

LOUISIANA SCIENTIST

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Abstracts of Presentations

2017 Annual Meeting

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

CPMP	Calcasieu Parish Mosquito Control
CSM	Colorado School of Mines
CU	Comenius University, Bratislava, Slovakia
CWRU	Case Western Reserve University
GSU	Grambling State University
GU	Georgetown University
HHMS	Hammond High Magnet School
HU	Howard University
LSU-A	Louisiana State University, Alexandria
LSU-BR	Louisiana State University, Baton Rouge
LSU-E	Louisiana State University, Eunice
LSU-S	Louisiana State University, Shreveport
LTU	Louisiana Tech University
LU-NO	Loyola University, New Orleans
MSS	Missouri Southern State
MSU	McNeese State University
NRL-DC	Naval Research Laboratory, Washington D.C
NSU	Nicholls State University
NYU	New York University
RPCC	River Parishes Community College
SLU	Southeastern Louisiana University
SU-BR	Southern University, Baton Rouge
SUAMC	Southern University and A&M College
UB	University of Belgrade, Serbia
UD	University of Dayton
ULL	University of Louisiana, Lafayette
ULM	University of Louisiana, Monroe
USM	University of Southern Mississippi
UTEP	University of Texas at El Paso

Division of Agriculture, Forestry, and Wildlife

Kendrick, R., and C. Corbat. LSU-A. **An examination of capture rates and nest occupancy patterns in Eastern Woodrats.**—Eastern Woodrats were captured on a bottomland hardwood site from Fall 2012 through Spring 2016. Nest locations, type, and nest activity were also recorded. We classified nests as active or inactive or unsure. We also observed that nests frequently changed activity status. Stick mound and rootball nests were the predominant types and also accounted for more active nest statuses than would have been expected based on their proportion. We also looked at association of nests with fallen timber. Although 44% of nests were associated with logs, there was no relationship between logs and nest activity. When we examined capture rates compared to nest activity status, we found no significant difference in the capture rate at inactive versus active nests, indicating trapping should occur at both. We also found evidence that woodrats have multiple nests within their home range and woodrat home ranges overlap.

Porter, T., and K.M. Tolson. ULM. **Seasonal abundance and habitat selection of chiropterans at Felsenthal National Wildlife Refuge in southeast Arkansas.**—Chiropterans (bats) are the second largest taxonomic order of mammals on earth, second only to rodents. Felsenthal NWR is a ~65,000 acre refuge composed of three distinct habitat types: bottomland hardwood forest, cypress-tupelo swamp, and upland pine forest systems. Up until 2015, mobile acoustic monitoring was done only twice annually to account for the presence of bat species and to record and compare abundance to years prior. During the summer of 2014, it was discovered that the northern long-eared bat (*Myotis septentrionalis*) was present on the refuge. The northern long-eared bat was recently listed as “threatened” by the U.S. Fish and Wildlife Service, and this location is believed to be outside of its geographic range. Over the course of 18 months, we are utilizing acoustic monitoring, mist netting, and tree cavity searches to record bat species present throughout the three habitat types present on the refuge. Mobile and passive acoustic surveys are being used to measure bat abundance and their habitat selection and utilization on the refuge. Mist netting is employed to confirm our acoustic samples of bat echolocation calls and document the habitats in which they are found. All bats collected in mist nets are screened for white-nose lesions. Tree cavity searches are performed to identify roost sites, maternity colonies, and hibernacula preferences. Results for data collected through the month of March 2017 will be presented.

Preuett, T., and C. Corbat. LSU-A. **Comparison of trapping techniques for Southern Flying Squirrels (*Glaucomys volans*) in a bottomland hardwood forest in central Louisiana.**—A variety of methods have been used to capture southern flying squirrels. Most studies recommend trapping in the trees. We investigated two trap orientations (horizontal and vertical) and three bait types (pecans, white-stripe sunflower seeds, and peanut butter and rolled oats). Traps were mounted on tree trunks at approximately 1.5 m above the ground. Forty-seven individuals were captured a total of 115 times over almost 2900 trap nights. Flying squirrels exhibited a preference for pecans as bait. Both horizontal and vertical traps with pecans resulted in more captures than expected. Flying squirrels showed no preference for horizontal or vertical traps. However, capture of non-target species, particularly Carolina Wrens and *Peromyscus*, was greatly reduced by use of vertical traps. We found no other mention in the literature of use of

pecans or vertical trap orientation for capture of flying squirrels, but we recommend this combination for future studies.

Division of Biological Sciences

Botany Section

Soorya, S., and J. Carlson. NSU. **Anthocyanin production in *Protea repens* influenced by genetic background in various light treatments.**—Anthocyanin, a water-soluble pigment in plants, protects against photoinhibition in high elevations. During photoinhibition, anthocyanin absorbs wavelengths that damage photosynthetic mechanisms to reduce rate of photosynthesis in high light conditions. Anthocyanin production in plant tissue varies due to environmental, genetic, and light factors. *Protea*, plants native to South Africa, exhibit different intensities of anthocyanin production. This study examines two populations of *Protea repens*, at low elevation and at a high elevation. The objective of this study is to observe change in anthocyanin production in response to two different high light treatments over time. Subsequent anthocyanin production was recorded for eight weeks. *P. repens* in high elevation population produced more anthocyanin under blue high treatment than under red high light treatment. The low elevation population produced less anthocyanin under blue light treatment. Evidence suggests plants shaded by other plants receive more far red wavelengths and less near red wavelengths and blue wavelengths.

Environmental Sciences Section

Beyer, M., and A. Corbin. NSU. **Isolation of a bacteriophage, MMAST116, with lytic activity against pathogenic strains of *Vibrio parahaemolyticus*.**—Certain strains of *Vibrio parahaemolyticus* are known to infect marine shrimp and cause early mortality syndrome in aquaculture. EMS has caused financial burdens to the Southeast Asia's and Mexico's aquaculture industry. Human gastrointestinal infections with pathogenic strains of *V. parahaemolyticus* are often associated with the consumption of raw seafood. Using oysters from four different locations in Louisiana as a source of bacteriophage, we infected four different *V. parahaemolyticus* strains: V.p. (ATCC 17802); V.p. 116 (shrimp hemolymph isolate), V.p. Tx2103 (a human pathogen), and V.p. 13-028A3, a shrimp pathogen. Following overnight incubation, cell free filtrates were tested for lytic activity against host strains. A bacteriophage from St. Bernard Parish oysters which was isolated on the 116 host (phage MMAST116-N) showed plaques formation on both the human and shrimp pathogenic strains of *V. parahaemolyticus*. The discovery of this bacteriophage is a major advancement in phage therapy against pathogenic strains of *V. parahaemolyticus*.

Anjier, J. LSU-BR. **The effects of flooding and nutrient loading on Louisiana wetland plant species.**—The degradation of wetlands in Louisiana is an ongoing problem that has many proposed solutions. Two of the most promising methods for wetland restoration, river diversions and assimilation wetlands, are currently under attack. The objective of this study was to conduct a field study investigating the growth response of bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*) to different nitrate and flooding regimes. A mesocosm experiment was also conducted to study these effects in a controlled environment. The results of the field study

indicate that restoration and conservation efforts should focus on flooding. Higher nutrient levels result in higher growth than lower nutrient levels while higher flooding levels resulted in lower growth levels. These data may be useful in informing future conservation and restoration efforts in coastal Louisiana.

Dexter, S.V., and R. Boopathy. NSU. **The relationship between diet, population genetic structure, and the microbiome in the Formosan subterranean termite, *Coptotermes formosanus*.**—The Formosan subterranean termite (FST), *Coptotermes formosanus* Shiraki, is an invasive insect pest, which causes great economic damage in Louisiana by feeding on wooden structures and living trees. The microbiome of FST consists of a relatively stable community of protozoans and bacteria, necessary to fulfill nutritional requirements. However, the bacterial profile of termites varies slightly between colonies. This difference is necessary for nestmate recognition. Recognition of foreign conspecifics is the first step in the decision of a colony to attack invading termites, and the microbiome could therefore potentially be a genetic barrier preventing outbreeding. Genetic differentiation is seen between termite colonies, both in populations on islands 100 km apart in Japan as well as within the same park in New Orleans, Louisiana. It is therefore possible that the microbiome, not the geographic distance between colonies, is the determining factor causing genetic differentiation. Secondary metabolites stored in the heartwood of many tree species have been found to be deterrent to termite feeding as well as wood density, and studies on other organisms have shown secondary metabolites to act by attacking the symbionts within insects. Therefore, it may be that tree species affects the community structure of the microbiome of FST and the microbiome inhibits outbreeding, causing genetic differentiation according to tree species.

Dong, W. MSU. **Assessment of mercury in buildings across the campus of McNeese State University.**—This research focused on the detection of elemental mercury on the main campus of McNeese State University. It was found that the concentration of mercury varies from the highest 3.5 ppm in one of the dumpsters near cafeteria to the lowest 2.5 ppm near Contraband Bayou. The concentration of mercury inside buildings falls between 3.5 ppm and 2.5 ppm. Compared to the global background concentration of mercury at 1.5-2.0 ppm, the mercury contamination on campus is slightly above the background level. The possible causes might include the leaked mercury vapors from damaged fluorescent light bulbs, which are the prevalent lighting fixtures inside buildings on campus. However, the mercury concentration level is still low, posing no health hazard to the faculty and students. Due to the small sampling size, further study is needed to confirm the findings.

Grabeert, R., and R. Boopathy. NSU. **Effect of antibiotics present in sewage treatment plant on nitrogen cycle.**—Antibiotics and their overuse has become a huge problem over the last couple of decades and their future use is under much scrutiny. Residual antibiotics, antibiotic resistance genes (ARGs), and antibiotic resistant bacteria (ARBs) have been reported in sewage treatment plants and ARGs and ARBs have been found in the local sewage treatment plant in Thibodaux. These antibiotics and ARGs may be influencing the bacteria in sewage treatment that carry out nitrification and denitrification processes to remove nitrogen from the wastewater. Therefore, this study was conducted to study the effect of an antibiotic, specifically tetracycline, on nitrification and denitrification rates in a sewage plant. Samples were collected from the aerobic ponds (activated sludge) and from the anaerobic digester sludge of Thibodaux Sewage Treatment Plant. Consortia of nitrifying and denitrifying bacteria were isolated from these

samples and their ability to oxidize ammonia and nitrate at different concentrations of tetracycline were measured. EC-50 values for tetracycline for each consortia was determined for denitrification and nitrification.

Lambiotte, A., and G. LaFleur. NSU. **Salinity tolerance in hatchlings of the apple snail *Pomacea maculata* in the Barataria-Terrebonne National Estuary.**—The invasive apple snail *Pomacea maculata* has been increasing its range in Louisiana waters over the past decade. The species poses the threat of destroying aquatic crops and altering wetland structure wherever it colonizes. In this experiment, the salinity tolerance of *Pomacea maculata* was analyzed to develop a predictor of the snail's possible range. Percent survival of snails exposed to increasing salinities was compared between hatchlings collected from sites above and below the GIWW. We found that the number of snails surviving an increase of 5 ppt was significantly lower from the number of snails maintained at 0 ppt. The LC-50 for snails above the GIWW was approximately 7.5 ppt while the LC-50 for snails below the GIWW was 2.5 ppt. Although snails do not survive at 15 ppt we found that percent survival reached 64% in 10 ppt, showing preliminary evidence that snails can tolerance brackish conditions.

Oubre, M., and R. Boopathy. NSU. **Use of plant growth promoting rhizobacteria (PGPR) as biofertilizer for the enhanced growth of *Hibiscus moscheutos* L., a native marsh plant.**—*Hibiscus moscheutos* L., or swamp mallow, is a perennial shrub commonly found in wetlands and marshes along the U.S. coast, as well as in horticultural use. It has the potential to be used for restoration projects to decrease loss of habitat that is crucial for many animal species and as a native replacement for non-native, horticulturally cultivated species. Microbes have been studied and it is known how vital they are to plant health. The purpose of this study was to test whether or not there is a difference in growth of *H. moscheutos* when grown in sterile soil, sterile soil with a consortium of microbes, or sterile soil with a pure culture of microbes. In this study, 5 different treatments of *H. moscheutos* seeds were grown for 30 days: sterile soil, sterile soil with 5% media (TSB), sterile soil with microbial consortium, sterile soil with pure culture of *Bacillus thuringiensis*, and sterile soil with pure culture of *Enterobacter aerogenes*. Various parameters were observed including phosphorous, ammonia, nitrite, and nitrate for 30 days as well as microbial counts. Results on the effect of microbes on shoot length, root length, shoot mass, and root mass of *H. moscheutos* were analyzed.

Microbiology Section

Ardizzone, C., and W. Dees. MSU. C. Gomez and A. Jerse. USUHS. **Evaluating the effects of human transferrin and human factor H co-supplementation on *Neisseria gonorrhoeae* infection in the murine genital tract.**—*Neisseria gonorrhoeae* infection is studied in the BALB/c mouse model, but mice lack human-specific factors necessary for accurately representing human infection. We investigated the influence of human factor H (hFH) and human transferrin (hTf) supplementation on colonization loads in the murine genital tract. Human transferrin-supplemented mice were infected with *N. gonorrhoeae* for seven days, supplemented with hFH, and monitored for colonization load in the lower genital tract, uterine horns, and oviducts. Dose regimen, dose response, and strain differences were evaluated. Greater numbers of gonococci (Gc) were recovered from both lower and upper genital tracts in treated

mice compared to the controls. A greater percentage of treated mice also were culture positive in uterine horns and oviducts compared to the controls. Gonococci were recovered and cultured from the oviducts of treated mice on days 3, 5, and 7 post-inoculation; up until now, Gc has only been detected in oviducts using PCR.

Ardoin, J., and J. Al-Dujaili. LSU-E. **Study antimicrobial activity of Kumquat (*Citrus japonica*) peel extract.**—As microorganisms are becoming resistant to present day antibiotics, our study focuses on antimicrobial activity and future prophylactic potential of the kumquat (*Citrus japonica*) peel. Biologically active compounds present in the medicinal plants have always been of great interest to scientists. The peel of citrus fruits is a rich source of flavanones and many polymethoxylated flavones, which are very rare in other plants. These compounds not only play an important physiological and ecological role, but are also of commercial interest because of their multitude of applications in the food and pharmaceutical industries. One such interest is the strong antimicrobial activity of citrus peels. The aim of this study was to evaluate the potential of kumquat on *Pseudomonas aeruginosa* and *Staphylococcus aureus* using agar diffusion technique and minimum inhibitory concentration (MIC). The peel of lemon was homogenized in different solvents individually and mixed well. The solvents used were acetone and methanol. 0.1 mL of *P. aeruginosa* and *S. aureus* were each mixed with 10 mL of melted nutrient agar and set into petri dishes. Sterilized paper discs (6mm) were saturated with a 50 μ L solutions containing a concentration between 200- 400 mg of both ethanol and acetone. Kumquat were placed on the agar plates. The plates were incubated overnight at 35°C. Diameters of inhibition zones were measured. To determine the minimum inhibitory concentration of crude extracts, different concentration of crude extract at 1:20, 1:40, 1:60, 1:80 and 1:100 were added respectively into 10 ml nutrient broth. The organisms were each inoculated and incubated at 37 °C, overnight on shaker. The MIC using a spectrophotometer was recorded also. The result of this study indicated that acetone peel extraction has inhibitory affects at 200 - 400 mg for both *P. aeruginosa* and *S. aureus*. The antimicrobial activity was checked with MIC, against *P. aeruginosa*. A MIC of 1:20 was observed in presence of acetone. In the case of *S. aureus* the observed MIC was 1:20 when acetone was used as solvent.

