011. We use Centers for Disease Control and Prevention (CDC) light traps baited with CO<sub>2</sub> to collect mosquitoes. Mosquitoes are collected in the open area near the preserved forest in each of the four seasons: spring, summer, fall, and winter. Meteorological 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 nigripalpus*, *Cx. salinarius*, and *Psorophora columbiae*. *Uranotaenia* spp. were collected only in the summer and fall. *Psorophora* spp. were collected only in the spring, summer, and fall. *Culiseta inornata* was collected only in the winter. Information obtained in this study can be used to determine potential health risks associated with nuisance and disease vector mosquito species.

Ardizzone, C., W. Dees, J. Theriot, K. Leonards, A. Fusilier, O. Christian, and J. Woolman. McSU. J. Hightower. CPMC. Cochran. NSU. **Screening plant parts for potential mosquitocidal compounds.**—In the Medical Entomology Research Laboratory at McNeese

State University, we are investigating if components and derivatives of plants native to Louisiana alter the behavior and development of medically important arthropods (e.g., mosquitoes). Information obtained from these investigations may lead to innovative area-wide pest management methodologies as well as novel personal protective measures against biting arthropods. Current studies focus on the effects of botanical components on mosquito mortality. We evaluated the effects of plant parts from eight plant families on female *Aedes aegypti*. Standard plastic Petri dishes were used to hold mosquitoes and plant parts from 18 plant species. We recorded percent mortality at 24 and 48 h. Mosquitoes exposed to flowers/petals, buds, leaves, stems, and seeds from Apiaceae, Asteraceae and Lamiaceae exhibited over 50% mortality when compared with the controls. Genera of interest include: *Chrysanthemum*, *Eryngium*, *Eupatorium*, *Rudbeckia*, *Monarda*, and *Pycnanthemum*. Mosquitoes exposed to different parts of a chrysanthemum plant (flowers, buds, leaves and stems) exhibited 100% mortality in 24 h. Mosquitoes exposed to cut buds of *Pycnanthemum muticum*, *P. tenuifolium*, and *Monarda fistulosa* as well as crushed seeds of *M. fistulosa* exhibited 100% mortality in 24 h.

Beachy, C. and P. Clarkson. SLU. **Induction of metamorphosis causes differences in sex-specific allocation patterns in axolotls (*Ambystoma mexicanum*) that have different growth histories.**—We tested the hypothesis that salamanders growing at different rates would have allocation patterns that differ among male and female metamorphic and larval salamanders. We raised individual axolotls, *Ambystoma mexicanum*, on four food regimes: constant high growth (ad libitum throughout the experiment), constant low growth (restricted throughout the experiment), high growth switched to low growth (ad libitum switched after 140 days to restricted), and low growth switched to high growth (restricted switched after 140 days to ad libitum). Because axolotls are obligate paedomorphs, we exposed half of the salamanders to thyroid hormone to induce metamorphosis. We assayed growth and dissected and weighed gonads and fat bodies. The salamanders that were switched from a restricted to an ad libitum food regime delayed metamorphosis. In all treatment groups, females had larger gonads than males and males had larger fat bodies than females. The association between storage and reproduction differed between larvae and metamorphs and depended on sex.

Bordelon, C. LSU-A. **Effect of estradiol on the food-searching behavior of *Procambarus clarkii*.**—Estradiol pollution has shown to cause morphological and behavioral changes in aquatic species including crawfish; increasing our knowledge of how estradiol affects these species can help with the search for solutions. The effect of estradiol on anxiety in *Procambarus clarkii* was investigated by submerging 34 male crawfish separately in 8 liters of water including 300 µg of estradiol diluted in 45 mL of pure ethanol per liter spring water (experimental group) or adding ethanol (ethanol control) or without any addition (control). Crawfish could hide in a plastic pipe on one end of the aquarium and were enticed by a food source (melt- bloody meat and common crawfish bait) on the other side. Our experiments demonstrate that *P. clarkii* has lower anxiety-like behavior (unwillingness to explore) when treated with estradiol. This is shown by treated crawfish having a higher success rate of reaching the food item in less than an hour compared to the control group ( $p = .0449$  using Fisher's exact test). Crawfish exposed to estradiol, which has been shown to reduce anxiety during short time exposure in mice, may have a higher risk of predation in contaminated areas, which may lower population densities.

Bozeman, K.E. SLU. **Dermal gland histology of *Amphiuma tridactylum* and the inhibitory effects of skin secretions against *Batrachochytrium dendrobatidis*.**—Skin glands and associated secretions have been studied in many amphibian species and have been suggested to serve an array of functional roles including predatory defense and defense against microbial pathogens such as the amphibian chytrid fungus, *Batrachochytrium dendrobatidis*. Similar studies are lacking for fully aquatic salamander species such as *Amphiuma tridactylum*. *Amphiuma tridactylum* is a large-bodied burrowing salamander endemic to various freshwater habitats of the southeastern United States. Like other amphibians, the skin of *A. tridactylum* seems to be heavily supplied with glands indicated by observations of two distinct cutaneous secretory products. The glandular distributions, morphologies, and the functional role of associated skin secretions are unknown for this species. The goal of this study is to provide histological descriptions of the dermal glands of *A. tridactylum*, and apply previously documented observations and experimental results to suggest potential functions of the skin glands and associated secretions of *A. tridactylum*.

Calhoun, S. and E. Zou. NiSU. **Carbonic anhydrase activity in the epidermis of the Blue Crab, *Callinectes sapidus*, during the molting cycle.**—In order to grow, crustaceans must shed their rigid exoskeleton in a process called molting or ecdysis. A molting cycle can be broken into five temporally distinct stages: post-molt (stages A and B), intermolt (stage C), premolt (stage D), and ecdysis (stage E). The degradation of the old exoskeleton occurs in the premolt stage. In this study, the Blue Crab, *Callinectes sapidus*, is used as a model organism to determine the change in exoskeletal calcium concentration during the molting cycle. Crustacean exoskeleton is mineralized with inorganics such as calcium, and it is predicted that calcium concentration will decrease during the premolt stage, with a greater decrease occurring in the initial premolt sub-stages.

Clarkson, P.M. and R.A. Valverde. SLU. **Rehabilitation stress dynamics of juvenile Kemp's ridley sea turtles incidentally caught by hook and line along the Mississippi coast.**—Kemp's ridley sea turtles, *Lepidochelys kempii*, are critically endangered, due in part to historic egg poaching and the effects of global change. In addition, juvenile Kemp's ridleys have a coastal distribution, exposing them to incidental capture in fishing gear. To determine the effects of incidental capture by hook and line, the stress dynamics of free-ranging juvenile Kemp's ridleys will be examined throughout the 2015 fishing season along the coast of Mississippi, where 300 turtles were caught and rehabilitated in 2014. The objective of this study is to determine if the activity of the hypothalamic-pituitary-adrenal axis is altered during hooking, subsequent handling, and standard rehabilitation procedures. Initial corticosterone will be measured in association with plasma biochemistry. Corticosterone is expected to be elevated initially and to increase even further after several hours of handling; rehabilitation is expected to successfully return corticosterone to baseline values. Stress physiology is important to study as it can affect an organism's morphology, behavior, and physiology; in addition, it can be an indicator of environmental health. These data have serious implications for future management decisions and population recovery.

Dees, W., C. Ardizzone, A. Fusilier. McSU. D. Foley, D. Pecor, D. Burkett, L. Rueda, and R. Wilkerson. WRBU/SI. **An online repository for biosurveillance data for disease risk assessment.**—With world-wide vector biosurveillance efforts by governments, institutions and

citizen scientists to monitor and forecast vector-borne disease risks, there is a need for an easily accessible spatial data repository enabling users to dynamically view the factors influencing risks of vector-borne diseases. VectorMap ([www.vectormap.org](http://www.vectormap.org)) is an online repository for biosurveillance data that houses data management tools for uploading and managing surveillance information as well as spatial data critical for assessing disease risks. VectorMap is a web-based resource for reviewing and depositing collection records of mosquitoes, sand flies, ticks, fleas, mites, animal hosts, and disease pathogens from around the world. This resource contains distribution models of many components associated with vector-borne diseases, including ecological niche and disease risk models related to vector ecology. Users have access to a plethora of information including 450-plus ecological niche models for vector species worldwide, climate data, slide presentations on current vector-borne disease topics, and other resources, including links to the Armed Forces Pest Management Board, Centers for Disease Control and Prevention, World Health Organization, and Walter Reed Biosystematics Unit. For questions regarding VectorMap or if you wish to have surveillance data posted to VectorMap, please email the VectorMap Team at [mosquitomap@si.edu](mailto:mosquitomap@si.edu).

Grosch, J., Q. Fontenot, C. Bonvillain, A. Ferrara, and A. Pierce. NiSU. **Fish community structure in four different shoreline habitats of the Upper Barataria Estuary, Louisiana.**—The Upper Barataria Estuary (UBE) hydrologic regime has been considerably altered by human engineering and channelization of the Mississippi River so that historic flow patterns no longer occur. Future restoration efforts within the UBE include a reintroduction of Mississippi River water to the UBE. Understanding the relationship between shoreline habitat and fish community structure can aid restoration efforts to optimize fish habitats within the UBE. To determine the fish community structure of four habitats including standing timber, bare bank, emergent vegetation and submergent vegetation, fish were quantified at three randomly selected sites within each habitat via monthly electrofishing for 12 consecutive months from March 2014 to February 2015. Dissolved oxygen (mg/L), temperature (°C), pH, and conductivity (µS/cm) were measured at each site using a YSI 556 multi-parameter meter. Monthly data were combined into four seasons: Spring (March, April, May), summer (June, July, August), autumn (September, October, November), and winter (December, January, February). Data analyses are ongoing, and will determine if there are differences in the fish community structure among habitat types within each season and among seasons for each habitat type. To date, we have collected 7613 individuals comprising 42 species. We will provide empirical knowledge about the relationship between fish community structure and shoreline habitat characteristics within the UBE. Therefore, the results from this study are important to future restoration and management decisions in the UBE.

Klumpp, M., L. Gladney, H. Meyer, and J. Hinton. McSU. **Tardigrada of Antigua, West Indies.**—There have been no studies of terrestrial and freshwater tardigrades from the island of Antigua in the West Indies. These studies have been limited to Puerto Rico, the Dominican Republic, Cuba and Grand Cayman in the Greater Antilles, and Curaçao, Los Testigos, Saint Lucia, and Barbados, and Dominica in the Lesser Antilles. This paper presents the results of a survey of the terrestrial Tardigrada of Antigua, located 650 km southeast of Puerto Rico. Antigua (280 km<sup>2</sup>) consists of limestone formations in the northeast which are separated from the southwestern volcanic area by a central plain of clay formations. Twelve samples of moss and leaf litter were collected in May 2014 from two sites, Christian Valley and Body Pond Nature

Part, both near Mount Obama, the highest point on Antigua. Specimens were found in 10 of the 12 samples, representing five genera, and 7 species: *Milnesium katarzynae*, *Macrobiotus* sp. (probably a new species), *Macrobiotus harmsworthi*, *Minibiotus* cf. *intermedius*, *Paramacrobiotus* cf. *areolatus*, *Paramacrobiotus* cf. *richtersi*, and a *Hypsibiidae* sp.

Lee, A. FHS. C. Beachy. SLU. **A comparison between the direct developing salamander *Plethodon neomexicanus* and the facultatively paedomorphic salamander *Ambystoma mavortium*.**—We used museum specimens to compare life history features between two species of salamanders that differ in life cycle. *Plethodon neomexicanus* is a threatened species found in the Jemez Mountains of New Mexico. *Plethodon neomexicanus* is a direct developer, i.e., they metamorphose while developing inside the egg. *Ambystoma mavortium*, is a facultatively paedomorphic species from western North America. Paedomorphic species have the ability to reach maturity and reproduce while remaining in the larval state. We examined 49 *Plethodon neomexicanus* and 187 *Ambystoma mavortium* from the Southeastern Louisiana Vertebrate Museum. For *P. neomexicanus*, males are larger than females. We hypothesize that females mature before males (they mature at smaller sizes) or males grow faster than females. This is possibly because, even when mature, females take extra time to develop eggs before reproduction. Males and females do not transform until July or they transform after early June. We hypothesize that paedomorphs mature before non-paedomorphs transform due to the presence of mature larval specimens in June while immature transforming specimens do not appear until August and September. Paedomorphs start to transform before non-paedomorphs. This ensures the previous paedomorphs metamorphose in time to “catch up” with the non-paedomorphs.

Levron, C. and D. Schultz. NiSU. **Habitat-specific variation in the parental investment of Gulf pipefish (*Syngnathus scovelli*).**—In nature, organisms have a finite amount of energy to invest in reproduction. A parent may invest this energy in many small or fewer large offspring. In theory, parental investment should be optimized to produce the highest number of successful offspring for a given environment. The Gulf pipefish, an estuarine fish, is known to inhabit and breed in a large range of salinities, from full strength seawater to freshwater, with populations most commonly inhabiting higher salinity waters. Potentially, different environments select for different allocation of reproductive resources. This project compares nine populations of Gulf pipefish found in differing salinity regimes (fresh, brackish, and marine) to observe habitat specific parental investment. Because pipefish females must deposit ripe eggs into the pouch of a male, parental investment can be measured as the individual egg mass of newly laid eggs carried by males. Eggs were collected from both males and females, freeze dried, and weighed. Egg masses of populations surveyed were significantly larger in freshwater when compared to marine population ( $\alpha=0.05$ ). Potential explanations for this pattern include differences in resource availability and abiotic factors such as salinity.

Rupp, A., and D.M. Sever. SLU. **Seasonality and ultrastructure of mental glands and caudal courtship glands in three genera of Plethodontid salamanders.**—Salamanders in the family Plethodontidae exhibit a unique tail-straddle walk during courtship that can include the use of sexually dimorphic mental glands and caudal courtship glands that are thought to increase female receptivity. The presence of mental glands and caudal courtship glands has been observed in some species of Plethodontid salamanders, but a limited number of studies exist on the

seasonality and ultrastructure of these glands. While there are many light microscopy studies of mental glands that have observed intergeneric morphological variation, only four light microscopy studies of caudal courtship glands exist. The data available for mental gland characters can be optimized on a phylogeny to learn about evolution, but more data must be collected on caudal courtship glands before optimization would be useful. This study will use light microscopy and transmission electron microscopy to describe the ultrastructural and seasonal intergeneric variation of these glands in the three genera *Plethodon*, *Eurycea* and *Desmognathus*. This study focuses on native Louisiana species that have not been extensively studied for these glands. Preliminary light microscopy results on *Plethodon mississippi* and *Eurycea quadridigitata* have shown that caudal courtship glands exhibit intergeneric morphological variation.

Schultz, D. and S. Byrne. NiSU. **Fish entrainment by freshwater diversions of the lower Mississippi River.**—Freshwater diversions in the lower Mississippi entrain riverine species and introduce them into downstream habitats where they may flourish or fail to persist. This study used a variety of collection methods to document the degree to which fish species are being entrained by six freshwater diversions located in south Louisiana. Entrainment was quantified by identifying 35 species that are relatively common in the river but rare or absent in fish communities downstream from the diversions. Entrainment was often highest in diversions during or in periods shortly after there was high discharge through the diversions. There was little relationship between entrainment and river stage in most diversions likely because diversion discharges were greatly restricted during high river stages. Highest discharges and entrainment were seen in the months following the Deepwater Horizon oil spill when the diversions were opened to near their maximum capacity. During the same time period entrainment was generally higher in the larger diversions. The pallid sturgeon, an endangered species and its congener, the shovelnose sturgeon, were both entrained in two diversions. Fisheries downstream from diversions may benefit from entrainment but some species will encounter inhospitable conditions. Diversion management programs should consider fisheries benefits and costs.

Sorgee, B., G. Broussard, and H.A. Meyer. McSU. **Photokinesis and gravikinesis in the terrestrial water bear *Minibiotus acadianus*.**—Water bears (Phylum Tardigrada) are aquatic microscopic invertebrates found in marine, freshwater, and terrestrial habitats. Terrestrial species occur in leaf litter, soil, and cryptogams. Very little is known about the behavior of these animals. In 2000 Beasley studied photokinesis (movement in response to light) and response to gravity in *Macrobiotus hufelandi*. Beasley found that specimens <125 micrometers long avoided light, while there was no effect in larger animals. We used his methodology to examine photokinesis in *Minibiotus acadianus* collected from lichens on trees on the McNeese campus. Eyespots were present on these specimens, all of which were >125  $\mu\text{m}$  in length. Mean speed on agar of these animals was 3.8 mm/hour. Forty-eight animals were placed on agar in a Petri dish under fluorescent light. The Petri dish was covered so as to divide the area into areas of light and darkness. Forty animals were used in a control group in which the Petri dish was covered to ensure complete darkness. No significant difference was found in response to light between the experimental and control treatments. We plan to test smaller animals if they become available, as well as how *M. acadianus* responds to a gravity gradient.

Walkowski, W. SLU. **Glucocorticoid concentrations in calling and non-calling *Lithobates grylio*.**—Circulating glucocorticoids concentrations have been measured in a number of taxa to make inferences about mobilization of energy reserves during breeding season. Anuran vocalization is one of the most energetically expensive behaviors recorded in vertebrates, with energy costs being up to 25 times more than animals at rest. *Lithobates grylio*, the pig frog, is considered a prolonged breeder, calling from March to September. During the breeding season males exhibit a decline in foraging behavior and body mass. This study measures corticosterone concentrations, the primary glucocorticoid in anurans, in calling and non-calling male *L. grylio*. Blood samples were obtained from specimens (n=38) collected from a freshwater marsh in St. Tammany Parish, Louisiana, over the 2014 calling season. Behavioral observations and microhabitat selection were recorded upon capture. Corticosterone concentrations in blood plasma were analyzed using an enzyme linked immunosorbent assay. It was found that non-calling males had significantly higher CORT concentrations than calling males. Due to the nature of corticosterone to suppress calling activity and increase gluconeogenesis, it can be inferred that elevated corticosterone concentrations in *L. grylio* during the breeding season influences calling and non-calling behavior.

## Division of Physical Sciences

### Chemistry Section

Berkessa, S.C., K. Jeansonee, and J. Fotie. SLU. **Formation of a C-C bond through a silver(I)-catalyzed regioselective aryl-aryl cross-coupling resulting in a direct C-H activation.**—A silver(I)-catalyzed regioselective cross-coupling between phenols and aniline derivatives resulting in the formation of a new C-C bond through a direct C-H activation has been developed. The reaction involves the use of a large range of oxidizing agents, under mild conditions, resulting exclusively in the formation of a 2'-aminobiphenyl-2-ol derivative in a quantitative yield, without producing any of the possible homocoupling products. The optimization of the reaction conditions as well as the expansion of the scope of the reaction will be discussed.

Bhasker Ranganath, S., A.S. Hassan, C.D. Wick, and B.R. Ramachandran. LTU. **Computational studies on transition metal oxides as lithium-ion battery anode materials.**—Lithium-ion batteries (LiB's) are found to be promising energy storage devices with their applications extending from portable electronics/electric vehicles to load leveling applications. Most of the current generations of commercially available LiB's use graphite as the anode, which has a theoretical maximum capacity of 372 mAh/g [1]. A major challenge is in enhancing the power and energy density of these devices while using safe, eco-friendly, non-toxic and low cost materials of higher capacity. Transition metal oxides with a theoretical capacity of 500-1200 mAh/g [2] are among the materials being studied as alternatives to graphite. In this work, we describe computational studies using density functional theory to study the use of NiO, CoO and other oxides as LiB anodes. Effects of lithiation on structural and electrochemical properties of the material are investigated. Computations provide an atomic scale window into the behavior of these materials. [References: 1. Srivastava and Roy. Nanostructured anode materials for lithium ion batteries. *Journal of Materials Chemistry A* 3:2454-2484 (2015), 2. Goriparti et al. Review on recent progress of nanostructured anode materials for Li-ion batteries. *Journal of Power Sources* 257:421-443 (2014).]

Cui, Y. and D.G. Kuroda. LSU-BR. **Solvation dynamics of an ionic probe in simple and complex solvents.**—The knowledge of the solvation dynamics of liquids is very important in many areas of science as well as in many industrial processes. In particular, the solvation of any solute is of great importance in chemistry where the interplay between the different molecular interactions allows one to modify the energetic landscape of a chemical reaction. However, the characterization of these interactions is hard to obtain because of the short lifetime, or small energetics, of the inter- and intra-molecular interactions observed in these liquids. Here, we use non-linear ultrafast infrared spectroscopy to investigate the dynamics of an ionic probe in different solvents ranging from simple molecular solvents, such as water, to more complex, such as ionic liquids. Our studies show that in solvents containing hydroxyl groups, the dynamics are simply described by a fast rearrangement of the hydrogen bonds interacting with probe irrespective of the molecular nature of the solvent. Moreover, our studies suggest that there is not a simple correlation between the viscosity of the solvent and the dynamics measured for the probe.

Dong, C., D. Wayment, and G.V. Lo. NiSU. **QSAR approach applied to the prediction of retention time of nitroaromatic explosives.**—A quantitative structure-property relationship (QSPR) study has become a very useful approach for relating the properties of compounds to their molecular structure. This poster describes the use of QSPR and multiple linear regression (MLR), to develop a regression model to relate the HPLC retention times (tR) of six nitroaromatic explosives in a reverse-phase C<sup>18</sup> column (with 50:50 MeOH:H<sub>2</sub>O mobile phase) to their structural features as calculated using a molecular modeling program (Spartan). For six molecules, log(tR) was found to depend linearly on the polar surface area and molecular volume. The use of the regression model to predict retention times for two other molecules revealed insights into subtle structural features that need to be considered to derive a more generally applicable model.

Ducharme, G, A. Gallo, C. Battle, B. Primeaux, and J. Davis. ULL. **Synthesis of isomeric methyl nitrosopyridines as dienophiles for hetero Diels-Alder reactions.**—The nitroso group acts as a reactive dienophile in many [4+2] cycloaddition reactions. Our initial research focused on the synthesis, characterization and reactions of three isomeric methyl nitrosopyridines: 4-methyl-2-nitrosopyridine, 6-methyl-2-nitrosopyridine and 4-methyl-3-nitrosopyridine. A modified method of synthesis described by Taylor et al. was employed for the synthesis of these three compounds. The synthesis involves the conversion of the amino group to a sulfur ylide via a sulfilimine with final oxidation of the nitrogen to the nitroso group with a peracid such as mcpba. The characterization of these compounds by NMR, MS and IR will be discussed. NMR analysis of the 6-methyl and 4-methyl-2-nitrosopyridines showed the presence of a dimer which was temperature dependent. X-ray crystallography of the 6-methyl-2-nitrosopyridine dimer indicated a slightly rotated Z configuration, such that the oxy and pyridine groups were held sterically apart by a rotation around the N=N bond of 5.7 degrees. The Diels-Alder reaction of 6-methyl-2-nitrosopyridine and cyclohexadiene to give the DA adduct will be presented.

Esumike, S. and U. Siriwardane. LTU. V.N. Seetala. GSU. **BET, thermal and PXRD characterization of Ni, Co, Fe, Fe/Co, Ni/Fe and the study of promoter effect of Ru on alumina supported catalysts for the conversion of syngas and hydrocarbons: FT process.**—With the impending shortage of traditional fossil-based petrol fuels, it is important that research continues in the search for efficient catalysts. The Fischer–Tropsch (FT) process is a collection of chemical reactions that converts a mixture of carbon monoxide and hydrogen into liquid hydrocarbons. We have prepared particles, containing nano-particle metal oxides, NiO, CoO, FeO, FeO/CoO, and NiO/FeO in various metal w/w % ratios by sol-gel oil drop methods as FT catalysts. The same catalysts compositions with various RuO w/w% also were prepared. The catalysts were characterized by differential thermal analysis (DTA) and thermo-gravimetric analysis (TGA), surface area analysis by BET method and phase identification by powder X-ray diffraction (PXRD). All catalysts were calcined at 450°C and later activated by passing hydrogen gas at the same temperature. The catalysts activity of synthesis gas conversion to hydrocarbons was investigated using a gas phase reactor using mixtures of CO and H<sub>2</sub>. In this poster we will present the DTA, TGA, BET, XRD and initial catalytic data.