Bird, D., and R. Boopathy. NSU. **Presence of antibiotic resistant bacteria and antibiotic resistance genes in Bayou Lafourche.**—In recent years, concern has grown around the presence of antibiotic resistant bacteria (ARB) and antibiotic resistance genes (ARG) due to their impacts on public health. While many instances of antibiotic resistance are often associated with healthcare facilities, antibiotics in the environment can greatly exacerbate the potential threats of drug-resistant pathogens. Bayou Lafourche of Southeastern Louisiana serves as the raw source drinking water for 300,000 people in the region. The major purpose of the study was to find the presence of ARB and ARGs in Bayou Lafourche. Four sites along the bayou and one site from its input source on the Mississippi River are being monitored for water chemistry, total and fecal coliform estimates, and presence of ARB/ARG. Water analysis was done to determine pH, dissolved oxygen, organic carbon, nitrite, nitrate, ammonia, sulfate, and phosphate. Total and fecal coliforms were estimated by means of the most probable number method (MPN). Four bacterial isolates (*Escherichia coli*, *Klebsiella pneumonia*, *Enterobacter* sp., and *Enterococcus* sp.) were periodically isolated from these samples and tested for resistance to antibiotics (carbapenem, sulfonamide, methicillin, erythromycin, and tetracycline) and resistant bacteria were further examined to confirm the presence of antibiotic resistance genes (*IMP*, *KPC*, *Sull*,

mec(A), *erm(B)*, *tet(A)*, *tet(W)*, *tet(X)*). This study will show how prevalent is the presence of ARB and ARGs in the raw source water for drinking water treatment plant.

Dhakal, S., and S. Garlapati. ULM. **Role of initiation factor 4A in *Giardia lamblia*.**—*Giardia* initiation factor, GleIF4A is identified as a homologue to eukaryotic initiation factor, eIF4A2. Eukaryotic eIF4A, in association with eIF4G, unwinds secondary RNA structures facilitating ribosome binding to mRNA, and hence translation. However, eIF4A interacting protein eIF4G has not been identified in *Giardia*, and it is thus unclear whether *Giardia* eIF4A functions similarly. Therefore in this project, we aim to elucidate the role of initiation factor 4A in *Giardia lamblia*. To accomplish our goal, first we treated *Giardia* with pateamine A, a compound that has been demonstrated to inhibit translation initiation by reducing eIF4A concentration. Then we cloned bacterial plasmid to overexpress eIF4A in *Giardia*. We hypothesize that the overexpressed *Giardia* cells will continue to grow normally after drug treatment compared to normal cells. Finally, after purifying *Giardia* eIF4A expressed in *E. coli*, protein activity test will be performed against the drug, *in vitro*.

Elumalai, A., and R. Giorno. LTU. **Effect of heat activation on spore germination of *Bacillus anthracis* cotH mutant spores.**—Spores of *Bacillus anthracis* germinate in the presence of nutrients sensed by germinant receptors. Historically, *B. anthracis* spores are exposed to sublethal heat treatments to reduce the time between nutrient exposure and germination (Tlag). *B. anthracis* cotH mutant spores germinate faster and more completely than wild type (wt) spores. Therefore we wondered if the heat activation step is necessary for cotH phenotype. We measured and compared the germination rates of heated and unheated wt and cotH spores using loss of optical density. Heat activation does not reduce the Tlag in cotH spores. Heat activation does not positively impact germination rates in cotH spores. We suspect that heat activation denatures proteins which lower the germination rates in wt spores and these proteins are absent or heat resistant in cotH mutant spores. We will investigate other mutant strains that impact germination in *B. anthracis*.

Johnson, H., and R. Giorno. LTU. **Which morphogenetic spore protein(s) control the assembly of IunH to *Bacillus anthracis* spores?**—The spore is the infectious particle of anthrax. Germination is a process that converts metabolically inactive spores to active vegetative cells. Inosine-uridine preferring nucleoside hydrolase (IunH) is responsible for inhibiting germination by degrading the germinant inosine. Spore formation relies on morphogenetic proteins that control the assembly of additional proteins to spore surface layers. To determine which proteins control the assembly of IunH to the spore, we measured IunH activity in cotE, cotO, iunA and spoVID at room temperature and 37 °C. We found that IunH is more active at 37° C and that cotE, cotO, and iunA mutant spores have decreased IunH activity. This suggests IunH assembly is controlled by more than one morphogenetic protein.

Jones, C. LTU. **The implications of a reactive oxygen sensitive green fluorescent protein to measure *Candida albicans* production of antifungals.**—*Candida albicans* is an opportunistic fungal pathogen commonly found in the mucosal tissue of the human body. In immune-compromised patients *C. albicans* causes candidiasis, which can be fatal in extreme cases where the yeast causes systemic fungal infection. Due to the commonality of this yeast the use of antifungal drugs in treating infections is well documented, although there are many conflicting reports on how these drugs kill *C. albicans*. *C. albicans* produces reactive oxygen species (ROS)

as a stress response during exposure to antifungals drugs. Using reactive oxygen sensitive GFP, with mutations at S147 and Q204 where the amino acids are replaced with cysteine, it is possible to measure the production of ROS by the change in fluorescence. Using site directed mutagenesis, we introduced point mutations replacing serine and glutamine with cysteine. Our rosGFP will be transfected in *C. albicans* via homologous recombination, tested using a variety of antifungal drugs.

McLeland, C., and R. Giorno. LTU. **CotH controls alanine racemase (Alr) assembly to *Bacillus anthracis* spores.**—*Bacillus anthracis* undergoes a developmental process resulting in a dormant spore, which must germinate to cause disease. Alanine racemase (Alr) is assembled to the spore and converts the germinant L-alanine into the germination inhibitor D-alanine. CotH and alr spores germinate more completely than wild type (wt) in suboptimal concentrations of L-alanine. Because CotH controls the assembly of a minimum of four spore proteins, we hypothesize that Alr is a CotH assembly-dependent protein. Germination assays utilized L-alanine alone or with cogerminants. Wt, cotH, and alr spore extracts were analyzed through immunoblotting with anti-Alr antibodies. Results: Germination data with 10 mM L-alanine or 0.5 mM L-alanine and 5 mM L-tryptophan show that cotH and alr spores germinated comparably and more completely than wt spores. Immunoblotting shows cotH spores are negative for Alr. Germination kinetics and western blot analysis confirm that CotH controls Alr assembly to the *B. anthracis* spore.

Naik, D., and R. Giorno. LTU. **Identification of morphogenetic proteins in alanine racemase (Alr) assembly in *Bacillus anthracis* spore.**—*Bacillus anthracis* spores are the infective particle for anthrax. We study the two outermost spore layers: the exosporium (outermost) and coat (which is underneath). These layers are assembled through series of protein-protein interactions. SpoVID, CotE, CotH, and CotO are responsible for the assembly of the other proteins that reside in these layers and are called morphogenetic proteins. Previous studies indicate that alanine racemase (Alr) is present in both the exosporium and coat. Alr inhibits germination by converting L-alanine (germinant) to D-Alanine (germination inhibitor). To determine which morphogenetic protein(s) control the assembly of Alr, we measured Alr spore activity and used western blot analysis. We detected Alr activity in wild-type spores, and also inhibited that activity using D-cycloserine, a known inhibitor of Alr. Western blot analysis indicates cotH spores lack Alr and was confirmed by an Alr activity assay. We are currently exploring if the other morphogenetic proteins decrease Alr activity.

Ross, A., and R. Colebrook. NSU. **Isolation of bacteriophage with lytic activity against *Staphylococcus aureus* from the anterior nares of colonized individualized.**—*Staphylococcus aureus* is often found colonized in the anterior nares and skin. Lytic bacteriophages are bacterial viruses that infect, replicate and then lyse the bacterial cell. Just as *S. aureus* colonizes in the nares, we hypothesized that bacteriophage do as well. Forty-four nasal swabs were streaked on Mannitol Salt Agar for the isolation of *S. aureus*. These swabs were then transferred to PBS to preserve any bacteriophage. Fermentative colonies from MSA cultures were identified as *S. aureus* using gram stain, catalase, coagulase and sensitivity testing. Ten cultures (22.7%) were positive for *S. aureus* and one isolate was confirmed as methicillin resistant *Staphylococcus aureus* (2.3%). These isolates were used to amplify corresponding nasal samples for recovery of bacteriophage. Bacteriophages were isolated from four samples. Host specificity of these

bacteriophages was determined by cross infectivity with recovered isolates. Six of the *S. aureus* isolates showed sensitivity to one of the bacteriophage isolates.

Soorya, S., R. Nathaniel, and A. Corbin. NSU. **Purification and characterization of bacteriophage protein(s) isolated from *V. parahaemolyticus* in oysters.**—*Vibrio parahaemolyticus* is a halophilic, gram-negative, bacterium which causes bacterial diarrhea and septicemia due to ingesting raw or improperly cooked sea food. Isolated *V. parahaemolyticus* is found to be multi-drug resistant, limiting use to control this pathogen in aquaculture. Viruses as bactericidal agents are significant to fix issues of multi-drug resistance. The use of host-specific bacteriophages with lytic activity may be effective at controlling *V. parahaemolyticus* recirculating aquaculture systems. In this study, *V. parahaemolyticus* isolated from oysters are infected with varying strains of bacteriophage that are collected from different sites. The objective of this study is to enrich/purify phage preparations to obtain sufficiently high enough quantities of the phage for SDS-PAGE analysis to evaluate the varying phage proteins. These proteins are characterized/compared to other phage proteins. The purified proteins can be used in a future study on immunogens to produce polyclonal antibodies and possibly to utilize virus phage-therapy in aquaculture disease management and control.

Trosclair, L., and J. Al-Dujaili. LSU-E. **Reduction of hand bacteria: a comparative study between Sumac oil liquid soap, antibacterial soft hand soap, and antibacterial hand gel.**—Antibacterial liquid soap is able to reduce the transmission of pathogenic bacteria in healthcare units and in a household. This study was conducted to study the reduction of hand bacteria, comparing between Sumac oil liquid hand soap, antibacterial hand gel, and antibacterial soft hand soap. The effectiveness of antiseptics was tested by students, staff, or faculty of LSUE. There were a total of 16 participants and 8 were randomly selected for each antiseptic test. A sterile cotton swab was used to swab the ventral surface of participant's hands to obtain initial bacteria. The hands were washed in running water at 35-45°C. Participants were asked to wash their hands for 30 seconds using 1-2 ml of sumac oil soap or antibacterial soap. The hands were rinsed in running water and dried with a paper towel. The total amount of bacteria was recorded and the percent transmittance and optical densities were recorded. T-tests compared before and after treatment groups, and a one-way analysis of variance (ANOVA) test was performed. The results of this experiment revealed that all antibacterial products were effective at reducing bacteria. Although individual products showed reductions in hand bacteria, the ANOVA revealed no statistically significant difference when comparing bacterial reduction among products ($p = 0.243$; d.f. = 1.5). When comparing methods of hand washing, all methods were effective at eliminating bacteria found on the hands. The Sumac oil soap sanitizing method revealed an average of 50.36% reduction in hand bacteria. For Purell gel antiseptic, there was an average of 25.79% reduction.

Molecular and Biomedical Biology Section

Acharya, N., A. Mudd, and A. Hale. MSU. **Histovariability of *Alligator mississippiensis* skin.**—Despite the great scientific, economic, and ecological value of characterizing mature Alligator skin histology, a complete guide does not exist. While it is well recognized that the

histology of reptilian scales is distinct, spatial histovariability of skin has been neglected. We have acquired, processed, and analyzed skin biopsies from American alligators in order to describe the microanatomy of both commonly harvested and less commonly harvested skin areas. Average thicknesses of the epidermis, additional measurements of the stratum corneum individually, and dermis were collected. Notable features, components, and variances are included in the descriptions. This descriptive work is foundational to accurately describe growth and development, as well as pathologies affecting this species.

Adedoja, A., and S. Garlapati. ULM. **Identifying protein-protein interactions between initiation factors in *Giardia lamblia* using Yeast- Two Hybrid Assay.**—Cap binding protein eIF4E is an important factor for translation initiation and regulation in eukaryotic cells. It interacts with the 5' cap structure of mRNA and eIF4G which also serves as an important binding protein for other translation initiation factors and recruits the 43S pre-initiation complex (PIC) to mRNA. Homologs of eIF4E have been identified in *Giardia* but not eIF4G. This raises a fundamental question of how the 43S PIC is recruited to the 5' end of *Giardia* mRNA. Nine *Giardia* initiation factors: GLeIF1A, GLeIF2alpha, GLeIF2beta, GLeIF2gamma, GLeIF3-P39, GLeIF4A, GLeIF4E2, GLeIF5 and GLeIF5A were tested for protein-protein interaction using a yeast-two hybrid assay. Preliminary results indicate that GLeIF4E2 and GLeIF4A do not interact with GLeIF2alpha, GLeIF2beta and GLeIF5A. The results also reveal a novel interaction between GLeIF4A and GLeIF3-P39. Further investigation into this interaction may explain how the 43S pre-initiation complex is recruited to the 5' end of *Giardia* mRNA.

Bryant, E., A.M. Hancock, M. Broadway, A. Wiedemeier, C. Gissendanner, and A. Findley. ULM. **Comparative analysis of *Rhodococcus erythropolis* CA cluster phages (Angry Orchard, Bobby Dazzler, Dinger, Harlequin, Jester, Partridge, and Yogi) and a CB cluster phage (Weasels2).**—Eight *Rhodococcus erythropolis* phage were isolated and sequenced. The seven CA cluster phage range from 46,314 – 46,962 bp in length, and have a GC content of 58.7 – 58.8. Phamerator comparison indicates that they share considerable sequence homology and exhibit many gene products shared only by members of their own cluster including: tapemeasure protein; holin; tail assembly chaperone; and lysin. There are also a number of gene products which CA phages share with A subcluster Mycobacteriophages including: DNA polymerase I; DNA primase; helicase; excisionase; S-integrase; deaminase; capsid; terminase; and, the immunity repressor. *Rhodococcus erythropolis* phage Weasels2 has a genome length of 134,973 bp and a GC content of 41.3. Weasels2 has been assigned to the CB cluster but there are significant differences between Weasels2 and the other CB cluster members. In addition, Weasels2 was found to share some gene products with several *Streptomyces* phage.

Busby, M., J. Straub, and M. Osmun. LTU. **The role of MED31 in mesenchymal stem cells.**—MED31 is part of a large protein complex called Mediator. Mediator plays a crucial role in the regulation of gene expression and is present in all eukaryotes. This complex is required for cell-type specific transcription, meaning that without Mediator, proper development will not occur. We are investigating the role of MED31 in the self-renewal and differentiation of human bone marrow derived mesenchymal stem cells (MSCs). MSCs are used in the lab and clinic because of their self-renewing properties and their differentiation potential. We have found that the loss of MED31, through siRNA-mediated knockdown, results in a reduction in cell proliferation. We have also seen that early fat markers are reduced and a reduction in adipogenesis is observed. In the future, we plan to evaluate osteogenic differentiation in the absence of MED31.

Decuir, F., and B. Hollins. LTU. **Development of hardware and software for a novel mouse sleep deprivation method.**—The Center for Disease Control and Prevention has declared sleep deprivation (SD) as a public health epidemic. The physiological mechanisms of SD are poorly understood, due to limited understanding of sleep biochemistry and a lack consistent methodology for inducing SD. The goal of this project is to develop an automated system to normalize SD methodologies between labs. The system utilizes biosignals to stimulate a rat to disrupt sleep patterns. Important engineering design parameters include reduction of external stresses, animal acclimation time, and customization. The design utilizes 3-D printing making it easily accessible in most research settings. We present results of hardware testing, program functionality, and project module integration.