He, L. and D. Wayment. NiSU. **Fate of pyraclostrobin on sugarcane leaves under wash-off conditions.**—Brown rust, caused by the fungal pathogen *Puccinia melanocephala* is a significant pest in the Louisiana sugarcane industry. Damage to sugarcane can be reduced

through application of the fungicide pyraclostrobin (trade name Headline® SC; produced by BASF). However, little is known about the dynamics of pyraclostrobin in sugarcane leaves and soil. Previous wash-off studies on sugarcane indicate that very little fungicide appears in the wash-off after 48 hrs after application to the leaves, with the fate of the unrecovered pyraclostrobin being unknown. In order to better assess the fate of the unrecoverable pyraclostrobin, sugarcane leaves (n=15) were exposed to pyraclostrobin over a 96 hr interval. Leaves were harvested in triplicate at various intervals and subjected to aqueous wash-off conditions, followed by a final wash-off in methanol. Aqueous wash-off samples were concentrated by solid phase extraction (SPE) and all samples were analyzed by HPLC with UV-Vis detection. Most of the total extractable pyraclostrobin (96.9 ( $\pm 0.5$ ) %) appeared in the final MeOH wash-off after 24 hrs, while 3.1 ( $\pm 0.5$ )% was found in the aqueous wash. After 96 hrs, 97.6 ( $\pm 0.3$ ) % was found in the MeOH wash-off and only 2.4 ( $\pm 0.3$ )% in the aqueous wash. These results indicate that pyraclostrobin on sugarcane leaves is resistant to aqueous wash-off after 24 hrs of exposure.

Junk, T., G. Sanford, and K.E. Walker. ULL. F.R. Fronczek. LSU-BR. **Tellurium-containing heterocycles: Tellurazoles, tellurazinones, tellurazepinones.**—While benzothiazoles, benzothiazines and benzothiazepines constitute important classes of sulfur-containing compounds, their tellurium analogs have remained almost unexplored. Recent work will be presented which drastically improves access to these compounds and includes the first structural characterization of benzotellurazin-3(4H)-one and 2,3-dihydro-1,5-benzotellurazepin-4(5H)-one heterocycles. Synthetic access to the latter is of particular interest, considering the important role their sulfur analogs (benzothiazepinones) play as calcium channel blockers. When compared to acyclic aliphatic organotellurium compounds, the heterocycles prepared in this study showed remarkable thermal stability and had little tendency to oxidize, further facilitating the development of practical applications for these compounds.

Ma, J., S. Xuan, D. Zhang, and D.G. Kuroda. LSU-BR. **Molecular events of a thermo-responsive polymer.**—Thermo-responsive materials have gained significant attention because of their wide range of possible applications, such as drug delivery, bioseparation, etc. Thermo-responsive polymers are water soluble polymers that show a dramatic change in their water solubility when their temperature is changed. Here, we focus our studies on a family of pseudo-peptidic polymers in which the solubility decreases as the temperature increases; i.e., they have a low critical solution temperature (LCST). It has been previously shown that the structure and composition of these polymer directly affects its LCST. Here, we investigate how the structure of the polymer modifies the LCST via infrared spectroscopy. Our studies focus on two polypeptoids with the same chemical composition and molecular weight, but different structure: one is cyclic and the other one is a linear chain. Our experimental results suggest that the mechanism giving rise to the LCST is the same for both polymers.

Mathaga, J., Y. Cui, T. Li, R. Kumar, and D. Kuroda. LSU-BR. **Hydration and vibrational dynamics of betaine (N,N,N-trimethylglycine).**—Betaine is a zwitterion with a positively charged cationic quaternary ammonium and negatively charged carboxylate functional groups. The physiological, biochemical and dietary applications of the betaine has made this molecule a center of interest among many disciplines of science. In this study, the hydration and vibrational dynamics of the betaine were investigated both experimentally and theoretically. The linear

infrared experimental results show that aqueous betaine has two no-resolved bands in the IR region corresponding to the asymmetric stretch of carboxylate, i.e., between 1550-1700/cm. This finding also is observed by non-linear infrared spectroscopy (2D IR). In addition, the 2D IR spectroscopy of betaine shows that the zwitterion exhibits ultrafast hydration dynamics. To understand the experimental findings, we studied an aqueous solution of betaine with ab initio molecular dynamics simulations in combination with vibrational theory. Our results show that betaine has two stable conformers. In addition, the modeled hydration dynamics also displays an ultrafast decay of the frequency-frequency correlation function in agreement with the experimental findings. Finally, the modeling of the hydration dynamics allows us to show that the molecular mechanism giving rise to ultrafast hydration dynamics is solely caused by the water motions around the carboxylate group.

Ouma, G. and T.L. Perry. GSU. **One pot solvent free synthesis of highly functionalized 3,4-dihydropyrano[c]chromenes.**—An efficient and simple approach to the synthesis of some dihydropyrano[c]chromenes via a one-pot three-component reaction of hetero-aromatic aldehydes, 4-hydroxycoumarin, and malononitrile in the presence of an ionic liquid as a recyclable green catalyst in solvent-free neat condition at 25°C is reported. This reaction protocol has advantages of high atom economy, simple work-up procedures, and decreased reaction times.

Pokharel, U. LSU. A.W. Maverick and F.R. Fronczek. LSU-BR. **Fixation of carbon dioxide to oxalate and carbonate by supramolecular copper complexes.**—The fixation of carbon dioxide to oxalate ( $C_2O_4^{2-}$ ) or carbonate ( $CO_3^{2-}$ ) is an interesting area of research, as the process utilizes an environmental pollutant and converts it into more useful compounds. We have discovered a dimeric copper complex that can reductively couple two  $CO_2$  molecules to oxalate under mild conditions. The starting copper(II) dimer can be reduced to copper(I) using sodium ascorbate. The copper(I) dimer reacts selectively with  $CO_2$  from air and reduces it to oxalate, giving an oxalate-bridged binuclear complex. Treating this complex with acid releases the bound oxalate ion as oxalic acid. The starting complex also converts  $CO_2$  into a carbonate-bridged trinuclear complex when it is treated with DABCO (1,4-diazabicyclo[2.2.2]octane) as a guest. The trinuclear complex loses carbonate in the presence of  $BaBr_2$  or  $HCl$  giving an “empty” binuclear complex. The carbonate-bridged trinuclear complex also rearranges to oxalate-bridged binuclear complex when it is treated with ascorbic acid followed by  $CO_2$ . The structural and spectroscopic studies will be discussed.

## Computer Science Section

Bluford, C. GSU. **To perform various functions using the IntelliBrain robot.**—This project is related to the Grambling State University Rising Sophomore Academy during the summer of 2014. The project includes the IntelliBrain Bot Robot, Java language commands, IntelliBrain Bot package with C-language, and Windows 7 operating system. This robot was designed to be easily programmed with the Java programming language. I constructed many different programs to make the robot perform various functions, from moving forward in a straight line, to displaying text on the LCD screen, to driving in a perfect square. Overall, I learned the basics of

programming a robot to carry out simple functions as well as become more familiar with programming with Java.

Busby, S. and D. Saint-Jean. GSU. **Shellshock/Bash door: Its danger and solution.**—Shellshock is a nickname for a bug in the Bash command-line interpreter, also known as a shell. Systems running Internet servers are the most vulnerable and likely to be targeted. Home users who have Bash on a personal computer also may be exposed if they use untrusted networks (i.e. Public Wi-Fi access points). The attack vectors include HTTP Servers, DHCP Clients, SSH, Common Unix Printing System (CUPS), and Browser Plug-ins. The attack modes include CVE-2014-6271, CVE-2014-7169, CVE-2014-7186 & CVE-2014-7187, and CVE-2014-6277 & CVE-2014-6278. Our study concludes the protection against shell shock. Long-term, just like Heartbleed, the only real solution for Shellshock is to install a patched version of Bash. For server admins, this should not be too difficult, though there will be a lot of computers to update. For many people, the real concern will be updating any and all devices that run some kind of Linux-flavored operating system and have a vulnerable version of Bash. At the very least, this will probably mean a lot of wireless routers need to be patched. Other smart and Internet-of-Things (IoT) devices also may need to be patched: Smart TVs, Smart fridges, Wi-Fi-connected thermostats, and similar household or office tools.

Hardee, L., W. Dees, L. Petticrew, C. Ardizzone, S. Thapa, H. Fogg, and J. Woolman. McSU. **Louisiana Environmental Research Center at McNeese: Developing an ADA accessible website.**—The Louisiana Environmental Research Center (LERC) at McNeese State University, Lake Charles, Louisiana, was established to conduct research focused on environmental problems of importance to southwest Louisiana (SWLA) and the Gulf of Mexico region. The Center also provides information and data to agencies, researchers and industry on impacts of environmental events on the SWLA coastal region. The Center's mission is to conduct basic and applied research, accumulate and disseminate information, and create awareness through education on SWLA environmental issues and concepts with a primary emphasis on the Chenier Plain. To publicize information related to ongoing and completed research and environmental projects at LERC, a plan was formulated to develop, launch, and operate an Americans with Disabilities Act (ADA) accessible LERC website featuring LERC news, staff, media, projects and publications. An accessible content management system, Drupal, was used as the base structure of the website to speed up the development phase. The programming languages HTML, CSS, Javascript, PHP, and MySQL were used to alter the appearance and extend the functionality of the Drupal core. Through automated tools and real world testing, the website was analyzed for potential accessibility issues.

Hawkins, J. and A. Cherry. GSU. **Implementation of the Map/Reduce framework using client server mode.**—Big data is a general term used for a large volume of data that are structured, unstructured and semi-structured data created or generated by a company. This data cannot be loaded using any database models and it is not possible to get results with available query languages. It is expensive to analyze, organize, and prepare as useful data. Therefore, we need special efforts to prepare meaningful tools by using new algorithms, special hardware and software. There may not be a single tool to analyze and create big data as meaningful data. The tools may vary to analyze data. Hadoop technology made a breakthrough to process unformatted data and generates the results very fast. Before Hadoop technology, the results were produced for

formatted data using SQL and other tools, and had them effectively sharing memory, central processing unit, disk, and network input/output more efficiently. The research presents the implementation of the Map/Reduce framework using client server mode to count the number of occurrences a word occurs in a single document or multiple documents. The implementation was done on a Dell Precision T5500 at Grambling State University using a single-node and multi-node system.

Hill, D. GSU. **VEX robot track navigation.**—The goal of my project was to construct a functioning robot that utilizes line trackers in order to navigate using white lines laid on a flat surface, and an ultrasonic rangefinder to sense objects in its path. It will be able to use the guidelines in order to retrieve objects at the end and bring it back to the beginning of the line. The frame of my robot consists of four chassis rails that were 1x2x1 and three flat metal panels in varying sizes going across the top – a design stable enough to hold the other parts of the robot. This robot has a claw on the front which will be used to pick up objects that the ultrasonic range finder senses. The robot was programmed to do specified functions and move on a specified track.

Lambert, D. GSU. **Snake 3X.**—Snake 3X is a computer game developed using a python. It is based on the concept which originated during the late 1970s in arcades. Developing a game of the widely known snake game with custom features makes Snake 3X stand out from other variants. There are three difficulty settings for playing the game - easy, medium, and hard. The player controls a square that represent the snake on a 2D bordered plane. As the snake moves forward, it leaves a trail behind, resembling a moving snake. The end of the trail is in a fixed position, so the snake continually gets longer as it moves. The player attempts to eat fruits by running into them with the head of the snake. Each object eaten makes the snake longer, so maneuvering is progressively more difficult.