Johnston, C. LSU-A. **A primer for barcoding at LSUA.**—Biological barcoding allows identification of distinct species through sequencing of Cytochrome C Oxidase I. Proposed in 2003 by Paul Hebert as a means to create a database of specimens, barcoding provides species identification via nucleotide sequencing. Cytochrome C Oxidase I has undergone only minute evolutionary modification due to its vital role in the electron transport chain. Cytochrome C Oxidase I is unique to each species and helps differentiating species that may otherwise exhibit no phenotypic differences. Barcoding used in conjunction with morphological identification can provide genetic information to support and assist taxonomic classification of specimens that are relatively indistinguishable, uneasily identified, or damaged. We performed research to determine the most efficient way of barcoding various arthropods and establish a research protocol that accommodates the small budget and limited resources available to a small liberal arts college.

Kety, M., D. Sandel, N. Dinkins, and J. Cambre. LTU. **The role of NOTCH3 in determining mesenchymal stem cell fate.**—The NOTCH signaling pathway has been shown to play a vital role in determining cell fate of human Adipose Stem Cells (hASCs). Misregulation of the pathway is associated with some diseases and cancers, including breast cancer. To date, the four individual NOTCH ligands have not yet been characterized for their role in adult stem cells. The aim of this project is to characterize the role of NOTCH3 in the maintenance and differentiation of hASCs. NOTCH3 appears to have the highest level of expression in hASCs. Preliminary results using siRNA-mediated knockdown of NOTCH3 show that while self-renewal and cell viability is unaffected by the loss of NOTCH3, there is an increase in adipocytes following adipogenic differentiation. Experiments are ongoing to determine the role of NOTCH3 in bone differentiation. Since regenerative medicine relies heavily on controlling cell fate, characterizing the NOTCH signaling pathway is a gateway for further advances.

Kim, P., R. Greenaway, O. Ohwe, and A. St. Ville. GSU. **High sugar diet-induced obesity in *Drosophila* involves a trip to the ER?**—*Drosophila melanogaster* has been used as a model for understanding the relationship between obesity and health problems such as diabetes (Musselman et al. 2011) and heart disease (Na et al. 2013). In these studies, flies raised on a high sugar diet became fat, hyperglycemic, and insulin-resistant, and developed cardiomyopathy, similar to the pathologies observed in human obesity. In humans, obesity also induces endoplasmic reticulum (ER) stress, which is thought to play an important role in mediating insulin resistance and inflammation. Therefore, the present study seeks to use *Drosophila* as a model to study the relationship between obesity and ER stress. *Drosophila melanogaster* (Oregon-R-C, Bloomington Stock Center) will be placed on a high sugar diet during the larval

and adult stages to induce obesity. These flies will be compared to flies on a normal diet. Genes involved in ER stress and other genes of interest will be analyzed by qPCR.

Leung, H.T., J. Cropprue, and S. Yun. GSU. **Study of neural cell adhesion molecule precursor protein (NCAM) in different model organisms.**—Neural cell adhesion molecule (NCAM) has been shown to play a role in cell–cell adhesion and neurite outgrowth which are important for synaptic plasticity, learning and memory. The NCAM precursor protein (NCAMP) is converted into NCAM in vivo on demand. We compared the amino acid sequences of NCAMP found among 6 vertebrates (three mammals, a bird, a reptile and a fish) using the NCBI blast function. NCAMPs of the three mammals share high homologs but not in the non-mammals. However, our previous study of serotonin did not show a drastic decrease in homology between mammals and chicken. So we checked the protein homologs of five other proteins in the organisms. We found that all five other proteins shared significantly higher homologies to their human counterparts than NCAMP. Thus, NCAMP is among a group of proteins that set birds apart from their counterparts found in mammals.

Li, Z., T. Bishop, and R. Sun. LTU. **Interactive chromatin modeling.**—Chromatin is the biomaterial that houses the genome in all higher organism. Chromatin structure therefore impacts all genomic process. Nucleosomes are the fundamental structural unit of chromatin and consist of 147 base pairs of double stranded DNA wrapped 1.7 times around eight histones. To integrate physical modeling with informatics-based analysis of chromatin we have integrated our Interactive Chromatin Modeling (ICM) tools with the Dalliance genome browser (DGB). ICM is an interactive web based tool that allows users to rapidly fold any sequence of DNA into atomic or coarse-grained models of chromatin. ICM-DGB unites ICM’s physical modeling with sequence and experimental data from public databases. Users can manipulate nucleosome positions, display modeling data as tracks in the genome browser and map informatics data onto a physical model in real time. As a research tool ICM-DGB supports cross-validation of physical modeling and informatics studies of chromatin.

Mudd, A., and K. Jackson. MSU. **Inhibition of MMP-2 and MMP-9 by native plant species.**—Matrixmetalloproteinases (MMPs) are extracellular degrading enzymes with humans having 23 members of this family. MMP-2 and MMP-9 function in normal physiological processes including embryonic development and wound healing, as well as play a role in a number of disease processes including arthritis and cancer metastasis. Many plants have been identified as having anti-inflammatory activity. One possibility for this activity is an ability to inhibit MMP-2 and/or MMP-9. For these studies, we screened plants native to Louisiana for their ability to inhibit human MMP-2 and MMP-9 using gelatin zymography. We found that magnolia and honeysuckle leaves had little effect on MMP-2 and MMP-9 activity. In contrast, blueberry leaves inhibited 80% of MMP-2 activity and 58% of MMP-9 activity while blackberry leaves inhibited 85% of MMP-2 activity and 73% of MMP-9 activity at the concentrations tested. We continue to screen for novel plants with MMP-2 and MMP-9 inhibiting activity.

Mudd, A., M. Merchant, and A. Hale. MSU. **Autophagy pathway conservation in the American alligator.**—The American alligator is a large, extant apex predator native to the tropical and subtropical swamps of North America, including Louisiana. Alligators stop feeding during the cooler winter months and these stretches may extend up to six months at some latitudes. It has been shown that their metabolism slows along with body temperature depression

during this time, as is the case with most ectotherms. It is our working hypothesis that alligators upregulate the autophagy pathway during their winter anorexia. Autophagy is a well-conserved catabolic process that is upregulated due to stress at the cellular and organismal level. We have used published genomic data to perform an analysis of the autophagy pathway and related regulators. Taking a bioinformatics approach, we have compared nucleotide sequences, protein sequences, domain conservation, and regulatory data to the human homologues. Transcriptome analysis of liver tissue confirms expression of requisite autophagy genes.

Murphy, K., O. Sullivan, O. James, S. Khan, L. Soileau, M. Lemaire, A. Smegal, and C. Self. MSU. **Examining the DNA-binding specificity of fungal-specific zinc cluster transcription factors.**—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 (Zn₂Cys₆) family of transcription factors (TFs) are primarily responsible for the upregulation of these efflux pumps and thereby mediating pleiotropic drug resistance (PDR) in yeast. The aim of this study is to characterize the DNA-binding specificity of previously undescribed Zn₂Cys₆ TFs (ZCF3, ZCF7, ZCF9, ZCF14, ZCF29, ZCF32, ARG83) from *Candida albicans*. Additionally, DNA-binding specificity data will be used to predict target genes and biological processes regulated by these TFs. Toward these aims, a cloning strategy involving PCR from genomic DNA, Gateway-based cloning, *in vitro* protein expression, and protein-binding microarray analysis will be utilized. Future studies will expand this analysis to additional TFs and related species.

Philobos, J., R. Eddy, and I. Pursell. LTU. **The use of biocompatible hydrogels to direct stem cell differentiation.**—One of the leading causes of death in America is myocardial infarction, which can lead to severe heart tissue damage. As the heart lacks regenerative properties and donor organs remain sparse, researchers must make efforts to find more efficient methods of tissue repair. One such solution may be found in tissue engineering using biocompatible scaffolds seeded with stem cells using mouse embryonic stem cells (mESCs), which can successfully differentiate into spontaneously contracting cardiomyocytes. This project seeks to optimize differentiation of mESCs on synthesized biocompatible hydrogels that will mimic the matrices of muscle cells. Gene expression is being used to characterize these cells to determine the extent of their differentiation towards either an atrial or ventricular myocardial lineage. Human mesenchymal stem cells (hMSCs) are also being used as further proof of the differentiation capabilities of the hydrogels into other lineages such as fat and bone for application in related biomanufacturing fields.

Possoit, H., and L. Porter. NSU. Z. Radulovic, and A. Mulenga. TAMU. **Bioinformatic and RNAi analysis of putatively infection-responsive genes in *Amblyomma americanum*.**—*Amblyomma americanum* is a common and aggressive tick of medical and veterinary importance in the Southern United States. While known to transmit several pathogens including bacteria, little is known about this tick's response to infection with bacteria. In this study, data from the Illumina sequencing of RNA from LPS-exposed and non-exposed adult females were analyzed. The bioinformatics software CLC Genomics Workbench was used to compare contigs between treatment and control groups to determine putatively infection-responsive genes. Several transcripts with identity to previously characterized immune-related proteins were identified. Targets were selected for functional assessment using RNAi. Construct design for dsRNA

synthesis in *E. coli* HT115 was performed. Future directions are discussed. Understanding the molecular interaction between this species and bacteria is a first step in discovering alternative tick control methods.

Pruitt, M., A. Mudd, and A. Hale. MSU. **Seasonal starvation and autophagy activation in alligators.**—*American* alligators fast in response to cooler temperatures, which is accomplished by decreasing metabolism and body temperature depression. Nutrient scarcity, at the cellular or organismal level, may promote autophagy. Autophagy is a well-conserved sub-cellular catabolic process which cells activate to maintain energy homeostasis during periods of cellular stress. Bioinformatic evidence, which is presented on an accompanying poster, suggests that the alligator autophagy pathway is highly similar to that of humans. This similarity enables us, conceptually, to use available molecular tools targeted to human autophagy proteins on alligator tissue and tissue lysates. We will adapt molecular techniques and reagents to our alligator tissue in order to test the hypothesis that autophagy is downregulated in the warmer summer (fed) months, and upregulated in the cooler winter (fasting) months.

Scoggin, L., and T. Murray. LTU. **Top-down machined enhancement for wholemout brain imaging.**—One day we hope to repair brain damage by accelerating the brain's natural mechanisms of neurogenesis. However, we need better methods to study neurogenesis in real brain tissue. The subventricular zone (SVZ) is one of two main regions in the brain where neurogenesis occurs in mice as well as humans. Lateral ventricular wall wholemouts (WM) are advantageous to study the cytoarchitecture of the SVZ. Time-lapse images of this area are difficult to acquire, however. Due to the curved nature of the tissue, fine details are obscured. Movement across the walls for cerebral spinal fluid studies or neuroblast migration tracking must be broken down to a few number of frames at a time and then calculated. A device was envisioned to allow rotation of the tissue with respect to the microscope objective lens for more efficient image capture of time-lapse images.

Shaikh, Y., M. Merchant, and A. Hale. MSU. **Structure and expression analysis of crocodilian NF- κ B.**—Nuclear Factor kappa B (NF- κ B) is a pleiotropic transcription factor that plays a vital role in a variety of biological processes. Its regulatory role in the early phases of inflammation is critical for proper immune function. We found the NF- κ B gene in all three lineages of crocodilians, and the deduced amino acid sequences show a high degree of identity with mammalian and avian species. We identified Dimerization, Death, and Rel domains, a nuclear localization signal, and ankyrin repeats. Western blot analysis showed the presence of both the 50 kDa mature protein and the 105 kDa precursor protein in the liver of infected alligators. Immunohistochemical analysis revealed a broad distribution of hepatic expression, and altered sub-cellular localization following infection. Alligator NF- κ B has the ability to bind DNA resembling human NF- κ B. We have shown that the structure, processing, expression, and DNA binding function of crocodilian NF- κ B is similar to the mammalian homologue.

Smith, S., and L. Porter. NSU. **Analysis of sequence conservation of latroinsectotoxins in *Latrodectus geometricus*.**—While the southern black widow spider is an easily recognized pest of the south, the brown widow, *Latrodectus geometricus*, is a less-well known species that was first detected in Louisiana in 2007 but is now the more predominantly found of the two species. A search of GenBank shows only one reported venom toxin-encoding sequence for *L. geometricus*, annotated as belonging to the latrotoxin family. Coding sequences for a

latroinsectoxotins (LITs) have not been reported. We used the publically available *L. tredecimguttatus* LIT-coding sequence to design primers for the amplification of its homologue in *L. geometricus*. Total RNA was extracted from an adult female and cDNA was synthesized. Results are discussed. A complete LIT-coding sequence for this species would not only contribute to the understanding of venom evolution and specialization in this medically important species, but would also provide for bio-assays of insect toxicity.

Soorya, M. NSU. S. Pradhan. GU. **Identifying Csy-3 protein in *Vibrio parahaemolyticus* isolates.**—The CRISPR/Cas system is a primitive immune system for bacteria to fight against parasitic attacks such as bacteriophage. This mechanism seems to be an inherited trait that only exists in 40% of bacteria. In the study, we assayed for the *csy-3* gene that is associated with bringing an RNA copy of the parasitic genetic material to the Cas 9 complex. We made PCR primers that were complementary to the genes that made the *csy-3* protein. Then we checked if *cys-3* existed in one pathogenic shellfish isolate, one human strain, and one ATCC isolate of *Vibrio parahaemolyticus*. Results show the human pathogenic strain of *Vibrio parahaemolyticus* has the *csy-3* gene with a 98% sequence similarity with the gene bank sequence. The results indicate the possibility of a CRISPR complex being in the human strain of *Vibrio parahaemolyticus*

Straub, J., and E. Beadle. LTU. **The role of MED31 in the regulation of mesenchymal stem cell state.**—Mediator regulates eukaryotic cell-type specific gene expression. Mediator functions as a molecular adaptor that connects gene regulatory element-bound activators to the transcription pre-initiation complex (PIC) on the promotor and recruits RNA polymerase to the PIC. Our research focuses on how Mediator influences the differentiation of bone marrow-derived mesenchymal stem cells (MSCs). MSCs are harvested from adult donors and can differentiate down chondrogenic, osteogenic, and adipogenic lineages. Published research demonstrates that the absence of MED31 reduces cell proliferation and appropriate differentiation as evidenced by reduced limb development in mouse embryos. We performed MED31 knockdowns using siRNA, then performed osteogenic and adipogenic differentiation assays for 14 days post-transfection to determine the role of MED31 in differentiation. MSCs remained viable post-transfection but displayed reduced adipogenic and osteogenic differentiation demonstrated by images of cell morphology and patterns of gene expression. These results suggest MED31 is important for appropriate Mediator function in regulating MSC differentiation.

Sun, R., Z. Li, and T. Bishop. LTU. **All atom molecular dynamics simulations of nucleosome positioning.**—Nucleosomes are the building blocks of eukaryote genomes. Given that a nucleosome contains 147 base pairs of DNA, there are over 4^{147} sequence possibilities. A comprehensive study is impossible. However, today's computational resources are sufficiently powerful to support simulations of ensembles representing 10's to 100's of nucleosomes. Here we demonstrate a workflow that enables us to efficiently characterize 21 different positions of the super strong nucleosome positioning sequence labeled 601. The positions include 10 upstream, 10 downstream, and the ideal position. In all 21 simulations, the superhelix geometry evolves in less than 100ns to a conformation that is significantly different from the original geometry. Thus we have demonstrated that simulations as short as 100ns are sufficient to investigate sequence specific properties of the nucleosome and validated a workflow that allows

us to efficiently simulate, analyze and publish results. All simulation and analysis data are available on our iBIOMES server.