Macha, A. and M.A. Salam. SU-BR. **Comparison of hierarchy based routing protocols in wireless sensor networks.**—Wireless Sensor Networks (WSNs) are used in many security applications such as military and forest fire detecting applications. Basically, WSN is a collection of nodes, which sense data, collect data from the environment and process the data collected. Usually these nodes will have batteries as their source of energy. As in most of the applications, nodes are deployed randomly over an area, and battery charging or replacement is not practical. This is one of the main reasons why energy-efficient protocols are given high priority to increase a network's lifetime. Hierarchical routing is considered as one of the most efficient routing protocols. In this paper, we present a comparative study between some hierarchical routing protocols namely LEACH, LEACH-C (Centralized), and A-LEACH (Advance LEACH). Furthermore, we compare the advantages, disadvantages, and assumptions of considered protocols. We also provide direction for an enhanced protocol.

Maddireddy, B. and M.A. Salam. SU-BR. **PEGASIS algorithms in wireless sensor networks.**—Sensor networks consist of nodes in which the nodes have limited battery power. Wireless communications from the field to the base station are used to collect all the data from the nodes. In gathering sensed information in an energy efficient manner is the key issue in operating the sensor networks for a long period of time. In each round of communication, sensor nodes have data in the form of packets to be sent to the base station. In sending the data packet to the base

station a certain amount of energy is required for the nodes and that energy cost depends on the distance of the transmission from nodes to the base station. When a node sends a data packet, a certain amount of energy will deplete from the nodes. There are certain techniques that can be used in reducing the energy cost of the nodes in data transmission. One efficient technique is PEGASIS. There are several enhancements in the PEGASIS technique and this paper compares all of the different PEGASIS algorithms proposed by different scientists and displays compared results depending on their lifetime and type of chain formation.

McDowell, P. and D. Dale. SLU. **Protective inflatable garment system for people with unstable balance.**—This paper describes the methods and results of a semester long senior project in which a team of four students successfully developed and tested the first phase of a protective garment for use with patients who have unsteady balance. A prototype was developed and tested using a mannequin and a test stand. It was designed and built by a four member student team for their senior capstone project at Southeastern Louisiana University to fulfill requirements for their Computer Science/Information Technology degrees. The goal for this phase of the project was to create a prototype vest/garment, detect a fall using onboard sensors, and trigger the protective apparatus of the garment, before impact. To support the development various test stands/equipment were built so that consistent falling motions could be generated, and upon impact sensors and microprocessors would not be damaged.

Mosley, C. and G. Spears. GSU. **RootKits – A malware in Unix operating systems.**—A rootkit is a stealthy type of software, typically malicious, designed to hide the existence of certain processes or programs from normal methods of detection and enable continued privileged access to a computer. Rootkits allow viruses and malware to “hide in plain sight” by disguising themselves as necessary files that your antivirus software will overlook. Rootkits themselves are not harmful; they are simply used to hide malware, bots and worms. Rootkits get their name from the UNIX term for the primary administrator account called “root” and “kits,” which refer to the software pieces that implement the tool. The first rootkit was created for the UNIX system over 20 years ago. To penetrate into a rootkit, an attacker must first gain access to the root account by using an exploit or obtaining the password by cracking it or social engineering. Due to the way rootkits are used and installed, they are notoriously difficult to remove. Rootkits today usually are not used to gain elevated access, but instead are used to mask malware payloads more effectively. The study concludes with the current status and patches available to eliminate rootkits.

Reddy, YB. GSU. **Fingerprint matching - A review.**—Fingerprints are the most widely used and accurate method of identification of an individual. Every individual has a unique set of ridges and points that are used by experts to identify a person. Pattern matching model can be used to identify the fingerprint by matching certain ridge characteristics (dot, bifurcation, ridges, ridge ending, and islands). The ridge factors include relative positions of the minutiae points (ridge features) with a reference print. The fingerprint identification became automated due to advances in computing. Gannon Technologies (Gannon ridge flow using computations) have developed a method to overcome latent fingerprints and conventional matching methods. With the introduction of graphics processing units (GPUs), the computing capability multiplies exponentially and the results are in hand much faster than our imagination. The presentation

discusses the number of techniques for fingerprint minutiae, evaluation of fingerprint technology, advance of fingerprint technology, and GPU-based implementation.

Robicheaux, J., L. Hardee, T. LaFleur, J. Woolman, W. Dees, and H. Fogg. McSU. **Development of the “Innovation Marketplace” web application.**—In 2011, the Office of Research and Sponsored Programs at McNeese State University (MSU) determined that centralized information about university expertise and capabilities was not readily available for the purpose of establishing public-private partnerships. An opportunity was realized for MSU to improve upon public-private partnerships that benefit the institution, the faculty and staff members, the students, the public/private sector partners, and the community. The Economic Development Administration University Center at McNeese, through a collaborative and strategic alliance with the University, established a partnership that will advance the region’s knowledge economy through research, scholarly work, projects, and services. The goal of the Innovation Marketplace project is to identify intellectual capital (e.g., faculty/staff expertise, qualifications, certifications, industry experience, and research) and create an interactive web application to enable potential community and regional partners to search for and request faculty and staff expertise. We used HTML, CSS, Javascript, PHP, and MySQL to create an ADA accessible web application for the compilation and retrieval of faculty and staff professional expertise information. Applying academic intellectual capital toward mutually beneficial partnerships enables knowledge transfer and the opportunity for students and faculty members to engage in innovative discoveries for economic growth and prosperity.

Salam, M. SU-BR. **Protocols development of wireless sensor network.**—Wireless sensor networks play an important role in the field of sensing and monitoring of various environments. Depending on the application, heterogeneous or homogeneous sensor nodes are spread in the environment of interest. These sensor nodes could be mobile or static or the event could be moving or stationary. Data gathering from these sensors is an important issue since these sensor nodes are battery operated and have limited energy. Efficient data gathering techniques are necessary to maximize the lifetime of these sensor networks. This research focuses on various data-centric, hierarchical, and location-based routing protocols and characterizes them with different features. It discusses key features for wireless sensor networks protocols such as network dynamics, node deployment, data delivery, node capability, and data fusion. It also highlights future research trends of wireless sensor networks in the area of security, reputation, and trust.

Small, C. GSU. **Linked website.**—Linked was built to make web browsing more convenient and also faster. Most people use common sites every day and many of these people revisit those sites. Why not use a site which can save multiple sites? Speed in web browsing is a major factor for which Linked can help. Why search for a page that you already know when you can use linked as your home page and have the sites that you use on a daily basis right in front of you. These sites are just one click away and you can add and delete sites at your own will. Linked uses user input and URL saves to save pages that the user enters. Therefore, if you want to delete one of your sites, there is a button for that. Linked was built with html5 which gives it even more room to be updated, so there can be changes if too many problems occur during user feedback.

## Materials Science & Engineering Section

Ahmed, M.A. and S. Tewari. LTU. **Unmodified and modified carbon based electrode's performance and regeneration in capacitive deionization.**—Technologies such as reverse osmosis (RO), membrane filtration, multistage flash, electro-adsorption, etc. are commonly used in desalinating water. Capacitive deionization (CDI) is a relatively novel technology which has shown increased energy and cost efficiency compared to these contemporary technologies. CDI is an electrochemical process to extract salt ions from water. Different forms of porous-carbon and graphene based electrodes have been used in CDI and have further increased its effectiveness by facilitating mass transport and adsorption of salt ions on the surface nanopores of these materials. Furthermore, surface modification of electrodes by metals/metal oxides, organics and other compounds has resulted in increased higher salt removal efficiency per unit of mass of carbon compared with use of uncoated/unmodified forms of the same material as electrodes in CDI. Incorporation of RO and membrane technologies, resins and ion exchange polymers resulted in modified CDI technologies which have shown remarkable improvement in removal efficiency. CDI technology can be a better alternative to replace conventional technologies of desalination which are not yet capable of reducing salt content in product water in an environment friendly way. This research focuses on exploring performance of carbon and its modified forms with different operating conditions and also the regeneration of electrodes.

Carter, J., M. Elaasar, I. Tietzel, and R. Belmasrou. SU-NO. **Design and test of a temperature controlled compartment for fruit flies.**—The LaSPACE High Altitude Student Platform (HASP) is designed to carry small student payloads such as instruments or living organisms to an altitude of about 36 km with flight durations of 20 hours. Fruit flies have been used as early as the 1960's to study the biology of living organisms during space flight. Fruit flies were part of payloads in designed capsules. The control of temperature and other internal conditions of the space payload for fruit flies is critical. Thus it is hypothesized, that design of payload must meet standards that avoid temperature changes, oxygen depletion and carbon dioxide changes. Therefore, the design of a temperature controlled shield compartment must contain temperature, oxygen, and carbon dioxide monitors. An integrated circuit board was built using the Arduino microcontroller board and transistor. The transistor has three pins for ground, signal, and +5volts. It outputs 10 millivolts per degree centigrade on the signal pins. To convert output voltage to degrees, we used Arduino's math abilities to display the data. The design of the compartment and data will be presented. The research was supported in part by SURE EPSCoR award to M.E. Funded by LEQSF-EPS (2014)-SURE-123.

Chokwitthaya, C. and A.M. Aly. LSU-BR. **Retrofitting building roofs with solar panels to reduce hurricane damage and enhance eco-friendly energy production.**—The purpose of this study is to investigate impact of hurricane winds on low-rise buildings retrofitted with solar panels. Pressure coefficients on a building with a gable roof and solar panels mount on top were measured both computationally and experimentally, before and after installation. Computational fluid dynamics (CFD) simulations with Reynold's Stress Model (RSM) and Large Eddy Simulation (LES) turbulence closures were carried out. Laboratory experiments are also being carried out at a new open-jet facility at Louisiana State University (LSU), which was recently built by the Wind Impact and Structural Engineering (WISE) research team. The results of trialing several arrangements of solar panels show that proper retrofitting configurations can help

reduce hurricane-induced uplift loads on roofs, a key conclusion toward improved resilience with sustainability benefits. In addition, future research will deal with more shapes of building roofs and patterns of solar panels, with the objective of creating proper design codes. This will lead Louisiana and the nation to improved solutions that can improve the resilience of buildings under hurricanes and enhance green energy production.

DiCarlo, A., J. Burnette, and N. Seetala. GSU. **Defect analysis of heavy ion-irradiated polyethylene composites with Martian regolith.**—We used SRIM-2013 computer code to estimate the irradiation parameters in polyethylene and its composites with Martian regolith (MR) subjected to irradiation with 600MeV/u  $^{56}\text{Fe}^+$ -ions. The positron annihilation lifetime spectroscopy (PALS) results showed that MR composites were less porous with much lower nanopore concentration compared to polyethylene. A qualitative inverse relationship was observed between nanoscale porosity and mechanical properties (flexural stress at maximum flexural load obtained from a 3-point bent tests). But overall flexural stress at all irradiation doses is lower for MR composite than for polyethylene. SRIM-2013 provided estimates for the irradiation parameters such as cascade displacements, stopping power, lateral/longitudinal straggling, ionization, and the defect concentrations. The dissipated energy density, H- to C-vacancies ratio, the loss of H-atoms from matrix, and their effect on chemical transformations are discussed to explain the differences observed between PALS and mechanical property results. The work is partly supported by NASA-CIPAIR grant, Award# NNX09AU97G.