Whitehead, A., N. Patel, M. Caldorera-Moore, and J. Newman. LTU. **Characterization of stem cell-biomaterial interactions on tailorable poly(ethylene glycol) hydrogels designed for tissue engineering applications.**—New developments in stem cell technologies and biomimetic materials are rapidly advancing potential methods for the regeneration of damaged tissues. For these technologies to be clinically applicable, fully functional cells and tissues must be mass produced, and there is currently a need for new techniques that are inexpensive, tailorable, and reproducible. Here, we have developed a poly(ethylene glycol) (PEG)-based hydrogel platform that has been shown to support the attachment and viability of both pluripotent and multipotent stem cell types. Previous studies have demonstrated that matrix elasticity can influence stem cells fate. The hydrogel platform we have developed can be tailored to mimic the elasticities of native tissues, and thus has the potential to be used to direct stem cell differentiation toward specific lineages. Pluripotent and multipotent stem cells will be seeded on hydrogels of various elasticities during differentiation, and the effect of elasticity will be analyzed.

Williams, G. LTU. **Development of an UV-Vis spectroscopy technique for detecting protein-centered radicals.**—Oxidative stress, induced by reactive oxygen species, has been implicated as a contributing factor in numerous disease states. One of the products of oxidative stress is the formation of protein-centered (PC) radicals. PC radicals are very reactive and decay at a rapid rate, making them difficult to analyze with standard technology. Immunospin trapping technology was developed using a nitron spin trap to trap PC radicals, which decay into stable adducts detectable by standard immunochemical techniques. We have recently developed a UV-Vis spectroscopy method for detecting PC radicals. With the development of this methodology for PC radicals, we have opened the pathway for greater specificity and efficiency of protein analysis in oxidative stress conditions. By providing a cost-effective alternative, but complementary approach, for analysis of PC radicals, we are able to increase accessibility of the technique to biomedical researchers, students, and labs.

Wykes, A., J. McMurray, and W. Dorsey. GSU. **Ras signaling potentiates mitogen-activated protein kinase (MAPK) diversity in TIB-73 mouse hepatocytes exposed to pentachlorophenol.**—Ras is a small G protein that is involved in transmitting incoming signals to downstream signaling molecules and is intimately linked to cell proliferation, differentiation, and survival. The active GTP-bound form of ras operates as a molecular switch that transmits signals to the nucleus. Once this happens, it is believed that the heterodimeric AP-1 complex orchestrates proliferation and differentiation. In mammalian cells, cellular adjustment in response to environmental stress leads to the dysregulation of MAPK signaling molecules. Ras mutation through signal disruption is seen in many tumor types, including roughly half of all colon cancers and 90% of pancreatic carcinomas. The mitogen-activated protein kinase (MAPK) pathway has been implicated as a key signal transducing system that mediates extracellular signals through a step-wise phosphorylation regime. There are three distinct tiers in the MAPK pathway: ERK, JNK, and p38. ERK encodes transcription factors to recruit anti-apoptotic proteins, while JNK regulates cell cycle progression. The p38/MAPK orchestrates apoptotic activities and is closely associated with cytokines involved in the inflammatory response. Pentachlorophenol (PCP) is an organochlorine compound that has been widely used as a biocide in several industrial, agricultural, and domestic applications. The US EPA categorizes PCP as a Group B2 carcinogen

because it causes injury to major organs including the lung, liver, kidney, heart, and brain. In the present study, we hypothesized that exposure to PCP would cause different MAPK responses in TIB-73 mouse hepatocytes. We assessed the ERK, JNK, and p38 MAPK proteins in PCP-treated TIB-73 mouse hepatocytes at concentrations of 0 ug PCP/mL, 2 ug/mL, 4 ug PCP/mL, 16 ug PCP/mL, 18 ug PCP/mL, following 48 hr of exposure. A dose dependent upregulation of the 43 kDa ERK molecule, 46 kDa JNK molecule, and 38 kDa phospho-p38 molecule was observed in 4 ug PCP/mL, 8 ug PCP/mL, 16 ug PCP/mL, and 18 ug PCP/mL, respectively. We believe that the ras G-protein plays a molecular switch for ERK, JNK, and phospho-38 MAPK biomolecules. This research was financially supported by the Louisiana Board of Regents Research Competitive Subprogram grant 20130008265 and Louisiana Biomedical Research Network grant, PO-10001.

Zoology Section

Beachy, C. SLU. H. Beachy and W. Beachy. HHMS. **The effect of temperature, sex and maturation status on metamorphosis in the Western Tiger Salamander, *Ambystoma mavortium*.**—We hypothesized that temperature variation among these types of habitats is a significant cause of life cycle variation. We collected 77 salamanders using minnow traps from Agsite Pond/Swalls Lake in Ward County in northwestern North Dakota. We tested three hypotheses: metamorphosis is temperature dependent; metamorphosis is dependent on maturation status; and metamorphosis is dependent on sex. We placed larvae in individual boxes and placed 40 larvae at 14 degrees C and 37 larvae at 20 degrees C. We analyzed the response of metamorphosis (yes or no) and how this response differed among temperature treatments, sexes and maturation status. Larvae were more likely to metamorphose at high temperature. However, this effect is influenced in a complex way by sex and maturation. Females always showed a propensity to metamorphose, although this was less strong in adult females. All juvenile males at high temperature metamorphosed and no adult males metamorphosed under any condition.

Bergeron, S., J. Doucet, C. Bonvillain, R. Boopathy, R. Nathaniel. NSU. **The microbial ecology of the alimentary canal of the red swamp crayfish, *Procambarus clarkii*.**—*Procambarus clarkii*, the red swamp crayfish, is native to northeastern Mexico and south central United States and can dominate ecosystems by controlling food availability from the ability to shift diets. Additionally, juvenile crayfish feed on more animal matter than adults because protein is needed for growth, molting and reproduction. During crayfish development, its diet changes to a predominantly herbivorous diet in adult crayfish, which can influence changes in microbial ecology of the alimentary canal. Small, medium, and large *P. clarkii* crayfish were collected from a local crayfish pond in Thibodaux, Louisiana, and the Atchafalaya River Basin, Louisiana. Then bacteria were isolated from the alimentary canals of the crayfish and identified using physical characteristics, Biolog Microstation™, and biochemical tests. *Raoultella*, found on plants, was isolated from larger *P. clarkii* suggesting a possible change in the microbiome of the alimentary canal due to a shift in diet to primarily vegetation.

Elliott, J., and C.A. Corbat. LSU-A. **An investigation of response to light stimuli by the Mediterranean Gecko, *Hemidactylus turcicus*.**—The Mediterranean Gecko is an introduced

species which has been in Louisiana since the 1950s. The gecko lives on human developments and is exclusively nocturnal. Geckos are frequently observed on windows and around external building lights at night, presumably feeding on insects attracted to the lights. This study investigated response of geckos to various colors and "temperatures" of light. Light temperature is a way to describe the intensity of white light, with low temperature light appearing more yellowish, and high intensity white light appearing more white, to the human eye. In trials with various colors of light, geckos emerged from shelter more when either red or UV light was used. Gecko preference for light temperature appeared to be contingent on distance from the light source. Geckos directly exposed to light used low temperature lights more, but when those on the periphery of lights were considered, results were less clear.

Erdmann, J. SLU. **The influence of predatory toad behavior on isopod movement.**—Foraging predators exhibit a number of movement patterns that influence their ability to capture prey items, from stalking to luring. Gulf Coast Toads (*Incilius nebulifer*) perform a number of motions, including toe and whole-body movements, while hunting and are known to eat primarily woodlice (Isopoda: Oniscidea). These movements have been posited to be both adaptive, luring mechanisms, and nonadaptive, indirect responses to encountering suitable prey items. No experiments have been done on amphibians to tease apart these explanations and their relative importance for feeding. Using video data and tracking software, I address how the different motions of stimulated *I. nebulifer* affect the behaviors of their prey to understand how these predator-prey interactions unfold at a detailed scale. Toad movements appear to have a dichotomous response in woodlice prey (*Armadillidium* sp.), causing either a rapid escape behavior, or a long-lasting pause, depending on multiple factors.

Fulbright, M. ULL. **Is there enough swamp for all of us? Habitat selection of cottonmouth snakes.**—Intraspecific competition plays a significant role in how species are distributed throughout a habitat. Because of morphological similarities, conspecifics are directly competing for the same resources and must find ways to partition the available resources within an area. In cannibalistic species, smaller individuals are vying for similar resources of larger ones, but must also avoid larger conspecifics. I investigated the spatial distribution of cottonmouths in an isolated wetland, by mapping the geographic locations where snakes were found and measuring the microhabitat variables of each location that snakes occupied. I found that juvenile snakes are limited to areas of shallow or no water, whereas adult males were more commonly found in areas with deeper water. Adult females were found primarily in intermediate habitats between open canopy buttonbush (*Cephalanthus occidentalis*) slough and dense canopy lowland forest but there does not seem to be a pronounced ontogenetic shift in habitat selection.

Fulbright, M., and C. Hillard. ULL. D. Penning. MSS. **Going out on a limb: scaling of terrestrial and arboreal defensive strikes by ratsnakes.**—Ratsnakes are semi-arboreal snakes that must dispel predators in both terrestrial and arboreal environments. We measured defensive terrestrial and arboreal strikes to determine if snakes modulate their strike performance relative to the habitat they occupy. To determine the scaling of striking performance, snakes were measured from an ontogenetic range of body sizes. In paired analyses terrestrial strikes were significantly higher in maximum velocity, strike duration, and strike distance than perched strikes ($p < 0.01$ for all) while striking performance scales isometrically with body size. Performance of snakes in arboreal habitats is likely confounded by the need to use a portion of the posterior part of the body to maintain contact with limbs and prevent falling.

Hardy, L. LSU-S. **Ecological observations of the trapdoor spider, *Myrmekeiaphila comstocki* (Araneae, Mygalomorpha, Euctenizidae, Apomastinae) in the Ouachita Mountains of Arkansas.**—The ecology of the trapdoor spider, *Myrmekeiaphila comstocki*, was examined in the Ouachita Mountains of west-central Arkansas in order to understand the microhabitat of the burrows and the activity season. A population of individually marked burrows was studied during 2003-2009 at the Ouachita Mountains Biological Station. The surface structure of the burrows, temperatures, burrow depth, microhabitat around the burrow, and the facing direction of the trapdoor relative to the surrounding terrain were recorded. Spiders were active in all seasons and at ground surface temperatures that were below freezing. Burrow diameters change over time and are correlated to the size of the spider. The burrows were 60-330 mm deep and were open 25% of the time. Larger burrows were destroyed (by possible predation or other physical damage) more often than were smaller burrows. The population density in the area studied was 366 burrows per hectare.

Hinton, J., H. Meyer, M. Klumpp, M. Hopper, A. Mendez, E. Fox, M. Qureshi, and V. McDaniel. MSU. **Three new species of water bear (Phylum Tardigrada) from Maui, Hawaii.**—Three species of the 18 we collected from Maui are new to science. One which belongs to a group of 8 species in the genus *Pseudechiniscus* is characterized by the presence of thin connecting lines between granules of dorsal cuticle and one or two posterior projections. The new species has two short posterior spines. It differs from the most similar species, *P. bartkei*, in having an undivided pseudosegmental plate and a much denser cuticular granulation. The second species is a minute member of the genus *Isohypsibius*. Eight species in the genus are characterized by the presence of multiple rows of dorsal gibbosities. The new species differs from all of these in its unique pattern of eight dorsal rows, each with two gibbosities. The third species belongs to genus *Paramacrobotus*. Adults of this species have a wider buccal tube than any other species and differ also in some characteristics of their eggs.

Hopper, M., H. Meyer, J. Hinton, and K. Jackson. MSU. **Molecular data on Louisiana *Milnesium lagniappe*.**—Tardigrades are microscopic animals found in diverse environments. Classically, tardigrade species have been identified and distinguished using morphological data; recently molecular data have become increasingly important. *Milnesium lagniappe* was first collected from moss in Calcasieu Parish, where it is widely distributed. Based on morphological criteria, specimens from Fort Myers, Florida have also been identified as *Milnesium lagniappe*. The aim of this study was to collect molecular data on *Milnesium lagniappe* to determine the level of genetic diversity within the species, and compare it to other *Milnesium*. We examined the internal transcribed spacer region (ITS2), which has a fast rate of evolution and should allow for differentiation between closely related species. DNA isolated from seven Louisiana *Milnesium lagniappe* was analyzed and was between 93.2%-100% identical over a 516bp region of ITS2. We plan to collect specimens from Florida to assess whether they are indeed the same species.

Johnson, D., C. Ardizzone. MSU. J. Hightower. CPMC. W. Dees. MSU. **A longitudinal seasonal survey of mosquitoes in a residential park.**—We are conducting a seasonal longitudinal survey of mosquitoes at a 24-acre woodland park in an urban area of Lake Charles, Louisiana. The park is separated into two distinct areas - an open area with playground equipment, open shelters, a small conference center, and concrete walking paths with benches and a preserved forest with nature trails. The mosquito survey was initiated in the summer of

2011. We use Centers for Disease Control and Prevention (CDC) light traps baited with CO₂ in the form of dry ice to collect mosquitoes. Mosquitoes are collected in the open area near the preserved forest in each of the four seasons. Temperature and humidity data are recorded during each trap night. To date, the predominant species collected (i.e. >50 in one trap night) are *Aedes atlanticus*, *Ae. taeniorhynchus*, *Ae. vexans*, *Coquillettidia perturbans*, *Culex erraticus*, *Cx. nigripalpus*, *Cx. salinarius*, and *Psorophora columbiae*.

Meyer, H., and J. Hinton. MSU. **New water bear records from New England, with the description of a new species.**—Terrestrial tardigrades are minute animals found in leaf litter and cryptogams. The tardigrade fauna of New England is poorly known. There are a few published records from Maine (11 species), Vermont (9 species), New Hampshire (1 species), Connecticut (1 species), and Massachusetts (1 species), and none from Rhode Island. In 2014 25 samples of moss and lichen were collected from sites in Connecticut, Massachusetts, New Hampshire, and Rhode Island, of which 22 contained specimens. We have found 8 species in the Connecticut material, 2 from Massachusetts, 10 from New Hampshire, and 6 from Rhode Island. At least one species, from Franconia Notch State Park in New Hampshire, is new to science. This species belongs to the genus *Milnesium*, and is most similar to *Milnesium granulatum*. Both species have a [3-3]-[3-3] claw configuration and a granulated dorsal cuticle. The new species can be distinguished from *M. granulatum* in having proportionally smaller claws and a significantly wider buccal tube. It has recently been demonstrated that in some species of *Milnesium* the claw configuration changes, with newly hatched individuals having fewer basal claw spurs than adults. However, in the New Hampshire species even the smallest individuals have the [3-3]-[3-3] configuration. *Milnesium* eggs are laid in the molted exoskeleton of the mother. By allowing some eggs to hatch and comparing the claw configuration of the neonates to that of the mother's exoskeleton, we verified that claw configuration in this species does not change with age.

Partin, M. SLU. **Traffic noise- potentially the bane of anuran existence- causes of physiological stress in *Hyla chrysoscelis* (Anura: Hylidae).**—Noise pollution is an increasing concern throughout the world due to potential impacts it could have on the environment and wildlife, particularly in those species using acoustic communication. Anurans are among the organisms that have been affected, mainly by traffic noises because many ponds and temporary pools are near roads, some of which have heavy traffic. Changes in calling characteristics in anurans and other animals in response to noise have been well established in the literature. Traffic noise has been shown to cause physiological stress in different organisms, including some anuran species. During the breeding season in summer of 2016, blood samples were taken from *Hyla chrysoscelis*, the cope's gray tree frog, through cardiac puncture with heparinized hypodermic needles, and corticosterone concentrations were measured via ELISA assays. It is expected that the frogs exposed to applied noises have changed their call characteristics, and that corticosterone has increased.

Rupp, A. ULL. **Baby got back: why plethodontid courtship glands are important.**—Salamanders in the family Plethodontidae exhibit a unique tail-straddle walk during courtship. Sexually dimorphic mental glands and caudal courtship glands are thought to increase female receptivity during courtship. While many studies of mental glands observe intergeneric morphological variation, caudal courtship glands have been relatively unstudied. I hypothesized that similar intergeneric morphological variation would be seen in caudal courtship glands as had already been seen in mental glands. Salamanders from three genera, *Plethodon*, *Eurycea*, and

Desmognathus, were collected throughout the year and tissues from the chin and dorsal base of the tail were analyzed using either light or electron microscopy. Results show that there are patterns of morphological variation by genus in caudal courtship glands that may be taxonomically important. These data also present SEM as a meaningful tool to study these glands. Further investigation of caudal courtship glands is needed to better understand the evolution of the tail straddle walk.

Schwartz, N., and J. Carr. ULM. **Growth and survival of head-started alligator snapping turtles (*Macrochelys temminckii*) in northeastern Louisiana.**—Adult *M. temminckii* were historically hunted at levels that have led to threatened populations. Captive-reared *M. temminckii* were raised at Tishomingo National Fish Hatchery, and 10 two-, 5 three-, and 5 four-year olds were released at two field sites for three summers. Both field sites are oxbow lakes in different stages of succession located at Boeuf Wildlife Management Area in northeastern Louisiana. Growth measurements were collected on all 120 individuals before release and 61 individuals several months after release. Using ANOVA procedures in SAS, we found significant positive relationships between growth rate by year released ($P = < 0.001$, $R^2 = 0.52$) and by year hatched ($P = < 0.001$, $R^2 = 0.42$), but no relationship by age at release. Therefore, as the study progressed and as hatched year progressed concomitantly, the growth rate increased. Survivorship was 72% (four months), 52% (six months), and 6% (one year).

Tsaliki, M., and H. Meyer. MSU. P. Degma. CU. **Two new species of *Echiniscus* (Phylum Tardigrada) from Maui, Hawaii.**—Water bears, also known as tardigrades, are microscopic animals closely related to arthropods. They occur in marine and freshwater habitats, and in terrestrial soil, leaf litter, moss, and lichen. In 1985 Robert Schuster collected six species of the genus *Echiniscus* from Hawaiian cryptogams. Unfortunately, Schuster died before completing his study. We obtained his slides from UC-Davis. Two species from Halea Kala National Park, Maui are new to science. The dorsal cuticle of one species is ornamented with a pattern of rosettes reminiscent of leopard spots. It is very similar to *Echiniscus pardalis*, a species from northern Italy, but differs in lacking cuticular plates on its legs and in some morphometric measurements. The second species most closely resembles species of the *Echiniscus viridis* group, especially *E. perfiviridis* and *E. viridissimus*. It differs from them in the length of its claws, the sculpture pattern of its cuticle, and its color.

Division of Physical Sciences

Chemistry Section

Akeroyd, E., S.Bhatt, and J. Fotie. SLU. **Palladium acetate catalyzed hydrosilylation of alkynes.**—This report describes a Palladium acetate catalyzed hydrosilylation of internal and terminal alkynes. The optimization of the reaction conditions as well as the scope of the reaction is also discussed.

Bessette, T., S. Arnold, and S. Eklund. LTU. **Corrosion reduction of launch pad concrete with electrokinetic nanoparticle treatment.**—Rocket ignition causes physical, chemical and thermal damage to the launch pad concrete causing \$10M/ year on average in repair costs. In order to increase the physical, chemical, and thermal resistance properties of the concrete, along with reducing repair costs, the concrete can be subjected to electrokinetic nanoparticle treatment. Here we present changes in the strength and corrosion of cement specimens upon electrokinetic treatment with alumina-coated silica nanoparticles. The treatment regimen includes applying a cathodic potential to the rebar under varying controlled current conditions.

Bista, R., S. Murru, M. Crawford, and A. Hancock. ULM. **Synthesis of non-natural chiral oxazolyl amino acids.**—Chiral heterocyclic amino acids, the most important class of non-natural amino acids in the pharmaceutical and agrochemical industries, can induce biological activity when incorporated into natural products or designed molecules. Because of the high biological profile of oxazole moiety, its incorporation into small molecule scaffolds is valuable in drug development. Accordingly, we have developed synthetic approaches for oxazolyl amino acids, starting from α -amino acids and serine ester, which serve as chiral building blocks in constructing combinatorial libraries.

Bonck, I.H, and J. Fotie. SLU. **Pd(OAc)₂ catalyzed deconstruction of tetrahydrofuran by acyl halides.**—This report describes the deconstruction of tetrahydrofuran by acyl halides to produce the corresponding 4-chlorobutyl 4-(4-chlorobutoxy)butyl ester derivatives. The reaction conditions have been optimized and the scope of the reaction explored.

Duke, B., and J. Fotie. SLU. **Pt(0) silicate catalyzed hydrosilylation of alkene.**—This report explore the synthesis of organosilane derivatives using platinum-nano-dispersed in sol-gel-derived organically modified silicates as catalysts for the hydrosilylation of alkenes. The reaction conditions has be optimized and the scope of the reaction is currently been explored.

Ganguly, S., R. Gaudet, H. Godwin, S. Jones, and P. Reed. NSU. **Synthesis of ZnO nanoparticles and their assembly into thin films.**—Quantum dots have the potential to impact the present and envisioned technologies such as thermoelectric, photovoltaic and bioimaging, owing to their unique physical and optoelectronic properties. Efforts in the past few decades have led to numerous synthetic methodologies (physical and chemical) rendering access to several classes of nanoparticles. However, the applications/device fabrications do not use single nanocrystal or solutions of nanocrystals, but are established on the assembly of discrete nanoparticles in the solid-state. This presentation will describe colloidal based strategies to

produce ZnO nanoparticles of varied size and shape. In addition, synthetic strategies leading to the assembly of discrete nanoparticles into thin films will be discussed. Further, the suitability of these discrete nanoparticles and their assemblies, as transparent conducting materials, will be addressed.

Godara, S., and D.S. Mainardi. LTU. **Elucidation of Initial Predictor Performance in 55-atom Transition Metal Clusters for Fischer Tropsch Synthesis.**—Due to limited resources of fossil fuel reservoirs (e.g. coal, oil or natural gas), increase in demand and environmental concerns, one possible route to meet future energy challenges is through the production of synthetic fuel using the Fischer-Tropsch synthesis (FTS). In our previous work, we presented a mechanism based on density functional theory (DFT) calculations to explore the natural potential of a catalyst material (13 atom cluster) to break the CO bond. CO adsorption and dissociation on 55-atom metallic clusters is under study. The main idea of this work is to apply the same predictor which worked well on 13 atoms pure cluster, on 55-atom metallic clusters. Thus, this work presents a mechanism to quickly explore the natural potential of a catalyst material to break the CO bond. The predictor presented here can guide the synthesis of new catalysts, involving modifications of known and currently used catalysts for the Fischer-Tropsch process.

Johnston, W., S. Eklund, and W. Dorsey. GSU. **Chronological observation of molecular mechanisms and oxygen consumption in TIB73 hepatocytes.**—A fluorescent sensor in a transverse flow/stop measurement platform based on an oxygen sensitive fluorophore has been developed to determine real time changes in oxygen consumption rates for cell metabolic studies. Pentachlorophenol (PCP) is a halogenated hydrocarbon used in industrial applications and as a wood preservative. Research suggests it is toxic and carcinogenic to humans, but more research needs to be done to establish mechanisms of toxicity. PCP has been shown to have a biphasic effect on hepatocytes, exhibiting cytotoxic and mitogenic effects. Our recent observations of hepatocytes in a microphysiometer have shown PCP induces change in oxygen concentration levels. Typical toxicology studies observe exposure to toxins at 24-48 hours. Our observations have shown effects at less than eight hours. We hypothesize that short interval observation of DNA and proteins will corroborate oxygen sensor data and increase understanding of the mechanisms of cellular response to short term exposure to toxins.

Junk, T., K. Walker, N. Silar, and F. Fronczek. LTU. **Synthesis of organotellurium precursors for supramolecular frameworks.**—Recently, heterocyclic organotellurium compounds have found much attention because of their tendency to self-assemble to supramolecular frameworks ranging from molecular wires to ribbons and rings. In the past, this work centered around 1,3-telluradiazoles, but their sensitivity to hydrolysis has been a limiting factor. Our work focusses on the self-assembly of 1,3-tellurazoles, which are highly stable. Novel ways of preparation for these compounds are presented, which increase the range of substituents that can be introduced to modify the self-assembly process. An OREP plot of the novel compound 2-cyanomethyl-benzotellurazole reveals that this compound self-assembles to the first example of a 1,3-tellurazole based ribbon structure, due to Te-N coordination between the tellurazole rings as well as further coordination between the tellurium and nitrile moieties.

Michel, B., and J. Fotie. SLU. **Investigation of the ion-ion interaction between a long chain alkyl imidazolium ionic liquid and a charged cellulosic surface of a paper handsheet.**—A series of long chain alkyl imidazolium ionic liquids have been prepared and their ion-ion

interaction with a charged cellulosic surface of a paper handsheet evaluated. Here we discuss the first series of data collected so far.

Ordone, M., B. Warren, and S. Eklund. LTU. **Preparation of *in situ* regolith-based geopolymers for Martian structures.**—The purpose of this research is to examine the geopolymerization of Martian simulant, JSC MARS-1A. The geopolymerization of JSC MARS-1A requires an activator solution of NaOH and Na₂SiO₃. Adjusting the ratio of activator to simulant allows for geopolymers of different strengths to be developed, perhaps those capable of withstanding cosmic radiation and the fluctuating temperatures of Mars. Tests were carried out to measure the maximum compressive strength of the JSC MARS-1A geopolymers prepared under various temperatures and pressures. The geopolymers were also characterized using FTIR and Raman Spectroscopy. The finding of a specific preparation for the Martian geopolymers is key to constructing human-habitable structures on Mars while reducing the payload needed from Earth.

Pickett, K., A. Ivanisevic, and Y. Lvov. LTU. **Nanoconfined synthesis of gallium oxyhydroxide within halloysite clay nanotubes.**—The functionalization of semiconductor materials with high bandgaps and attaching functional organic molecules is sought after widely. Gallium oxyhydroxide is an inorganic material that possesses a high bandgap. The surface attachment of various molecules to the gallium oxyhydroxide can be used for many purposes such as biosensing and imaging. Halloysite is a clay mineral that is natural and aluminosilicate. This halloysite is rolled in tubes. The goal of this experiment was to synthesize these gallium oxyhydroxide nanostructures within these halloysite nanotubes. Due to the interior lumen of the halloysite as well as the exterior surface, we hope the gallium oxyhydroxide is synthesized within the nanotubes, and different semiconductor materials could be placed on the outside of the tubes. Results: the process of synthesis of gallium oxyhydroxide within the halloysite nanotubes appears to be successful and we have clear images of gallium nitrate that are “sticking out” of the halloysite nanotubes.

Schibler, C.L., K.H. Vizinat, T.E. Kramer, D. Barnes, and J. Fotie. SLU. **Screening of a library of small molecules as potential selective inhibitors of Plasmodium HGPRT.**—A library of compounds have been screened as potential selective inhibitors of Plasmodium HGPRT in comparison to the human form of the enzyme. The expression and purification of the human and Plasmodium HGPRT enzymes as well as the optimization and the standardization the HGPRT inhibition assays are discussed.

Shorter, S., and F. Ohene. GSU. **Optimization of bare fused-silica capillary with linear polyacrylamide to separate vitreous humor proteins by capillary electrophoresis.**—The vitreous humor is the largest structure of the eye and plays an integral role in vision. Genetic, environmental, as well as biological (aging) factors can aid in the degradation of the structure and thus lead to related diseases of the eye. In an investigation of the underlying pathogenesis of vitreous humor related diseases, it is essential to identify the proteins found in bovine vitreous humor. These proteins must first be separated and identified. This can be achieved by proteomics, the combination of high resolution protein separation techniques with mass spectrometry and modern sequence database mining tools. Identification of proteins in complex mixtures, such as the bovine vitreous humor, is dependent on a highly sensitive method, such as capillary electrophoresis. Electrophoresis is the movement of electrically charged particles or molecules by an electrical potential within a solution. Capillary electrophoresis provides efficient

and prompt separations. The purpose of this study is to optimize bare fused-silica capillary with linear polyacrylamide and utilize it to separate vitreous humor proteins.

Srivastava, R., M. Lee. ULL. **Ruthenium(II)-pyrazole complexes as potential anticancer compounds.**—The discovery of new metal-based antitumor drugs has been largely based on cell viability assays (IC50 values) and compounds that bind to DNA. The Pt (II) compounds currently the most widely used anticancer drugs. Today there is hardly any clinical regimen or combination of chemotherapy that does not contain either cisplatin or carboplatin. Cisplatin, is one of the three most widely utilized anticancer drugs in the world and has annual sales of approximately \$500 million. Despite the resounding success of cisplatin, the drug exhibits several side effects. This has led researchers to develop anticancer drugs utilizing other metals. We have recently developed several Ru (III) complexes with pyrazole for the same purpose. Pyrazole is a poor π electron acceptor and a better σ donor and hence acts as a hard donor site. Pyrazole moieties are known for their antimicrobial, anticancer, ACE inhibitory, antiviral and anti-inflammatory activities. The synthesis of some Ru(II) pyrazole complexes and possibly biological assay will be discussed.

Yin, H., and P. Arumugam. LTU. **Microfabrication and characterization of concentric nanodes for brain chemical sensing.**—Understanding the function of human brain is one of the most scientific challenges of 21st century. Recent studies show critical role of neurochemicals in various brain disorders. Developing advanced chemical microsensor technologies that can detect multiple neurochemicals, neurotoxins and local field potentials with high spatial-temporal resolution is urgently needed. Current microsensors foul quickly and lack sensitivity long-term in *in vivo* use. In this work, we design, micro fabricate and characterize a novel ring-shaped nanoelectrode μ nanode μ for brain chemical sensing. Gold nanodes micro fabricated onto silicon micropillars with varying thickness of passivation layers are characterized using SEM, cyclic voltammetry and electrochemical impedance spectroscopy techniques. We report the general electrochemical behavior of the nanodes in standard redox species and its advantages in dopamine and lead detection.

Computer Science Section

Alexander, A., and A. Silva. GSU. **Languages with multiple inheritance.**—The role of inheritance in any Object Oriented-Programming (OOP) language is simple; reuse code that is already written. The basic premise behind inheritance is that you start with one class, and then you create a new class based on the original class. That new class inherits all the data members and methods from the original base class. Multiple inheritance is a feature of some object-oriented computer programming languages in which an object or class can inherit characteristics and features from more than one parent object or parent class. It is distinct from single inheritance, where an object or class may only inherit from one particular object or class. In this report we present the implications of multiple inheritance, then, we consider what it means for an object to belong to multiple parent classes.