Gyawali, S. and D. Mainardi. LTU. **Study of structure, stability and catalytic activity of transition metal cluster for Fischer Tropsch reaction using First Principle DFT.**—Transition metal cluster (TMC) exhibits different properties which form an important bridge between molecules and the bulk. The nature of bonding, the geometrical structure, and the ground state of TMC are very unpredictable which makes them interesting candidates to study their structure, stability and catalytic activity for various heterogeneous reaction processes. First Principle Density Functional Theory (DFT) has been used to study the structure and stability of cobalt ( $\text{Co}_n$ ), iron ( $\text{Fe}_n$ ), and nickel ( $\text{Ni}_n$ ) clusters, with 'n' varying from 1-15. The adsorption and dissociation of Co, an elementary step in various catalytic reactions including Fischer Tropsch Reaction (FTS), on cobalt cluster ( $\text{Co}_{14}$ ), iron cluster ( $\text{Fe}_{15}$ ) and bimetallic cluster of cobalt/iron ( $\text{Co}_{10}\text{Fe}_4$  and  $\text{Fe}_{10}\text{Co}_4$ ) also has been studied using the same theory level. Cobalt adsorption and dissociation on the surface of the catalysts falls under surface carbide reaction mechanism which was proposed by Fischer and Tropsch. According to this reaction mechanism, the dissociation of Co on the surface of the catalysts is the first step that is carried out during the process; hence, this step should not be the rate determining step for the reaction to proceed. Therefore, transition state calculations are done using LST/QST method with density functional theory to study the dissociation energy of Co on the surface of the catalysts.

Julien, W., J. Burnette, J. Dean, and N. Seetala. GSU. S. Esumike and U. Siriwardane. LTU. **Magnetization studies of syn-gas conversion bimetallic nanocatalysts.**—Characterization of alumina supported bimetallic nanoparticle catalyst granules was performed for the use in syn-gas conversion reaction. Samples of alumina supported Co, Fe, Cu/Fe, Cu/Co and Co/Fe nanocatalyst granules were prepared using sol-gel/oil-drop methods with 4% metal loading in each case. The calcined granules have mesoporous structure with large surface area examined by BET method. A Vibrating Sample Magnetometer (VSM) is used to find the magnetic properties of the

nano-catalyst granules after each stage of calcinations, hydrogenation, and catalytic reaction. Each magnetization curve is analyzed to separate paramagnetic and ferromagnetic components. The saturation magnetization of the ferromagnetic component is used to estimate the reduction efficiency during hydrogenation and catalyst poisoning after catalytic reaction. The results indicate increasing ferromagnetic properties after syn-gas reaction. This work is partly supported by DOE-EFRC (Atomic Level Catalyst Design, contract# DE-SC0001058) and LASiGMA (contract#EPS-1003897) grants.

Philgence, A., T. Ismael, B. Hawkins, M. Alhulaymi, and A. Ainousah. GSU. **Street crossing assistance device for the blind.**—The need for reliable, safe and easy to use assistance devices for the blind has been constantly growing. This project is to design a handheld device that is able to make street crossing easier and safer for visually impaired people. This device is equipped with a transmitter/receiver unit, a vibration alert unit, and a remote crosswalk control unit that can be integrated with the existing traffic light control systems. The transmitter/receiver enables communication between the remote crosswalk controller on the handheld device and the traffic control system. The vibration alert generates two different vibration signals to alert the user whether it is safe to cross or the “safe to cross” time is about to expire. An Arduino mega microprocessor is programmed to simulate the traffic light control operation. The performance of the designed device was demonstrated experimentally with promising results observed. This system is practical and expandable.

Rezaee, M. and A.M. Aly. LSU-BR. **Vibration mitigation of traffic signal support structure.**—Traffic signals play a major role in transportation all over the world to control conflicting traffic flows particularly at road intersections and crosswalks. A typical support structure for traffic signals is cantilever one with a single vertical pole and a horizontal mast arm. These structures are considered as slender, lightly damped structures and because of long span they are very flexible structures that are vulnerable in critical weather conditions such as hurricanes. Fatigue life of these structures also is another important issue that may highlight the importance of vibration control of cantilever traffic signals. Current research is conducted to investigate vibration mitigation methods. Our study recommends the most reliable and effective damping system to reduce the mast arm vibrations and, therefore, to increase the fatigue life of the structure.

Stone, S. and B. Hollins. LTU. **Leaching of dopant from doped PDMS into liquid media.**—Recent work has shown the usefulness of (poly)dimethylsiloxane (PDMS) for microfluidic work and cell culture applications for its low cost, reproducibility, biocompatibility, and easily modifiable surface. When the surface of PDMS is modified to be hydrophilic, hydrophobic recovery occurs via reorientation of surface groups to the bulk polymer, or through diffusion of particles in the bulk to the surface. The goal of this study is to show that dopant diffusion from doped PDMS may be applied to administering small molecules to cell culture. Before curing the PDMS prepolymer, powdered substances could be added to the prepolymer mixture before curing, and these particles should be able to diffuse from the bulk to the surface immersed fluid. Fluorescein was added to PDMS in concentrations of 1mg/10g PDMS, 5mg/10g PDMS, and 10mg/10g PDMS, and 1g samples of the doped PDMS immersed in 5 mL of water, formic acid, Williams E medium, and McCoy’s 5A medium. The fluorescence of the fluid after some time was measured and the amount of leached material shows a maximum leaching percent of 1% and

maximum leached mass of 4.7  $\mu\text{g}$  over 4 days. The results show promise for administering small amounts of a substance to cell culture.

Thapa, S., C. Ardizzone, N. Zhang, H. Fogg, L. Hardee, P. Yadav, W. Dees, and J. Woolman. McSU. **Development of a bioassay chamber for investigating innovative mosquito control techniques.**—As part of a multidisciplinary collaboration between the Economic Development Administration University Center at McNeese State University and the Louisiana Environmental Research Center that is sponsoring research on innovative pest management practices, we are designing a mosquito bioassay cage to aid in determining the efficacy of water-based mosquito prevention and control products. Currently used cages are rectangular in design and have side access openings through which mosquitoes are introduced. This design may influence the distribution of mosquitoes in standard cage experiments. Mosquitoes in these cages have been observed to position themselves in specific regions of the cage - the corners (the “corner factor”) - and either near or away from the access opening. We have designed a cage that eliminates the “corner factor” and the access opening influence. Our cage design includes a cylindrical lower portion (vs. standard angle construction), a dome upper portion (vs. standard flat top construction with associated angles), and a removable cage access section for introducing mosquitoes. These portions contain interlocking construction for ease of assembly. We are designing a prototype of the bioassay chamber using computer-aided design (CAD) software. The prototype will be manufactured by a 3-D printer.

Villermin, L. and M. Caldorera-Moore. LTU. **High surface area patterned hydrogels for drug delivery or tissue engineering applications.**—Biocompatible hydrogels can be tailored to release pre-loaded drugs in a localized area of the body. To battle disease, drugs can be released in desired amounts by changing hydrogel pore size, crosslinking density, or the presence of nanofeatures. Upon the establishment of a hydrogel composition that swells and degrades at a predictable rate, a subcutaneous film could be developed to release a drug as needed. Hydrogels also can be used as scaffolds to repair damaged tissues. By increasing the surface area of a hydrogel scaffold with a dense network of nanofibers, an environment not unlike the extracellular matrix can be simulated. This research aims to develop two different fabrication techniques: one to pattern hydrogels with vertically aligned nanowire arrays and one to create a biocompatible network of hydrogel nanofibers. It is hypothesized that with the resulting increase in surface area, these added nanofeatures will significantly affect gel swelling, degradation rate, and therefore the release of therapeutic agents while simultaneously mimicking the extracellular matrix of cells. A hydrogel patterned with nanofeatures increases the surface area to volume ratio, thus allowing for rapid swelling. The increased area also will aid intelligent hydrogels in sensing and responding to stimuli.

Willis, M., D. Swafford, and N. Seetala. GSU. **XRD analysis of spark plasma heat treated  $\text{ZrB}_2$ -SiC coarse- and nano-powder composites.**—Ultra-high-temperature ceramics (UHTC) are useful for propulsion and thermal protection systems.  $\text{ZrB}_2$  and  $\text{HfB}_2$  with 5-20 wt% SiC were prepared using ultra-sonication, rotary evaporation, and spark plasma sintering (SPS) at high temperatures ( $\sim 2,000^\circ\text{C}$ ) and pressures (35-60 MPa). A comparison is made between coarse-powder and nano-powder composites. Nano-composites have higher microhardness, lower porosity, and smaller grains compared to coarse-composites. Bruker D2 x-ray diffractometer (XRD) is used to study phase compositions along with the material analysis using

diffraction (MAUD) program for analysis. The nano-composites showed oxidation of Zr to form  $ZrO_2$  phase during SPS consolidation of the nano-composites. In general, higher percentage of the crystalline SiC phase is observed in  $HfB_2+SiC$  composite compared to  $ZrB_2+SiC$  composite. This work is supported in part by an Air Force grant.

## Math & Statistics Section

Bian, R. and C.G. Wilmot. LSU-BR. **A spatio-temporal population distribution method for emergency evacuation: A case study of New Orleans.**—Knowing where people are at different times of the day is important in emergency management. This study presents a spatio-temporal method to estimate population distribution by time of day, day of week, and season of the year. Population is broken down into six groups: resident, worker, student, stay-at-homer, shopper, and tourist. The last two groups have usually been neglected in past studies. However, they are quite important dynamic factors in daily/weekly migration and seasonal variation. In this study, population is distributed using dasymetric mapping where distribution is based on land use in the area. However, two modifications are made to the process. First, preprocessing of rough land use categories with resident density and employee data allow distinction between resident, worker, shopper, and tourist in the distribution process. Second, the relationship between population and land use is based on regression of existing data instead of on subjective judgment or sampling as in current dasymetric methods. The method is demonstrated in an application to downtown New Orleans evaluating the population affected by a hypothetical chemical spill. In one case, the spill is assumed to occur on a weekday afternoon during a local festival. Over 90,000 people are estimated to be affected by the toxic plume emanating from the site, with the most people affected being workers in the industrial areas surrounding the port and tourists in the French Quarter. In the other case, the same spill was assumed but considered to occur over the weekend at night during a period when no festival was in progress. In this case, only 57,000 people were estimated to be effected and the vast majority of them being residents and tourists spread throughout the area.

Dillon, A., M. Elaasar, and R. Belmasrour. SU-NO. **The performance indicators of elementary school students.**—During the summer of 2014, the National Nuclear Security Administration (NNSA) sponsored the Gateway to Excellence in Mathematics and Sciences (GEMS) summer camp at Southern University at New Orleans for elementary school students for two weeks. The first week, we introduced the students to robotics, and they were able to build their own robots and learn how to program them. The second week we introduced the students to the STEM fields in a very exciting way, by allowing them to perform different experiments in every STEM subject. We evaluated the students' attitudes towards the STEM fields by a simple survey which consisted of questions that we statistically analyzed. We studied three variables: students' interest in robotics based on their gender, grade level versus their thoughts about programming robots, and their favorite subject versus their gain in interest in math after engaging in robotics. We used the Chi Square test to analyze the data and concluded that the gender of the students is independent of their interest in robotics. The students' grade levels are independent of their thoughts about programming robots, and finally students continued to like math after engaging in robotics. Funded by: DE-NA0001890, DE-AC52-06NA25396, DE-NA0001896

Doucette, R. McSU. **A look at a mathematics journal problem section.**—A selection of recent problems from the problem section of the Mathematics Magazine will be considered. Examples involving mathematical inequalities and Euclidean geometry will be presented.

## Physics Section

Abbot, K., D. St. Jean, D. Williams, P. Derosa, D. Jana, and L. Sawyer. LTU. **Design and optimization of a radiation detector for ground and spaced-based exposure.**—This project aims to construct a detector capable of analyzing the effects of radiation on different biological samples for ground and space-based expeditions. The device will measure the amount of radiation that reaches DNA, a result that if correlated with the observed damage will help in assessing human survival under those radiation conditions. In order to optimize the design of the detector, simulations were run using the Monte Carlo technique as implemented in GEANT4; a toolkit for the simulation of particles through matter. The detection system design places the sample between glasses and a series of scintillator fiber arrays above and below to track radiation before and after hitting the sample. Two designs, one with 3 fiber layers above and below and a second model with 4 fiber layers were tested. A proton beam was fired with energies between 5 MeV and 200MeV. Simulation results show that below 40MeV, protons are absorbed before reaching the last fiber layers and thus outgoing direction cannot be determined, protons of even lower energy are fully absorbed in the top fiber not reaching the sample. It is observed that the energy deposited in the sample peaks for protons between 40-50 MeV.

Bagayoko, D. SU-BR. **A solution to the band gap catastrophe: Density functional theory (DFT) understood and completed in practice.**—We show that electronic structure calculations using density functional theory (DFT) must: (1) keep the number of particles constant and (2), using embedded basis sets, search for the smallest one that yields the absolute minima of the occupied energies. These two conditions are necessary for the calculated properties to have the full, physical content of DFT. Both the second Hohenberg and Kohn theorem and the Rayleigh theorem for eigenvalue equations dictate the selection of the noted smallest basis set. The findings from calculations following the above conditions have correctly described more than 25 semiconductors, including their band gaps. Hence, the wide spread underestimation of band gaps in the literature is apparently due to calculations and not to DFT. The catastrophe consisting of being content with the underestimation and of the proliferation of ad hoc potentials incongruent with predictive capabilities is hereby remedied, as the Planck formula did it for the UV catastrophe.

Beach, B., D. Sauriol, N. Ranjitkar, and P. Derosa. GSU/LTU. **Spin state vs. conductivity in a thiophene-functionalized iron-bis(dicarbollide) monomer between gold electrodes.**—The objective of this work is to study of the relationship between spin state and conductivity in a thiophene-functionalized iron(III)-bis(dicarbollide) monomer. Iron, as a ferroelectric atom, has a high ground state spin that can be altered leading to different magnetic states. The hypothesis of this work is that the spin state of the Fe-containing molecule also can be altered and that a difference in spin states leads to a difference in molecular conductivity. A molecule with spin-dependent conductivity may have applications as molecular switch, the basic building block in digital logic, or as a memory bit, to mention two examples. The molecule, with a single

thiophene ring attached to each cage, was first optimized via the Gaussian 09 Software at the B3LYP level of theory. For each spin state, the relaxed geometry was then ported to Atomistix and placed between gold electrodes for study, via non-equilibrium Green's functions, of its spin-polarized electron transport properties using the PBE Solids functional. Results show that conductivity increases significantly with the spin state. To extend this study beyond what is presented here, calculations will be repeated with multiple thiophene rings on either side of the molecule.

Bohara, B., I.H. Nwigboji, Y. Malozovsky, L. Franklin, and D. Bagayoko. SUAMC. **Ab-initio calculations of electronic properties of CaF<sub>2</sub>.**—We present results from ab-initio, self-consistent local density approximation (LDA) calculations of electronic and related properties of cubic fluorite (CaF<sub>2</sub>). Our nonrelativistic computations employed the Ceperley and Alder LDA potential and the linear combination of atomic orbital (LCAO) formalism. The implementation of the LCAO formalism followed the Bagayoko, Zhao, and Williams' method as enhanced by Ekuma and Franklin (BZW-EF). Self-consistency for the system of equations requires a search for the optimal basis set that yields the absolute minima of the occupied energies. This search involves increases of the size of the basis set and the related modifications of angular symmetry and of radial orbitals. We discuss the electronic energy bands, including the large band gap, densities of states, effective masses, and the bulk modulus. Acknowledgments: This research is funded in part by the National Science Foundation (NSF) and the Louisiana Board of Regents, through LASiGMA [Award Nos. EPS-1003897, NSF (2010-15)-RII-SUBR] and NSF HRD-1002541, the U.S. Department of Energy – National, Nuclear Security Administration (NNSA) (Award Nos. DE-NA0001861 and DE-NA000260), LaSPACE, and LONI-SUBR.

Elumalai, D. LTU. P. Derosa. GSU. **Application of an in-house simulation model to attain tunable release of molecular species from halloysite nanotubes.**—Encouraged by potential applications in rust coatings, self-healing composites, selective delivery of drugs, and catalysis, the transport of molecular species through halloysite nanotubes (HNTs), specifically the storage and controlled release of these molecules, when and where they are needed, has attracted strong interest in recent years. By varying the HNT's internal properties and by the addition of smart caps at the tube's ends, it is possible to further control the release rate of the encapsulated nanoparticles (NP). In this work, a three-dimensional, time-quantified Monte Carlo model that describes transport in HNTs was implemented. The controlled delivery from HNT is modeled based on interactions between the HNT's lumen and the NP's and the interactions among the NPs themselves. The model was validated using experimental data published in the literature. The validated model was then used to study the effect that the pH of the media inside the lumen and the addition of end-caps to the HNTs has on the NPs release rate. The results show noticeable changes in the release profiles with pH and that the NP's delivery rate is significantly affected by the addition of end caps to the HNTs, making delivery dependent on the end-cap's pore size.

Goita, A., I.H. Nwigboji, Y. Malozovsky, and D. Bagayoko. SUAMC. **Ab-Initio computations of electronic and related properties of cubic lithium selenide (Li<sub>2</sub>Se).**—We present results from ab-initio, self-consistent calculations of electronic and related properties of cubic lithium selenide (Li<sub>2</sub>Se). We employed a local density approximation (LDA) potential and performed the computations following the Bagayoko, Zhao, and Williams (BZW) method, as improved by

Ekuma and Franklin (BZW-EF). Our results include electronic energies, total and partial densities of states, effective masses, and the bulk modulus. We found cubic  $\text{Li}_2\text{Se}$  to have a direct band gap of 4.0651 eV, at the  $\Gamma$  point. Acknowledgments: Work funded in part by the National Science Foundation (NSF) and the Louisiana Board of Regents, through LASiGMA [Award Nos. EPS-1003897, NSF (2010-15)-RII-SUBR] and NSF HRD-1002541, the U.S. Department of Energy – National, Nuclear Security Administration (NNSA) (Award No. DE-NA0001861 and DE-NA000260), LaSPACE, and LONI-SUBR.

Gongre, M. and N. Simicevic. LTU. **Simulation of radiation dose in regolith built lunar base for the safety of astronauts.**—Ionizing radiation is a major concern in extraterrestrial environments. Galactic cosmic rays (GCR) and radiation from the sun must be taken into account for the safety of astronauts and sensitive equipment. Building a lunar living quarters, due to the cost of transportation from earth to the moon, requires using the moon's natural resources, a lunar regolith. Monte Carlo particle bombardment simulations were performed to test lunar regolith based building material against the hazardous radiation of the lunar environment. The study of the astronauts protection inside a real moon base included simulating the radiation, the structure made of the lunar regolith based material, and an astronaut analogue. The simulations were done using FLUKA, a Monte Carlo method particle bombardment simulating program. The data have shown that the radiation dose for a crew inside the regolith built lunar base, except for the extraordinary solar flares, will be below the dose limit for 30-day exposure for astronauts in low earth orbit of 25cSv.

Malozovsky, Y. and D. Bagayoko. SUAMC. W. Lynn. CC. B. Khamala UTEP. **Accurate electronic, transport, and structural properties of disodium sulfide ( $\text{Na}_2\text{S}$ ).**—We report results from ab-initio, self-consistent calculations of electronic, transport, and structural properties of cubic antiferroite disodium sulfide ( $\text{Na}_2\text{S}$ ). We used a local density approximation (LDA) potential and the linear combination of Gaussian orbitals (LGO) formalism. We followed the Bagayoko, Zhao, and Williams (BZW) method, as enhanced by Ekuma and Franklin (BZW-EF). We discuss electronic energy bands, total (DOS) and partial (pDOS) densities of states, effective masses, and the bulk modulus. For a room temperature lattice constant of 6.539 Å, our calculated, direct band gap, at  $\Gamma$ , is 2.83 eV. We predict a direct band gap of 3.05 eV for the calculated equilibrium lattice constant of 6.395 Å. The significant decrease of the lattice constant, for a drop in temperature from 300 to 0 K, is understandable with the relatively small, predicted bulk modulus of 43.9 GPa. Acknowledgments: This work was funded in part by the National Science Foundation (NSF) and the Louisiana Board of Regents, through LASiGMA [Award Nos. EPS-1003897, NSF (2010-15)-RII-SUBR] and NSF HRD-1002541, the U.S. Department of Energy – National, Nuclear Security Administration (NNSA) (Award Nos. DE-NA0001861 and DE-NA0002630), LaSPACE, and LONI-SUBR.

Malozovsky, Y., L. Franklin, C. Ekuma, and D. Bagayoko. SUAMC. **DFT predictions of electronic, transport, and bulk properties of  $\text{Li}_2\text{S}$ .**—We present results from ab-initio, self-consistent calculations of electronic, transport, and bulk properties of cubic lithium sulfide ( $\text{Li}_2\text{S}$ ). Our computations employed the local density approximation (LDA) potential of Ceperley and Alder and the linear combination of atomic orbital (LCAO) formalism. The implementation of the LCAO formalism followed the Bagayoko, Zhao, and Williams' method, as enhanced by Ekuma and Franklin (BZW-EF). Consequently, we solved self consistently both the Kohn-Sham

equation and the one giving the ground state charge density in terms of the wave functions of the occupied states. For a low temperature lattice constant, our calculated, indirect gap, from  $\Gamma$  to X, is 3.723 eV. The predicted LDA band gap, for the calculated equilibrium lattice constant, is 3.702 eV. We discuss the total and partial densities of states, electron and hole effective masses, and the predicted bulk modulus of 45.57 GPa that agrees with a low temperature measurement of 45.7 GPa. Acknowledgments: This work was funded by the NSF and the Louisiana Board of Regents, through LASiGMA [Award Nos. EPS-1003897, NSF (2010-15)-RII-SUBR] and NSF HRD-1002541, the U.S. Department of Energy – National, Nuclear Security Administration (NNSA) (Award Nos. DE-NA0001861 and DE- NA0002630), LaSPACE, and LONI-SUBR.

Nwigboji, I., O.F. Kayode, Y. Malozovsky, and D. Bagayoko. SUAMC. **Ab-initio computation of electronic and transport properties of cubic sodium selenide ( $\text{Na}_2\text{Se}$ ).**—We report on ab-initio, self-consistent calculations of electronic and transport properties of cubic sodium selenide ( $\text{Na}_2\text{Se}$ ). Our calculations utilized a local density approximation (LDA) potential and the linear combination of Gaussian orbitals (LCGO). We employed the Bagayoko, Zhao, and Williams’ method, enhanced by Ekuma and Franklin (BZW-EF). The BZW-EF method, by requiring the attainment of the absolute minima of the occupied energies, leads to electronic energies and related wave functions that provide the most variationally and physically valid density functional theory (DFT) description of the ground states of materials under study. Our calculated, direct band gap, at the  $\Gamma$  point, is 2.64 eV – for a lattice constant of 6.809 Å. We discuss the bands, total and partial densities of states, and calculated, effective masses. Acknowledgments: Work funded in part by the National Science Foundation (NSF) and the Louisiana Board of Regents, through LASiGMA [Award Nos. EPS-1003897, NSF (2010-15)-RII-SUBR] and NSF HRD-1002541, the U.S. Department of Energy – National, Nuclear Security Administration (NNSA) (Award No. DE-NA0001861 and DE-NA000260), LaSPACE, and LONI-SUBR.

Nwigboji, I., Y. Malozovsky, and D. Bagayoko. SUAMC. **Ab-initio electronic, transport and related properties of zinc blende boron arsenide (ZB-BAs).**—We present results from ab-initio, self-consistent density functional theory (DFT) calculations of electronic, transport, and bulk properties of zinc blende boron arsenide (ZB-BAs). We used a local density approximation (LDA) potential and the linear combination of atomic orbitals (LCAO) formalism. Our computational technique follows the Bagayoko, Zhao, and Williams’ method, as enhanced by Ekuma and Franklin. Our results include electronic energy bands, densities of states, and effective masses. We explain the agreement between these findings, including the indirect band gap, and available, corresponding, experimental ones. This work confirms the capability of DFT to describe accurately properties of materials, provided the computations adhere to the conditions of validity of DFT. Acknowledgments: This work was funded in part by the National Science Foundation (NSF) and the Louisiana Board of Regents, through LASiGMA [Award Nos. EPS-1003897, NSF (2010-15)-RII-SUBR] and NSF HRD-1002541, the U.S. Department of Energy – National, Nuclear Security Administration (NNSA) (Award Nos. DE-NA0001861 and DE-NA0002630), LaSPACE, and LONI-SUBR.