Gardner Jr., J., and Y. Reddy. GSU. **Techniques for secure data transfer.**—The Advanced Encryption Standard better known as the AES algorithm is a symmetric (uses the same key to

encrypt and decrypt) cryptographic technique used in most of today's classified and unclassified data transfers. The AES algorithm provides data transfers with layers of security through its mathematical complexity. Alongside this technique of encryption, the act of concealing data within different objects is now becoming an essential component in the art of secure data transfer. This method of hiding secret messages within a file type is known as Steganography. The current goal is to be able to embed an encrypted message within a media object successfully.

Hill, D., and Y.B. Reddy. GSU. **Deep learning image analysis using Caffe.**—In the current research, we used a deep learning neural network model (convolutional neural networks) to learn and recognize the objects from a given set of objects of various quality. Single high quality satellite image recognition directly is significantly more expensive. Therefore, our goal was to apply the model in a constellation of cheaper satellites instead of a single high-quality satellite. In this project we designed convolutional neural networks using NVIDIA CUDA tools with Caffe package (downloaded from Berkeley site) to complete our experiment successfully. The research was conducted using Berkeley Caffe framework installed on an HP ZBook workstation with Linux Ubuntu 16.04 LTS installed. It had a quad core Intel i7 CPU, NVIDIA Quadro GPU, and 16GB of ram. The proposed convolutional neural network model was successfully trained with the train image dataset. Once the model was trained, we used the test images to recognize the object successfully.

Kundarapu, S., and M. Salam. SU-BR. **Enhancement of SUBR alert system.**—Alert systems are an integral part of many organizations to alert its employees. Many educational institutions have adopted various types of alert systems. The existing alert system framework of SUBR (Southern University – Baton Rouge) notifies all the activities to students mainly through school emails, which is time consuming and most of the time students do not get any notification immediately. Hence the information may get delayed in reaching everyone. In our proposed framework, students will get all the alerts and notices from the school and faculty individual. In case of natural calamities like floods, and so on, warning to students will be sent from administrator office through application specifically. Faculty and staff members will be able to upload any notices for a specific semester. The proposed alert system can also be customized and used by other educational institutes or schools to send alerts to its members effortlessly.

Meruva, V., and M. Salam. SU-BR. **Characterization of cyber-attacks and its counter-measure.**—The research on cyber security is growing rapidly and various types of cyber-attacks are taking place almost every day. This is awakening cyber users to get more aware of the importance of the network security. Protecting computer and network security are critical issues. Cyber security is one of the most important components of information security because it is responsible for securing all the information passed through a network computer. There are different types of cyber-attacks. In this research, we are analyzing and quantifying the network security elements such as confidentiality, integrity, and availability, and classifying the network security attacks for various network applications. The main focus of this paper is to characterize various types of cyber-attacks and their countermeasures on different cyber application platforms.

Mireille, M.C., O. Ekanoye, T. Olokunde, and F. Ayeni. SU-BR. **Trends in electronic medical record; a case study of Germany.**—Health information technology plays an important role in increasing patient safety by virtue of the information contained in the electronic health record

(EHR) also known as Electronic Medical Record (EMR) and the features (error-checking, notifications, etc.) are used to ensure high quality care. Due to the threat of patient data breaches, the widespread use of telemedicine technologies and mobile health devices, and updates to health IT-related programs, health care providers in Germany that adopt the Electronic Medical Records regularly replace or upgrade their systems. In this study we look at the trends in Electronic Medical Recording in Germany.

Mungwe, R.E.M. SU-BR. **Legal and privacy issues with cloud computing in small and medium sized enterprises.**—As a result of insufficient resources to manage a costly and complex internal information technology infrastructure (local storage computing), cloud computing emerged providing potential benefits to small and medium size enterprises such as rapid access to flexible and low cost IT resources, enabling payment as per consumption and facilitating productivity for accounting services, for communication customer services and support. It provides simple ways to access servers, database and a broad set of application over the internet. Every cloud (public, private, hybrid and community cloud) provides services such as infrastructure as a service, platform as a service and software as a service

Salam, M. SU-BR. **Analysis of attacks on cyber physical systems.**—In this information age, through the use of Internet and World Wide Web, we are connected to millions of devices and sharing together huge amounts of data. It is very crucial that these data are trustworthy, reliable, and safe from unwanted users. There are many possible attacks on cyber physical systems (CPS). These attacks may take down any of the following network components: operating system, routers, network links, domain name system, applications, and protocols. These attacks use many types of techniques to degrade the network performance. It is necessary to understand the nature of the attack and take objective and precise measure to overcome it. In this proposed work, we are analyzing various metrics such as network delay, throughput, and packet loss to measure the security standards of the existing algorithms. We plan to represent the features of the existing solutions and thereby improve the CPS performance.

Triplett, J., V. Sok, and L. Grimes. GSU. **Regional-based memory management programming languages concepts.**—Within the realm of computer science, this particular type of memory management states that each designated object is assigned to a region. A region is a collection of selected objects that can be properly unselected collectively. Three core characteristics of this particular management: explicit regions, region inference, and garbage collection. These components play into managing the life span and memory allocation of objects.

Alexander, A.T., A. Silva, and P. Sreekumari. GSU. **An efficient mobile application for reopening small businesses after a disaster.**—Natural disasters such as floods, earthquakes and hurricane are getting more frequent and becoming serious threats to businesses of all sizes in a big way. However, new research results shown that small businesses are particularly vulnerable to losses caused by those catastrophic events. One of the largest reasons for this vulnerability is that small business owners often fail to take the necessary preparation and planning steps. According to the Federal Emergency Management Agency (FEMA), over 35% of small businesses never reopen their doors after a disaster due to lack of proper disaster recovery plans. We designed and developed an efficient mobile application for reopening small businesses after a disaster. Our application is a point of sale system that keeps track of in-house inventory as well other vital information and stores it on a cloud. The application also serves as an avenue for all

types of information about disaster preparedness and awareness. In the event of disaster employers can make uses of the application's different functionalities in order to reach both their customers and employees.

Earth Science Section

Manning, F., and S. Tewari. LTU. **Delineating corrosion zones for metal pipes using U.S. Natural Resources Conservation Service soil data.**—Transportation agencies often allow metal pipes as an option for cross drains under/along roads and highways. Metal culverts can corrode over time at various rates based on their environmental conditions (e.g. corrosive nature of coastal soils, high water table and saltwater intrusion). This paper focuses on identifying corrosion zones in coastal regions in an effort to help project managers and field engineers in pipe material selection for a long service life. Transportation agencies collect soil data from their project sites. This data along with web soil survey data provided by Natural Resources Conservation Service are used to create various corrosion zones for different types of metal pipes. The role of soil characteristics (e.g. pH, conductivity and salinity) in creating corrosion causing conditions is taken in to account in identifying these zones. These user friendly GIS maps can be made available online for easy access.

Yrle, F., B. Ramachandran, D. Drennan, G. LaFleur. NSU. Kemberling, A. USM. **Comparison of maximum likelihood and object-based image classification techniques using small unmanned aerial system imagery at Trinity Island, Louisiana.**—We are exploring the potential of small unmanned aerial systems to characterize the vegetation found at Trinity Island in Terrebonne Parish, Louisiana. Stacked visible and near-infrared orthomosaics with spatial resolutions of 4 cm from fall 2015 and winter 2016 were used to classify *A. germinans*. A photo-derived digital surface model provided elevation information as well. A maximum likelihood classification of *A. germinans* based on the imagery's spectral data resulted in a user accuracy of (95%, 87%), overall accuracy of (81%, 85%), and an overall Kappa statistic of (0.71, 0.77) for fall 2015 and winter 2016, respectively. An object-based classification of *A. germinans* from the same datasets produced a user's accuracy and overall classification accuracy of 96% and a Kappa statistic of 0.91. Based on our preliminary results, object-based classification of high spatial resolution imagery is a feasible solution for classifying target species such as *A. germinans*.

Materials Science and Engineering Section

Ahmed, M.A., and S. Tewari. LTU. **Performance of carbon based electrodes after acetone and nitric acid pretreatment in capacitive deionization.**—Capacitive deionization (CDI) is an emerging technology for energy efficient ion removal through electrosorptive process. CDI offers the advantage of less footprint as there is no additional chemical required. Carbon based electrodes are widely used as electrodes in CDI because of good conductive nature and inertness.

Besides, porous structure of many carbon-based materials offers high surface area which results in higher removal of ions. Surface modification is another technique used by researchers to enhance the electrochemical capacity of the carbon-based electrodes. Many metal oxides, polymers and other reagents are successfully used to enhance removal efficiency of the electrodes. In this study, two carbon based electrodes carbon aerogel and a commercially available cheap carbon block are used as electrodes in CDI application. These electrodes are used in unmodified condition and also after treatment with acetone and nitric acid or both. The results indicate higher removal capacity of electrodes after treatment.

Bamba, C. SU-BR. Accurate electronic transport properties of wurtzite beryllium oxide.—We present an ab-initio, self-consistent density functional theory (DFT) description of electronic and related properties of wurtzite beryllium oxide (w-BeO). We used a local density approximation potential (LDA) and the linear combination of atomic orbitals (LCAO) formalism. Our implementation of the Bagayoko, Zhao, and Williams (BZW) method, as enhanced by Ekuma and Franklin (BZW-EF), ensures the full physical content of the results of our local density approximation (LDA) calculations, as per the derivation of DFT [AIP advances, 4, 127104 (2014)]. We report the band gap, the total and partial densities of states, and effective masses. Our calculated band gap of 10.29 eV, using an experimental lattice constant of $a = 2.6979 \text{ \AA}$ and $c = 4.3772 \text{ \AA}$, at room temperature, agrees with some experimental ones of 10.3 eV and not with others (7.8 eV, 8.8 eV, 9.6 eV, 10.45 eV, and 10.6 eV).

Baxter, C. LTU. Catalytic ethanolysis of lignin over zeolites of various porosity and acidity.—Lignin has been a high-volume byproduct of the paper and pulp industry and the emerging biomass conversion processes. Its depolymerization under supercritical ethanol conditions has been investigated to produce phenol-type, high-valuable feedstocks. Considering the superior performance of zeolites with hierarchical porous structure in heavy hydrocarbon cracking, we report their use in lignin depolymerization. We looked into the importance of their acidity and mesoporosity different zeolite types. Special focus is made on the yield and selectivity on the high-value chemicals aromatics. Our results show that zeolites could help deeply break lignin into desired high-valued aromatics. Hydrogenation of model aromatics derivated from lignin on a noble metal (platinum) supported catalyst was also studied on the conversion and selectivity for mesoporous zeolites. Improvements were also showed when compared to their microporous counterparts and common Al_2O_3 catalyst support with weak acidity.

Darrat, Y. LTU. Formation of metal clusters in halloysite clay nanotubes.—We developed ceramic core-shell materials based on abundant halloysite clay nanotubes with enhanced heavy metal ion loading through Schiff base binding. These clay tubes are formed by rolling aluminosilicate sheets and have a diameter of ca. 50 nm, a lumen of 15 nm and length $\sim 1 \mu\text{m}$. This allowed for synthesis of metal nanoparticles at the selected position: 1) seeding 3-5 nm metal particles on the outer surface of the tubes, 2) inside the tube's central lumen resulting in 10-12 nm diameter metal cores shelled with a ceramic wall, and 3) smaller metal nanoparticles intercalated in the tube's wall allowing up to 9 wt. % of Ru, and Ag loading. These composite materials have high surface area providing a good support for catalytic nanoparticles, and can also be used for sorption of metal ions from aqueous solutions.

Farrar, K., H. Green, and B. Hollins. LTU. **Optimizing the fabrication of paper based microfluidics with 3D printing and PDMS stamps.**—Microfluidic paper-based analytical devices (micro-PADs) are a growing class of low-cost chemo/biosensing technology designed for point of care applications. In this paper, we present an optimization procedure for the fabrication of micro-PADs using 3D printing and PDMS stamps. The optimization sought to eliminate wax pooling/build up present on the micro-PADS during the fabrication process by determining the minimum size of device and channel width, the force at which the stamp is applied to the cellulose paper, and depth of the flow channel. This novel method for paper patterning does not require any specialized equipment, is inexpensive and rapid, and thus holds great potential to find wide applications especially in resource limited environments.

Gaudin, J., A. Heimbuck, and M. Caldorera-Moore. LTU. **Effect of chitosan molecular weight on hydrogel properties.**—Current diabetic foot ulcer treatment (DFU) is not specifically tailored for a patient's needs. The objective for this project was to investigate the effect of varying chitosan molecular weights on hydrogel behavior to develop a hydrogel tailored for DFU. Hydrogels were synthesized using two different chitosan molecular weights (MW); 15kDa (LC) and 50-190 kDa (HC), and 2-wt% genipin using thermal polymerization. The hydrogels were exposed to phosphate buffered saline (PBS) at pH 8.5 to simulate a wound environment over eight weeks. The water absorption and degradation results show a mass loss of 27% and 29% for HC and LC hydrogels, respectively over 56 days with swelling of approximately 3.7 times the initial weight within 1 h of immersion for both formulations. Although there are slight variations in molecular weight, no significant difference ($p \geq 0.05$) in absorption and degradation were observed between hydrogels made from high and low chitosan MW.

Hegab, R., M. Caldorera-Moore. LTU. C. Kevil. LSU-S. **Environmentally responsive hydrogels for oral delivery of vasodilator drugs.**—As heart disease remains the leading cause of death in the United States, the need for therapeutic drugs for improving cardiovascular health becomes prevailing. The usage of hydrogen sulfide and nitrite therapy regulates numerous physiological processes, providing numerous cardiovascular health benefits. Yet, these therapeutic agents have substantial limitations including poor oral bioavailability. Therefore, novel strategies to create nanocarrier systems that will enable sustained oral bioavailability of these compounds will make them realistic drug agents for further development. The objective of this research emphasizes an innovative approach for delivery of vasodilator drugs orally using designer hydrogel carrier systems for the treatment of cardiovascular and chronic inflammatory diseases. In order to optimize these novel carrier systems for oral delivery, our research focuses on characterization of the pore size. Specifically, we explored whether the calculated pore size of the networks correlated with the actual pore sizes of the network.

Heimbuck, A. LTU. J. Alexander. LSUHSC-S. ***In vitro* evaluation of chitosan-genipin hydrogels.**—The objective of this research was to evaluate the *in vitro* behavior of multifunctional chitosan-genipin hydrogels developed to promote diabetic foot ulcer (DFU) recovery. Biocompatibility, evaluated using MTT cell viability assay with 24 h and 48 h hydrogel exposure to human foreskin fibroblasts (HFFs) and immortalized human keratinocytes (K), showed that all hydrogel formulations had lower cell metabolic activity compared to controls. Hydrogels incubated cell conditioned media at 37 °C showed 150% swelling attained within 2 hours and maintained for a month while control films showed 120% swelling with signs of film degradation within the same time frame ($n=3$) without any change in media pH. These

results demonstrate that the developed hydrogels are capable of maintaining the fluid absorption property in cellular environment without altering the pH of healthy cells. Future work will explore the hydrogel behavior when exposed DFU wound exudate.

Henderson, D., and N. Seetala. GSU. A. Ulrich and C. Wilson LTU. **Magnetic properties of aqueous plasma synthesized FeCu micro-particles.**—Aqueous plasma techniques were used to synthesize FeCu micro-particles for the use as precursor particles for 3D printing to make miniature transformers. The magnetic properties of FeCu with five different compositions (1:0, 4:1, 1:1, 1:4, and 0:1) were studied using VSM. The particle size and elemental composition were studied using SEM and EDX analysis, which are used to estimate magnetization values. The average particle size is around 0.5 μm and composition showed almost all Cu was oxidized and some Fe is oxidized during aqueous plasma process. Magnetization and coercivity, both, increased with Fe content as expected. Using the composition and particle size, we estimated the magnetization values, which are much higher than the experimental values for all compositions. The difference could be explained by superparamagnetic nature at sub-micron/nano-size particles or the magnetic coupling between Fe and Fe_2O_3 magnetic moments within a particle. *Work is supported by NSF-CIMM grant.