Saleheen, A.U., T. Samanta, D.L. Lepkowski, and E. Kramer. LSU. **A 3d-transition-metal-based ferromagnetic Kondo lattice.**—Here we report the discovery of a 3d-transition-metal-based (i.e., not rare-earth-based) ferromagnetic (FM) Kondo lattice system. The isostructural alloying of two compounds having collinear magnetic structures has resulted in a quasi-one-

dimensional FM Kondo lattice system,  $Mn_{1-x}Fe_xCoGe$ . Such FM Kondo lattices are rare. Usually, rare-earth/actinide-based antiferromagnetic heavy fermion systems exhibit Kondo effects and occasionally, a quantum critical point (QCP). A universal characteristic of quantum criticality has been revealed for low-dimensional antiferromagnetic heavy-fermion compounds based on a Kondo destruction scenario, according to which the magnetic ordering disappears simultaneously with Kondo breakdown at the QCP. The discovery of this new class of 3d-metal-based FM Kondo lattice systems will not only broaden the material basis, but also may set a platform to verify further the existence of a FM QCP under suitable conditions as well as the universality classes of quantum criticality of different types of magnetic materials including FM systems based on the dimensionality.

Young, K. and C.H. Young. NiSU. S. Lai. NTHU. M.M. Dunham. HSCA. N.J. Evans II. UTA. **The young stellar object population in Perseus.**—Nearby molecular clouds, where there is considerable evidence of ongoing star formation, provide the best opportunity to observe stars in the earliest stages of their formation. The Perseus molecular cloud contains two young clusters and several small dense cores of the type that produce only a few stars. Perseus is often cited as an intermediate case between quiescent low-mass and turbulent high-mass clouds, making it perhaps an ideal environment for studying “typical” low-mass star formation. We present an infrared study of the Perseus molecular cloud with data from the Spitzer Space Telescope. By comparing Spitzer’s near- and mid-infrared maps, we identify and classify 369 young stellar objects (YSOs) in the cloud. The majority of the star formation activity in Perseus occurs in the regions around the clusters, to the eastern and western ends of the cloud complex. The middle of the cloud is nearly empty of YSOs despite containing regions of high visual extinction. Across the cloud, 56% of all YSOs and 91% of the most embedded sources are in areas where visual extinction is greater than 5 magnitudes, indicating a possible extinction threshold for star formation.

## Division of Science Education

### Higher Education Section

Darby-White, T. SU-BR. **Evaluating student attitudes and experiences toward general chemistry at a historically black college and university.**—Students' attitude has been determined to be a major factor in student success and achievement (Cook, 2013). The experiences, perceptions, and attitudes of the students can be directly related to STEM attrition (Griffith, 2010). The purpose of this study was to evaluate student attitudes and experiences in a general chemistry course at a historically black college and university (HBCU). The sample consisted of 56 undergraduates majoring in STEM disciplines. The students' attitudes toward chemistry were measured by the Chemistry Attitude and Experiences Questionnaire (CAEQ). Multiple linear regression analysis indicates that the HBCU students' have positive attitudes toward chemistry with level of classification and gender having no significant effect on attitude toward chemistry. Implications for increasing HBCU student attitudes toward chemistry, science self-efficacy, and STEM achievement are discussed.

Stumpf, C. LSU-A. **Impact of taxonomic studies on student engagement.**—This paper presents my impressions on how taxonomic studies impacted the learning success and understanding of ecological interactions of biology students in two upper-level undergraduate courses. The research got the students engaged and made them do their own literature searches, collect specimens, and apply taxonomic keys for identification purposes. Working in small groups was perceived as a very positive part of the activities. I received very enthusiastic feedback from the course evaluation forms. Students who took these courses are still interested in doing taxonomic research.

Woolman, J., W. Dees, H. Fogg, L. Hardee, L. Petticrew, C. Haymon, and J. Patterson. McSU. **Innovation and multidisciplinary engagement in undergraduate research.**—A key component of McNeese State University's vision is to create a culture of innovation and play an active leadership role in the civic and economic renaissance occurring in southwest Louisiana. Within the last seven years (2008-2015), undergraduate research at the university evolved from a small science event to today's campus-wide alumni association sponsored scholar and research symposium. This symposium provides an opportunity for students from all six colleges on campus –Business, Education, Engineering, Liberal Arts, Nursing, and Science – to engage in research and scholarly inquiry. The McNeese State University Alumni Association Undergraduate Scholar and Research Symposium continues to grow due to students who understand the significance of engaging in their selected discipline and the overwhelming support by university administrators, alumni and devoted faculty members who recognize that undergraduate research can be both academically and professionally rewarding. Global ventures in the 21st century require the adoption of a systematic approach to innovation and collaboration. To this end, the undergraduate research program at McNeese State University has recently expanded to integrate innovation with interdisciplinary scholarship and research. This project presents strategies and best practices for sustainable future growth and high-impact learning and mentorship at a predominantly teaching institution.

Young, C., A. Borsetta, G. Lo, and K. Young. NiSU. **FormScanner: Open source solution for grading multiple choice exams.**—We present software for grading multiple choice exams. FormScanner allows the instructor greater flexibility in grading and is much preferred over the "scantron" machines on campus for several reasons: 1) The software provides detailed item analysis, so instructors can better assess the effectiveness of questions; 2) Grading is considerably faster with FormScanner than on a typical scanner because one uses a photocopier machine to scan; these can scan hundreds of forms in a matter of seconds; 3) Faculty can create their own custom forms for a particular test; also, researchers can administer and analyze surveys with FormScanner; and 4) FormScanner is open-source, free, and without in-software advertising. Similar commercial products cost thousands of dollars and do not provide the same quality of results. We show how to use FormScanner, analyze a sample set of student papers, and share the experiences of our faculty with this software. More information about the process is available at [www.formscanner.org](http://www.formscanner.org).

## Division of Sciences & Humanities

Boudreaux, T. and J.P. Doucet. NiSU. **Thread theory: A new history of the concept of DNA.**—In the seminal 1953 report on DNA structure, Watson and Crick employ a “thread” metaphor to describe twin nucleotide chains coiled around a “fiber axis.” In 1882, German biologist Walther Flemming described chromatin behavior during cell division as “mitosis,” after the Greek term “mitos” for the lengthwise threads stretched across a weaving loom. And a century earlier, in 1769, French philosopher Denis Diderot used the idea of “threads” to explain concepts of heredity and evolution. Not only was Diderot’s early “thread theory” precocious, but interestingly it was also ironic. Diderot employed the thread metaphor to satirize the scientific ideas of his estranged former associate, Jean le Rond d’Alembert. Both Diderot and d’Alembert were eighteenth century philosophers heavily influential in the fields of mathematics, physics, and natural philosophy. One-time collaborators, Diderot and d’Alembert eventually clashed on views of philosophy and society. Diderot satirizes d’Alembert’s scientific ideas in a book titled *Le Réve de d’Alembert (d’Alembert’s Dream)*. In the “dream,” Diderot and d’Alembert discuss a novel model of biological heredity and evolutionary change, describing hereditary material as “threads.” Diderot’s eighteenth century satire provides an ironic anachronism that anticipates by nearly 200 years the structural-functional description of the DNA molecule, which has since become widely nicknamed “the thread of life.” This study analyzes the mercurial relationship of the two philosophers with particular emphasis on situations that led to publication of *Le Réve*, as well as the accuracy of Diderot’s “threads” in the context of modern genetics understanding.

Cibelli, D. NiSU. **Using Renaissance models developed by Leonardo da Vinci to question hierarchies of knowledge and facilitate innovative thinking.**—Dr. Roberta Ness from the University of Texas School of Health has discussed tools for fostering innovative thinking in her popular TEDx conference presentations. Her advice to question cognitive frames and preconceptions and to use analogies to cultivate inventive research suggests that we can continue to benefit from the examination of the complex relationship between thinking and seeing informing the drawings and paintings of that great Renaissance polymath, Leonardo da Vinci. The analysis of Leonardo’s work will allow us to assess the way in which his use of analogous forms may influence research and advance knowledge in science and the humanities.

Courteaux, B., J.D. Johnson, and S. Banville. NiSU. **Rhetorical mapping: Oil, land, and people in south Louisiana.**—Nicholls State University undergraduate English students collected interview data of the bayou delta region residents of Louisiana conducted by past students as part of an oral history project called “Stories of Oil and Land” sponsored by the Barataria-Terrebonne National Estuary Program and the Nicholls Bayou Studies program. Interviewee’s location, vocation, subsistence activities, religion, ethnicity, native language, military service, level of education, etc. were gathered and incorporated into a series of interactive data visualizations using Google Fusion Tables, showing shifts in land use and concentrations of religions, ethnicities, hobbies, and vocations. The purpose of these visualizations is to identify links between these factors and to show the impact of the petroleum industry on life in South Louisiana. In preparing the visualizations, studies used a variety of rhetorical theories to inform their coding, tagging, and choice of supporting images.

Doucet, J.P. and M. Moloney. NiSU. **Sediment and settlement: Chênières and the evolution of coastal Louisiana.**—Chênières are geomorphic structures formed by remodeled shorefront sediments. First described as a feature of southwestern Louisiana by Russell and Howe (1935), chênrières are found worldwide as a component not only of deltaic plains but also shores of large inland bodies of water. Structurally, they are long, narrow beach ridges composed of sandy or shelly material. Plains of riparian chênrières develop over time as a function of sediment progradation and antagonistic low energy wave action. In coastal Louisiana, riparian chênrières are Holocene phenomena formed by sediment spill from various prehistoric deltas of the Mississippi River challenged by the prevailing east-west Gulf of Mexico current and remodeled by surges associated with tropical cyclones. Chênrières along coastal Louisiana rise 2-6 feet above sea level and are conspicuous for their support of linear groves of live oaks amid vast coastal marsh, earning their name by the historical Francophone population (chêne = oak). Historically, these populations have utilized the unique attributes of Louisiana's chênrière plains for settlements based on farming or fishing subsistence. Grand Chenier and Pecan Island in the southwest and Chênrière Caminada in the southeast remain notable as early settlements, and each has coincidentally suffered destruction from historic hurricanes. In particular, the Great October Storm of 1893 made Chênrière Caminada the focal point of the second largest natural disaster of the North American mainland. This study explores the unique ecological and economic relationship between chênrières and chênrière dwellers and how environmental changes have influenced modern settlement patterns of coastal Louisiana.

Giguette, R. and R.A. Alexander. NiSU. **A.I. vs. philosophy: The ultimate difference between machine and human thought.**—Certain aspects of thought can be mechanized or mimicked, but philosophical thought – the ability to question meaning – is uniquely human. Knowledge comes from questioning, and computers ask only the questions they are programmed to ask. Humans, on the other hand, ask many questions for internal, emotional reasons such as curiosity, fear, or just the need to know. Much of human knowledge, including self-awareness, and independent thought, comes from our need to question our biological and psychological programming, as well as our social, cultural, and historical context. If human intelligence comes from the will to seek knowledge, then our intelligence requires free will. Because computers have no internal motivation, they have neither the will nor the ability to go beyond their programming. In other words, programming free will into a computer is a contradiction. Additionally, human intelligence is constructed of more than the purely logical and rational thought upon which computer coding is based. So the question becomes: Will the lack of the uniquely human qualities that compel us to engage in philosophical thinking prevent computers from becoming as intelligent as humans?