Ismael, T., B. Beach, P. Derosa. LTU. **Effect of molecule–tip distance on the conductivity of thiophene-functionalized cobalt-bisdicarbollide cages.**—Polythiophenes and metalla (bisdicarbollide) carboranes are known to be conductive with high chemical and thermal stability. Metalla (bisdicarbollide) carboranes shows interesting electrical properties due to its 3-D resonant structure and has been shown to improve conductivity in thiophene chains. In this work the midpoint of the molecular wire is occupied by a cobalt-bisdicarbollide sandwich, with each carborane cage functionalized by a single thiophene which is allowed to make contact with an Au electrode. The occupied molecular orbitals near the Fermi level are found to determine the low bias transport characteristics of the molecule. It is observed that conductivity initially increases when molecule-tip distance increases from the equilibrium distance of 1.9 \AA and decreasing thereafter. The increase in conductivity is attributed to the shift of the conductive orbital towards the Fermi level as its population decreases. This could lead to applications in molecular electronics.

Islam, M.M., and S. Zivanovic. LTU. J. Gojanovic. UB. **Operating temperature influence on P3HT:ICBA solar cells performance.**—Due to intense research for finding alternate to fossil fuel energy, clean sources of energy like polymer solar cells (PSCs) have drawn a lot of attraction over the years. However, the power conversion efficiency of PSCs is much lower than inorganic counterparts. In order to improve the efficiency of polymer–fullerene poly (3-hexylthiophene): indene-C60 bisadduct (P3HT:ICBA) bulk heterojunction PSCs, we investigated them under different temperatures, from 10 $^{\circ}\text{C}$ to 50 $^{\circ}\text{C}$. We fabricated them in cleanroom with standard air process. The interesting fact we discovered is that they perform better around 20 $^{\circ}\text{C}$, rather than any other temperature. Both the short circuit current density and the open circuit voltage have a tendency to increase from 10 $^{\circ}\text{C}$ to 20 $^{\circ}\text{C}$, and decrease with the increase of the temperature afterwards.

Kharashi, K. LTU. **NO_x sensors utilizing alternative composite electrolytes.**—Fully-stabilized yttria-doped zirconia (FSZ) is commonly used as the electrolyte for automotive NO_x exhaust gas sensors, due to the chemical stability, temperature tolerance, and high ionic conductivity of the

material despite exposure to stringent exhaust gas conditions. Recent porous electrolyte NO_x sensor studies found that adding up to 2 wt% Al₂O₃ to the PSZ electrolyte increased the sensitivity of the sensor to NO_x, and further increased mechanical durability. In other NO_x sensor works, PSZ-FSZ composite electrolytes were studied as PSZ provided mechanical strength and FSZ enhanced the NO_x sensing response of the sensor. This study also found the PSZ-FSZ based sensors demonstrated less cross-sensitivity to water, which typically interferes with the sensing response when present in the exhaust gas. Given the beneficial properties of PSZ, FSZ and Al₂O₃, the present work explored the potential of a PSZ-FSZ-Al₂O₃ composite electrolyte for NO_x sensing fabricated based on standard ceramic power processing methods.

Kuo, G. LTU. Naphthalene hydrogenation by new Pt loaded hierarchical ZSM-5 zeolites.—Deep hydrogenation of aromatics is one important process in oil-refinery and coal liquefaction industries. Studies found that when supported on zeolites, noble metal catalyst exhibited good catalytic activity. However, the sole microporosity of these zeolites often makes these reactions less effective when bulky aromatic hydrocarbons such as naphthalene in light cycle oil or coal tar are involved due to the significant mass transfer limitation. Here, we report a new Pt based catalyst supported on a new mesoporous ZSM-5 zeolites. The naphthalene hydrogenation performance of this new catalyst was investigated in a batch reactor at 200 °C and 7.5 MPa. Both naphthalene conversion and selectivity of main compounds of partially hydrogenated tetralin and fully saturated decalin were evaluated. Results showed that remarkably higher catalytic activity and selectivity were found than their conventional counterparts. This may bring great profit to the fuel business for high CN fuel and fuel with superior thermal stability.

Morgan, B. GSU. B. Trewyn and M. Davidson. CSM. Synthesis and characterization of multifunctional, compartmentalized magnetic mesoporous silica nanomaterials (magnet-MSN) with temperature sensitive polymer and heterogeneous catalysis.—Mesoporous silica with its high surface area, adjustable pore size, and hydrothermal stability, has applications ranging across drug delivery, catalysis, separation, sensors, and selective absorption. Previous research by Zhu et al. shows that poly(N-isopropylacrylamide), “PNiPAm”-functionalized mesoporous silica exhibit temperature dependent controlled release of tracer. Based on their work, one can assume that mesoporous silica would be the perfect candidate for recovery and delivery of the industrially relevant and hard-to-recover monomer precursor, succinic acid. A succession of various (PNiPAm)-functionalized mobile composition-of-matter-#41 (MCM-41) materials were synthesized and characterized using FTIR-ATR Spectroscopy, Thermal Gravimetric Analysis, Transmission Electron Microscopy, and Nitrogen Sorption Analysis. At least 35% wt. of the PNiPAm-polymer was attached to the MCM-41 surfaces based on the results from the TGA Analysis. The loading of succinic acid was attempted but at this moment, the loading could not be completed. Further investigation will be carried out by Dr. Brian Trewyn and his students.

Pal, N., and E. Murray. LTU. A comparative study on dense Au and Au-Pt sensing electrodes for impedancemetric NO_x sensors.—Advancement in diesel engine technology is resulting in lower NO_x emissions, which drives the need for NO_x sensors capable of monitoring lower concentrations of NO and NO₂ gases in order to regulate engine operation. Studies show dense Au electrodes are highly sensitive to NO_x. However, the manufacturing feasibility of Au is limited due to the low melting temperature of Au. Incorporating Pt with Au is expected to enable fabrication of a sensing electrode that is more compatible with high temperature firing process

used for other sensor components. The aim of this study was to characterize the electrochemical response of sensing behavior of Au and Au-Pt sensing electrodes at porous electrolyte based NO_x sensors using the impedancemetric method. Microstructural properties, electrode/electrolyte interfacial reactions and rate limiting mechanisms are discussed with respect to the NO_x sensing behavior of Au-Pt electrodes.

Parajuli, J., and D. Mainardi. LTU. **Minima hopping/molecular dynamics study of solidification of Ti-Al alloys for 3D metal printing.**—3D metal printing is widely researched as a cheaper and efficient alternative for current prototyping methods. Finding the global minimum serves as an initial step towards studying the solidification process of metal alloys. In the liquid phase (non-periodic), the global minimum determines the geometric ground state configuration of atoms comprising the system, while for a periodic system it gives the crystalline ground state structure of the solid. Two different titanium and aluminum alloy compositions (Ti360Al640 and Ti458Al542) are simulated in this study. Minima hopping method is used to obtain the global minimum structure. Zope-Mishin interatomic potential using the Embedded Atom Method calculator is explored to study forces and energy. Qualitatively, metal segregation can be observed as time evolves dictating the structural and mechanical properties the final printed product will have.

Phelan, K., B. Hollins. LTU. **Using polymer bulk diffusion as a mechanism for advancing tissue engineering applications.**—Advances in biopolymers have long been sought to advance fields of biomedical engineering, with particular focus in biomicrofluidics. We recently demonstrated that PDMS, a commonly used polymer in biological applications, can be used to intentionally leach molecules into a sample. In this work, we characterize the diffusion of fluorescein into water from the bulk PDMS, with a focus on calculating the diffusion rate of molecules from the polymer bulk into its surrounding aqueous environment. We look at diffusion from the bulk over a period of days in an attempt to formulate a fluorescein diffusion model from PDMS. We establish a framework with fluorescein for determining the properties of molecules capable of diffusion from bulk PDMS. This strategy can be used as a tool for creating self-regulating microfluidic chambers.

Prevo, C., and N. Seetala. GSU. **Effect of hydrogenation on ZrB₂+20vol%SiC nano-powder composites.**—Ultra-high temperature ceramics such as ZrB₂+SiC are useful for structural materials for applications in leading edge of hypersonic vehicles. Uniform distribution of SiC with high densification, low grain growth, and low porosity are important to minimize surface oxidation at high temperatures to propagate to the bulk material. The spark plasma sintered (SPS) nano-powder composites showed smaller grains and minimal segregation of SiC compared to coarse-powder composites, but with higher oxidation of ZrB₂ during SPS in nano-composites. To minimize the oxidation problem during SPS, a set of ZrB₂+20vol%SiC nano-powders was hydrogenated using dry hydrogen flow at 400°C for about 8 hr to minimize absorbed moisture from the nanoparticle surfaces. XRD peaks showed no ZrO₂ peaks in the hydrogenated powders or in their SPS consolidated composites. The material strength results obtained using four point beam bend tests showed Flexure Strength of 296 MPa for non-hydrogenated composite and 415 MPa for hydrogenated composite. The micro-hardness showed lower value for hydrogenated composite compared to non-hydrogenated composite, which may be due to lower sintering temperature used for SPS consolidation of hydrogenated powder. Work supported by Air Force Grant.

Robinson, A., P. Derosa, and R. Ramachandran. LTU. **Computational studies on oxidation of iron-chromium alloys.**—Iron-chromium alloys exhibit exceptional scientific properties including magnetism and crystallographic characteristics. In an industrial sense, iron-chromium alloys possess impressive properties including strong resistance to both swelling and high temperature corrosion and low ductile to brittle transition temperatures. These notable properties make iron-chromium alloys ideal for steel manufacturing, and this alloy is often used as a basic ingredient. Iron-chromium alloys have been deemed exceptional models for testing many theories. In this work, computational analysis is used to study the structural and electronic properties of surface oxidation of iron-chromium clusters. Molecular interactions are examined to understand the mechanism of oxidation on the surface of iron-chromium alloys. These analyses provide insight on the growth mechanisms and composition of surface oxide films.

Simpson, A., C. Prevo, and N. Seetala. GSU. **Comparison between Vickers and Knoop micro-hardness of ultra-high temperature ceramics.**—Ultra-high temperature ceramics, ZrB_2+SiC and HfB_2+SiC , were prepared using spark plasma sintering of micron- and nano-powders. Polished surfaces were studied for micro-hardness using Vickers (500 gf and 1000 gf loads) and Knoop (1000 gf load) micro indenters. The average area of indentation is about 250 sq. μm for 500 gf load, and approximately 700 sq. μm for the 1000 gf load. The micro-hardness values are more scattered in the smaller load, so 1000 gf is selected for comparison between Knoop and Vickers hardness. The area covered by Knoop approximately 850 sq. μm , but there is more scattering in hardness values than when using Vickers 500 gf or 1000 gf. This may be due to the uneven pressure applied on the grains, as Knoop indenter is very narrow. This is supported by extended damage from Knoop indentations observed in SEM. Vickers hardness test with higher load proves to be the better option. *Work is supported by Air Force grant.

Sonsalla, T., and S. Zivanovic. LTU. **Effects of HCl etching on ITO coated glass substrates for amorphous silicon solar cell applications.**—Transparent conductive oxides (TCO) are used as transparent conductive electrodes for solar cells. TCO can have an irregular and rough surface morphology. This surface morphology can traverse the thin p-i-n junction of amorphous silicon solar cells. In this study, indium tin oxide (ITO) coated glass substrates were etched in a diluted hydrochloric acid solution to determine if wet chemical etching could create a smoother surface morphology and enhance solar cell performance. Three types of ITO substrates were investigated in this study. HCl etching time was varied from 10 to 40 minutes. Sheet resistance measurements and atomic force microscope (AFM) images of the surface were taken before and after etching. It was found that sheet resistance increased after etching for any amount of time. The surface morphology of the substrates was determined from AFM images. A 3M HCl solution produced a smoother and more uniform surface after 10 minutes of etching.

Sun, S., R. Ramachandran, and C. Wick. LTU. **Development of new interatomic potentials for metals and binary alloys for large scale simulations of solid-liquid interactions.**—Selective laser melting (SLM) 3D printing is an additive manufacturing process that uses a high-powered laser to fuse metal/alloy powders to form complex shapes. Ti-Al and Ni-Al alloys have been widely used in this technology. Improving the SLM-3D process requires an atomistic level understanding of the feed stock behavior. Large scale computational modeling of the powders requires accurate descriptions of the interaction between atoms in the metal/alloy. We have developed new interatomic potentials for Ti, Ni, and TiAl alloy based on the modified embedded-atom method (MEAM) model for studying solid-liquid interfaces. The new MEAM

potentials reproduce the melting points and surface tension of the liquid phases, while also reproducing the properties of solid phases. The current work is focusing on improving the prediction of melting point and surface tension of Ni-Al systems.

Villermin, L., P. Nehal, A. Moore, and M. Caldorera-Moore. LTU. **Development of high surface area patterned hydrogel microfibers.**—Due to high biocompatibility, tailorability, and environmental responsiveness, hydrogels play an important role in the development of intelligent drug delivery systems and biomimetic scaffolds for cellular biomanufacturing and tissue engineering applications. Manipulation of hydrogels' chemical and physical/spatial configurations allows for controlled release of therapeutics encapsulated within the network as well as the development of biomimetic cell scaffolds. By increasing the surface area of a hydrogel scaffold with a dense array of hydrogel fibers, an environment not unlike the extracellular matrix can be simulated. Here we describe the development of a method for creating hydrogel microfibers for the formation of a high-aspect-ratio hydrogel scaffold. A hydrogel patterned with microfeatures increases the surface-area-to-volume ratio, thus allowing for real-time swelling and subsequent release of encapsulated agents. The increased area will also aid intelligent hydrogels in sensing and responding to stimuli.

Vinnakota, R., and D. Genov. LTU. **Thermo-optical modelling of laser matter interactions in selective laser melting processes.**—Selective laser melting (SLM) is one of the promising advanced manufacturing techniques, which is providing an ideal platform to manufacture components with zero geometric constraints. Coupling the electromagnetic and thermodynamic processes involved in the SLM, and developing the comprehensive theoretical model of the same is of great importance since it can provide significant improvements in the printing processes by revealing the optimal parametric space related to applied laser power, scan velocity, powder material, layer thickness and porosity. Here, we present a self-consistent Thermo-optical model, which simultaneously solves the Maxwell's and the heat transfer equations and provides an insight into the electromagnetic energy released in the powder-beds and the concurrent thermodynamics of the particles temperature rise and onset of melting. The numerical calculations are compared with developed analytical model of the SLM process providing insight into the dynamics between laser facilitated Joule heating and radiation mitigated rise in temperature. These results provide guidelines toward improved energy efficiency and optimization of the SLM process scan rates.

Mathematics and Statistics Section

Dembele, B. GSU. A.A. Yakubu. HU. **Controlling imported malaria cases in the United States.**—We extend the mathematical malaria epidemic model framework of Dembele et al. and use it to capture the 2013 Centers for Disease Control and Prevention (CDC) reported data on the 2011 number of imported malaria cases in the USA. Furthermore, we use our fitted malaria models for the top 20 countries of malaria acquisition by USA residents to study the impact of protecting USA residents from malaria infection when they travel to malaria endemic areas, the impact of protecting residents of malaria endemic regions from mosquito bites and the impact of killing mosquitoes in those endemic areas on the CDC number of imported malaria cases in

USA. To significantly reduce the number of imported malaria cases in USA, for each of the top 20 countries of malaria acquisition by USA travelers, we compute the optimal proportion of USA international travelers that must be protected against malaria infection and the optimal proportion of mosquitoes that must be killed.