Martin, J., A. Demaske, and L. Lewis. LU-NO. **Symbolizing the self in contemporary heraldic art.**—Ancient heraldic symbols are still used in the design of contemporary coats of arms through which they may convey something about the history of a family and/or the virtues and psychological or behavioral traits that its members prize. This study is a content analysis of the types and distribution of psychological characteristics and personal traits referenced in the design of contemporary coats of arms. We analyzed a sample of recent heraldic designs from the database of arms granted by the Canadian government and assessed the frequency of personal traits, types of traits mentioned (e.g., personality, personal values, professional, family history),

and the ways in which the traits are incorporated in the design (e.g., personification by animals, the use of certain colors, the choice of the patterns of lines or divisions of the shield).

Petticrew, L., J. Woolman, W. Dees, H. Fogg, L. Hardee, C. Haymon, and S. Thapa. McSU. **Engaging in regional economic development through interdisciplinary innovation and technology.**—Through a partnership with the University of Maine, the McNeese State University Student Innovation Center offers innovation engineering classes to undergraduate students in every discipline and features technology to bring ideas into reality. Leveraging innovation requires academic and community partnerships. The Economic Development Administration University Center at McNeese in collaboration with students, faculty members, local businesses, industry, and government agencies are exploring new strategies to enhance regional economic development. A team composed of students, faculty members, and local professionals in agriculture, biology, business, computer science, design art, engineering, innovation, and mathematics is conducting research and designing practical uses for both evolving and state-of-the-art technologies. Team members are: (1) developing solutions for applied research projects using 3-D printing and scanning equipment, 3-D milling machine, 3-D printing pen, green screen, and advanced development software; (2) investigating new technologies to augment classroom teaching and learning, conduct research, experience virtual education, explore surroundings, and develop new applications; and (3) coordinating an ongoing campus-wide initiative that allows undergraduate researchers along with faculty mentors to use Google Glass for projects. Strategic use of emerging technologies, creativity tools, and applied innovation methods provides new avenues to pursue creative contributions and engage in scholarship and research.

## Division of Social Sciences

Boudy, C. and C. Corprew. LU-NO. **A study of the effects of self-esteem and racial identity on future life expectations.**—African American children report higher self-esteem than most of their peers (Porter and Washington, 1993 p. 69), and although their self-esteem remains high during adolescence, their future expectations may wane (Rowley et al., 1998, p. 719). However, this is not indicative of all African American youth. The question at hand is what factors incite positive future expectations. Research suggests that adherence to one's racial identity may promote resilience and vulnerability. Thus, the current study investigates the moderating effect of racial centrality on the relations between self-esteem and overall future expectations of African American adolescents such that as self-esteem rises along with racial centrality, participants will report higher levels of overall future expectations. It also is hypothesized that as levels of self-esteem increase, but racial centrality does not, participants will report more positive future expectations. In addition, it is hypothesized that when racial centrality is low, and self-esteem is low, then one will report lower future life expectations. I will use a sample size of 126 African American adolescents from a major southeastern city, a majority of which are women to conduct this analysis.

Desselles, J., P. Pasquale, G. De la Torre, E. Dupuis, and C. Nichols. LU-NO. **Hurricane preparedness based on hurricane name, experience, knowledge, and personal control.**—In June 2014, Jung and colleagues published an article that indicated that female hurricanes are deadlier than male hurricanes. This research gained national attention. Their research indicated that individuals take feminine named hurricanes (e.g., Victoria) less seriously than masculine named hurricanes (e.g., Victor). They attributed their findings to gender-based expectations and stereotypes. However, their research was conducted primarily with University of Illinois students and Amazon Mechanical Turk participants – there was no indication that any of their participants had ever experienced a natural disaster such as a hurricane. Previous research has indicated that hurricane experience changes individuals' levels of disaster preparedness (Adeola, 2009; Norris et al., 1999). For example, Adeola (2009) found that prior experience and duration of residency in a Gulf State were significant predictors of likelihood to evacuate for Hurricane Katrina (albeit these factors were less significant than family and peer pressure). Based upon previous research, using hurricane vignettes which manipulate category and name, we seek to examine whether factors such as duration of residency, prior experience with a natural disaster, knowledge about hurricanes (i.e., hurricane category and flood risk), and spheres of personal control can mitigate the effect of gender named hurricanes.

Nachampassak, V., B. Owens, and L. Lewis. LU-NO. **Creative thinking, mindfulness, and cognitive style.**—This study is an exploratory correlational analysis of measures of creative thinking and other psychological variables in a sample of undergraduate university students. Results revealed a strong positive correlation between various measures of creative thinking and accuracy on a remote associates test and verbal insight problem solving. Cognitive style was associated with both time and accuracy scores on verbal insight problem solving tasks. Measures of mindfulness also were correlated with verbal, but not mathematical, problem solving. Personality measures were unrelated to creative thinking.

Normand, S.M. NiSU. **Chinese hegemony: A study of China's global media expansion in South Africa.**—Economic relations between China and Africa date back to the era of Mao Zedong, but recently China has had a heavy hand with their investments in South African media companies. The potential repercussions with the recent acquisitions go beyond the superficial issue of censorship or the underlying human rights issues both countries have faced. With the global rise in competition for limited resources and economic supremacy, it was only a matter of time until China surpassed the United States as the world's largest economy. Using the Hegemonic Stability Theory we can examine China's role in global investments and its use of "soft power" through public diplomacy, which could suggest that China is not only committing to the hegemonic system but also participating in a peaceful transition as the new hegemon or world leader. The hegemonic system is mutually beneficial for the top leaders on the global scale if the transition is peaceful and the new hegemon has the ability to lead and enforce stability. This paper examines China's global media expansion with a focus on South Africa and the potential effects this relationship could have on the international stage.

Robichaux, B., J.E. Foret, A. Eymard, and L. Ledet. NiSU. **The true impact of service learning: Realized through qualitative analysis.**—This qualitative study utilized heuristic phenomenology methodology for a group of nursing students to explore their lived experiences during a service learning trip to Jamaica. Three senior level nursing students maintained a journal throughout their experience by responding to a pre-determined set of reflective questions. The journal entries served as a recording of their reflections and insights. The main objective of the study was for the students to understand themselves and their lived experience during the excursion. Two of the participating students and two faculty mentors conducted analysis of the blinded journal entries. Coding was used to identify common themes throughout the journals. These common threads identified by the researchers will be identified and discussed during the poster presentation. The findings of the study reveal the lived experience of the nursing students during their service learning venture and a heightened level of self-understanding. This heightened self-understanding has impacted their future nursing careers and changed them forever.

Saintal, K., E. Dupuis, and C. Nichols. LU-NO. **Racial stereotyping and food.**—This study seeks to examine psychological factors underlying the cosmetic industry's use of food-oriented language, particularly with foundation, aimed at minority women consumers. Female undergraduate students (N=50) will be randomly assigned to two groups of 25. The first group will experience a situation designed to create stress/anxiety and the second group will not. Both groups will then complete a survey at the same time in the same room, assessing their liking for different cosmetic products, some with food names (e.g., mocha) and others with non-food names (e.g., numbers). We predict the stressed participants will exhibit greater liking for cosmetics with food related names rather than non-food names.

Sarradet, N.A. and C.S. Corprew III. LU-NO. **Men at the crossroads: Effects of emasculation and hypermasculine attitudes on attitudes toward sexual aggression and hostility toward women.**—The purpose of this study is to further the research on hypermasculinity, which previous research has found to be a multidimensional construct made up of several aspects of extreme masculine attitudes, including sexual aggression and hostile attitudes towards women (Corprew et al., 2014). In this study, we compare several conditions to examine whether the

presence of another male effects responses to emasculation by a female confederate. This response includes increased hostile attitudes toward women and attitudes about sexual aggression. Participants will be local university students ranging from 18 to 25. It is hypothesized that men who are emasculated by a woman will adopt greater attitudes of hostility toward women measured using the Hostility Toward Women Scale (HTW) and attitudes toward sexual aggression. Furthermore, this increase will be elevated in males who report high adherence to hypermasculine attitudes, as measured using the Auburn Differential Masculinity Inventory (ADMI-22). In the presence of another male, harsher and more hostile attitudes toward women will be displayed than after emasculation alone with no observers. Results of this study may have broad implications for future prevention of sexual aggression and crime.

Steven, M. and E.L. Zucker. LU-NO. **The ability of social justice music to inspire and motivate community engagement and activism in the listener.**—The purpose of this study is to ascertain whether music written with the intent of inspiring community engagement actually achieves its goal and motivates behavior, but also whether a mitigating factor exists for people who may find the prosocial meanings in the lyrics. Fifty participants will be recruited from the Loyola University New Orleans Department of Psychological Sciences and general undergraduate student body. Participants will first complete a demographic survey, and then listen to excerpts of twelve songs from four categories, with the order of presentation randomly determined. There will be three songs each with lyrics from mid-20th century social justice songs, mid-20th century non-social justice songs, modern social justice songs, and modern non-social justice songs. Next, the participants will complete a questionnaire about what they felt the purposes were of each of the songs based on the emotions evoked by the lyrics, and then participants will complete the Volunteer Functions Inventory to assess their beliefs as to the functions of volunteering. The hypothesis is that those who detected the social justice themes in the lyrics will attribute more altruistic functions to volunteering (values, understanding, and enhancement) per the Volunteer Functions Inventory than those not detecting those themes.

Szklarski, E. and C. Nichols. LU-NO. **The "right reasons" for choosing a college major.**—One hundred undergraduates will be surveyed about their current choice of major. Previous examinations of students' choices of a major field of study have failed to investigate motivational factors. The present study will measure the patterns of associations between satisfaction with college and life and the sources of motivation when deciding what field of study to pursue. It is hypothesized that students who have chosen their major for the right reasons (an autonomous choice, positive social connections, mastery with subject, feeling of control, etc.) are likely to be more satisfied with their education and life.

Tauzin, C. LU-NO. **Differences in personality correlates of emotional intelligence as a function of music ability.**—As music is considered to be a powerful medium for communicating emotional states, musical ability might be related to Emotional Intelligence comprised of perceiving, reasoning, understanding, and managing emotions in both self and others. Personality variables, such as openness (i.e. intellect/imagination), agreeableness, and conscientiousness, have been found to correlate with these emotion-related abilities. Previous research also has indicated a relationship between musical training and brain development in areas of the brain associated with cognitive processes and social behaviors. In this study, the personality characteristics intellect/imagination, agreeableness, and conscientiousness, all

correlates of Emotional Intelligence, will be assessed as a function of varying degrees of musicianship. Participants will include students and instructors from the College of Music at Loyola University New Orleans and non-musically trained students from other university programs. The personality characteristics will be measured using a 20-item mini IPIP based on Goldberg's (1999) five-factor personality model. Music ability, based on extent of training and level of expertise, also will be assessed. It is hypothesized that there will be differences among groups on the personality variables correlated with Emotional Intelligence as a function of the degree of musical training and ability.

Townsend, C. and L. Lewis. LU-NO. **The effects of phonological stress on novel vocabulary learning.**—The purpose of this study is to investigate the relationship between the use of phonological stressors and novel language vocabulary learning. Sixty Loyola University New Orleans undergraduate students will be presented with a list of ten novel vocabulary words, the words being either nouns or verbs. Definitions will be orated (recording) and shown via a PowerPoint presentation to ensure consistency and reliability. There will be three learning conditions: (a) the first condition will have similar stress patterns to English nouns and verbs, (b) the second condition will have contradictory stress patterns to English nouns and verbs (novel language based on Italian nouns and verbs), and (c) the independent condition will have randomized stress patterns. All conditions will have both monosyllabic and multisyllabic words. A multiple-choice examination will be given after the participants complete a questionnaire. It is hypothesized that the condition with similar stress patterns as English will correlate with higher scores than both the contradictory and independent syllable length and stress conditions.

Yehya, R. SU-BR. **Scholarly teaching in the globalization era.**—The world has become a global, diverse village. The curricula of higher education must respond to this fact and thus be updated. This paper argues that scholarly teaching must address and closely examine the impacts of globalization and diversity. Regardless of the subject matter, the social, cultural, political and economic implications of globalization and diversity must be addressed in almost all college courses, including the advantages and challenges facing any given country, state, region or business.

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