Doucette, R. MSU. **A discrete approach to a classic problem from calculus.**—We revisit a classic calculus problem involving the area of a region between a circle and the involute of the circle. The problem is often stated in terms of the area the region that a cow can reach if it is tethered to the side of a circular silo. A new solution is presented which is in some ways simpler than the solutions typically presented in the standard calculus textbooks.

Hou, S., and S. Zhang. LTU. **An accurate direct imaging method.**—We present an accurate direct imaging method for inverse scattering problems. The computational cost is lower than iterative imaging methods that require solving the forward problem in each iteration.

Physics Section

Alsaleh, M., and D. Genov. LTU. **Diamagnetic response for parallel slabs metamaterials at THz frequency.**—Metamaterials are nanocomposite materials i.e. metal- dielectric resonators in the form of split ring resonators, parallel wires or slabs. These materials show unique optical responses such as strong magnetism at high frequency range. Decreasing the size of resonators is a crucial step toward increasing the magnetic resonance frequency (MRF), however, this scaling breaks down at high frequencies. In this work, we present a transmission line theory to model the diamagnetic response for pair of metallic nanostripes separated by a dielectric material. The predicted by the model magnetic susceptibility and MRF are compared to exact numerical simulations showing excellent agreement. Parametric study of the MRF dependence on the resonator's sizes shows a clear saturation for small resonators. This is explained by the fact that at high frequencies, within the infrared and optical range, the metal strips behave as capacitive elements, which precludes the excitation of magnetic resonances for frequencies higher than the surface plasma frequency of the system.

Banjara, D., D. Bagayoko, L. Franklin, Y. Malozovsky, and A. Mbolle. SU-BR. **First-principle studies of electronic, transport and bulk properties of pyrite FeS₂.**—We present results of ab-initio, self-consistent density functional theory (DFT) calculations of electronic, transport, and bulk properties of pyrite FeS₂. We employed a local density approximation (LDA) potential and the linear combination of atomic orbitals (LCAO) formalism, following the Bagayoko, Zhao and Williams (BZW) method, as enhanced by Ekuma and Franklin (BZW-EF). The BZW-EF method requires successive, self-consistent calculations with increasing basis sets to reach the ground state of the system under study. We report the band structure, the band gap, total and partial densities of states, effective masses, and the bulk modulus.

Chen, Y., D.B. Pathak, R. Beminiwattha, and N. Simicevic. LTU. **The properties of shielding of pion detection system with high energy electrons.**—There is a plan at Jefferson Lab to perform a MOLLER experiment to measure the weak charge of the electron using highly precise measurement of the parity violating asymmetry in electron-electron scattering (Moller

scattering). The experiment will be sensitive to subtle but measurable deviations from precisely calculable predictions from the Standard Model. There will be about 0.1% pion and other hadron contamination at the main detection system. In order to provide hadron dilution and PV asymmetry, a pion detection system will be located behind the main detectors. In this research we studied the physical consequences and properties of the shielding of the pion detector under high energy electrons in the energy range from 1.8 GeV to 8.8 GeV with 20 cm thick lead shielding. We computed the energy distribution and the effects of secondary particles with the simulations performed by FLUKA, a fully integrated Monte Carlo simulation package for the interaction and transport of particles and nuclei in matter. The results can help us to better understanding the shielding properties of electrons and other secondary particles.

Inakpenu, R., C. Bamba, L. Franklin, Y. Malozovsky, G.L. Zhao, and D. Bagayoko. SUAMC. I.H. Nwigboji. UTEP. **Ab-initio computations of electronic, transport, and structural properties of zinc blende beryllium selenide (ZB-BeSe).**—We report results from several ab-initio, self-consistent computations of electronic, transport and bulk properties of zinc blende beryllium selenide (Zb-BeSe). Our non-relativistic calculations utilized a local density approximation (LDA) potential and the linear combination of atomic orbitals (LCAO). The key distinction of our calculations from other DFT ones is our implementation of the Bagayoko, Zhao and Williams (BZW) method, as enhanced by Ekuma and Franklin (BZW-EF). Our calculated, indirect band gap is 5.46 eV, from Γ to a conduction band minimum between Γ and X, for a room temperature lattice constant of 5.152 Å. Available, room temperature experimental band gaps of 5.5 eV (direct) and 4.0 – 4.5 eV (unspecified) point to the need for additional measurements. Our calculated bulk modulus of 92.35 GPa is in excellent agreement with experiment (92.2 ± 1.8 GPa). Our predicted equilibrium lattice constant and band gap, at zero temperature, are 5.0438 Å and 5.4 eV, respectively. Work funded in part by the US Department of Energy (DOE), National Nuclear Security Administration (NNSA) (Award No.DE-NA0002630), the National Science Foundation (NSF) (Award No, 1503226), LaSPACE, and LONI-SUBR.

Malozovsky, Y., A. Goita, O. Kayode, L. Franklin, and D. Bagayoko. SUAMC. I. Nwigboji, B. Khamala. UTEP. W. Lynn. CC. J. Ziegler. CWRU. D. Polin. NYU. C. Ekuma. NRL-DC. **DFT predictions of electronic, transport, and bulk properties of cubic antiferite A_2B compounds (A=Li, Na, B=O,S,Se).**—We present results from ab-initio, self-consistent calculations of electronic, transport, and bulk properties of cubic antiferite (anti- CaF_2) compounds A_2B (A = Li, Na, B = O, S, Se). 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, our calculations search for and attained the ground states of the systems under study, as required by DFT; our results therefore possess the full, physical content of DFT. We discuss band structures, band gaps, and related properties of these materials, including calculated, total and partial densities of states (DOS and PDOS), effective masses of charge carriers, equilibrium lattice constants, and the bulk moduli of cubic antiferite compounds A_2B (A = Li, Na, B = O, S, Se). Our results are predictions in some cases, due to the lack of experimental data. Work funded in part by the US Department of Energy (DOE), National Nuclear Security Administration (NNSA) (Award No.DE-NA0002630), the National Science Foundation (NSF) (Award No, 1503226), LaSPACE, and LONI-SUBR.

Norwood, D., C. Fontenot, R. Allain, N. Lama, M. Koduri, and A. Wallace. SLU. **Stress-strain measurements of semi-aquatic snake lenses.**—It is of interest to understand the mechanism by which semi-aquatic snakes maintain visual acuity when moving from land to underwater. Toward that end, we are interested in the mechanical properties of snake lenses and how this might affect the ability of snakes to deform the lens and thus alter the lens power. In this presentation, we will present data taken with a force sensor and a rotary motion sensor to measure, in one shot, force versus displacement, from which we estimate mechanical properties of stress and strain of the eye lens of a water snake. We will compare the results from lenses freshly removed from snake to those that have been stored. More importantly, we will compare results from one species of semi-aquatic snakes to the other species of interest.

Pathak, D.B. LTU. **Effects of the shielding on pions detection in the Jefferson Lab Moller experiment's pion detector.**—The objective of the Moller experiment at Jefferson Lab is the ultra-precise measurement of the Weak Mixing Angle using the parity-violating asymmetry in the elastic scattering of longitudinally polarized electrons on unpolarized electrons, Møller scattering. A very important part of the experiment is to measure the experimental background, out of which a large part exists because of the created pions. A pion detector is designed to measure the properties of pion background for the Moller experiment. In this report, the shielding properties of the pion detector shield are studied for pions in an energy range from 1.8 GeV to 8.8 GeV. The Monte Carlo simulations were performed using FLUKA, a fully integrated particle physics Monte Carlo simulation package. The simulation is performed to study how negative pions (π^-) interact with the geometry of the detector and estimate the effects of the pion detector shielding on the pion detector and on the surrounding detectors. In this presentation the effects of the shielding on pion detector are calculated for the lead shielding of thickness of 20 cm.

Pathak, D.B., Y. Chen, R. Beminiwaththa, and N. Simicevic. LTU. **Effects of the shielding on pions detection in the Jefferson Lab Moller experiment's pion detector.**—The objective of the MOLLER experiment at Jefferson Lab is the ultra-precise measurement of the Weak Mixing Angle using parity-violating asymmetry in the elastic scattering of longitudinally polarized electrons on unpolarized electrons. An important part of the experiment is to measure the experimental background, out of which a large part exists because of the created pions. A pion detector is designed to measure the properties of pion background for the Moller experiment. In this report, the shielding properties of pion detector shield are studied for pions in an energy range from 1.8 GeV to 8.8 GeV. The Monte Carlo simulations were performed using FLUKA to study how negative pions interact with the detector and estimate the effects of the pion detector shielding on the pion detector and on the surrounding detectors. The effects of the shielding on pion detector are calculated for the lead shielding of thickness of 20 cm.

Saint-Jean, D., B. Routon, P. Derosa, L. Sawyer, N. Crews. LTU. **Simulation of a scintillating fiber hodoscope for MIP trajectory reconstruction.**—For decades, researchers have studied the damage to DNA by high-energy radiation. In order to study this damage in detail, damage determined by the analysis of the affected DNA has to be correlated with the properties of the radiation that caused the damage. This is particularly important in space conditions where radiation cannot be shielded and reaches astronauts from random directions. We simulated and developed a radiation detector using multi-clad plastic scintillating fibers to study the characteristics of radiation on a biological sample that is later tested for damage. The efficiency

of energy deposition on each layer of the detector has been simulated using the GEANT4 toolkit and tested experimentally. The direction of propagation of the ionizing radiation beam is then determined from the intensity of the output signal. Multiple arrangements have been simulated and the optimal arrangements for beam track reconstruction and device parameters are reported in this work.

Stroud, A., and P. Derosa. LTU. R. Berry and C. Muratore. UD. **Characterization of peptide/surface interactions for MoS₂, graphene, and silica.**—Surface-binding peptides are increasingly being used to functionalize inorganic interfaces for bio sensing and 3D-printed bio-engineered applications. In this study, classical molecular dynamics was used to identify the structural characteristics of peptide sequences that selectively mediate the binding of graphene and molybdenum disulfide (MoS₂) to glass. These three surfaces were exposed to two peptide sequences in aqueous solution. The binding ability of the polypeptides, HSSYWYAFNNKT (P1) and HLLQPTQNPFRN (HLL), toward each surface was compared by calculating binding enthalpies and tracking the positions of critical amino acid residues during the simulations to determine which residues bond to each surface. The relevance of this finding is that as the list of residues that are found to bind to silica is different from those that bind to MoS₂ or graphene, such polypeptides can simultaneously bind to both surfaces, acting as a mediator for the 3D printing of 2D materials on glass.

Sullivan, E., T. Tarlton, P. Derosa. LTU. **Calculation of the local electric field at the CNT-CNT junction in a nanocomposite.**—The use of composite materials with an insulating matrix and a conductive filler have seen intense study in recent years. The insertion of the conductive phase creates materials that can be useful for applications ranging from electromagnetic interference shielding to structural health monitoring. In modeling charge transport in nanocomposites, a work assumption made by these authors (as well others) is that the electric field in all CNT-CNT junctions is the same, an assumption that may not be correct. This study looks closely at the behavior of the local electric field within the composite upon applying a voltage bias in a 3D system using finite element analysis, paying particular attention to the electric field in the CNT-CNT junction, something that has so far been neglected in literature. Conduction in composites is controlled by the transport at those junctions and thus its characterization is required to understand the overall transport process.

Tarlton, T., E. Sullivan, and P. Derosa. LTU. **Positive impact of agglomeration in nanocomposite conductivity.**—CNTs are embedded in an insulating matrix to form composites to improve its mechanical, thermal and electrical properties. However, CNTs tend to clump together forming agglomerates and thus experimental studies on CNT composites normally describe significant effort in dispersing CNT for a more effective performance. Although the main concern is on the impact agglomeration has on mechanical strength, it is accepted that agglomeration will also negatively affect conductivity. In this work computer simulations are used to study this effect in detail. It is found that some level of agglomeration actually improves conductivity by a better use of the available volume. Agglomerates leave voids in the sample in favor of other areas where the CNT-CNT distance is smaller than it would be if their distribution were uniform thus improving conductivity. More uniform samples have more conduction paths, but CNT-CNT distance is in average larger leading to a lower mobility.

Vinnakota, R., and D. Genov. LTU. **Active control of charge density waves at degenerate semiconductor interfaces.**—We present numerical modeling of an active electronically controlled highly confined charge-density waves, i.e. surface plasmon polaritons (SPPs) at the metallurgic interfaces of degenerate semiconductor materials. An electro-optic switching element for fully-functional plasmonic circuits based on p-n junction semiconductor Surface Plasmon Polariton (SPP) waveguide is shown. Two figures of merits are introduced and parametric study has been performed identifying the device optimal operation range. The Indium Gallium Arsenide ($\text{In}_{0.53}\text{Ga}_{0.47}\text{As}$) is identified as the best semiconductor material for the device providing high optical confinement, reduced system size and fast operation. The electro-optic SPP switching element is shown to operate at signal modulation up to -24dB and switching rates surpassing 100GHz, thus potentially providing a new pathway toward bridging the gap between electronic and photonic devices.

Division of Science Education

Higher Education Section

Dees, W., C. Struchtemeyer, C. Hennigan, C. Ardizzone. MSU. J. Woolman. Innovation Strategies, L.L.C. **From Microbes to Mosquitoes: A one-year review of student engagement in biology.**—The Microbes to Mosquitoes (MtM) Project is an interdisciplinary, multi-institutional approach to student immersion in the biological sciences. This project provides undergraduate students the opportunity to: (1) participate in undergraduate research, (2) visit facilities supporting scientific operations, and (3) participate in scientific conferences. We recruited science majors, some of whom were potentially at risk of academic failure, changing majors or leaving their academic pursuits altogether. We also recruited student peer mentors who worked along-side the other students. We developed two field and laboratory projects emphasizing multidisciplinary science concepts. Twelve students participated in these projects. In addition, 18 students attended and/or participated in scientific conferences. Eight seminars were held throughout the year (2015-2016) with an average attendance of 53 students per seminar. This project provides freshmen and first-semester sophomores with opportunities to personally engage with and experience the world of science beyond the classroom.

Zenon, E. RPCC. **Louisiana STEM GCP & EQP.**—This session is on the Louisiana STEM Girls Collaborative Project (LASTEM GCP) and the Louisiana STEM Equity Pipeline (LaSTEM EQP). These two organizations are currently working to infuse equity into the STEM Education discussions and activities that are taking place across Louisiana. Dr. Esperanza Zenon currently serves as the Lead for both of these organizations. She will share information on past, present, and future efforts of both of these organizations.

Division of Sciences and Humanities

Dicharry, H., and J. Doucet. NSU. **Medical forensics of a 1940s sugar mill infirmary in southeast Louisiana.**—We report on a series of medical ledgers from the historic Montegut Sugar Mill, active 1885-1972, near Houma, Louisiana. The three ledger books were recovered from rubbish during deconstruction of mill buildings and donated to Archives and Special Collections at Nicholls State University for preservation. Information recorded in these ledgers consists of two years of patient visits, diagnoses, and treatments from what was apparently a medical infirmary provided by the company to its community of employees during the years 1946-1947. We assessed the diagnosis frequencies of infections and other medical issues, including application of contemporaneous drugs and other treatments. These ledgers provide insight on the state of medical practice and pharmacy during operation of a sugar mill in the mid-20th century. Analysis of this information provides a unique picture of Louisiana medicine during the pivotal, circa-WWII period of U.S. history, as well as of life in rural bayou sugar lands.

Doucet, J. NSU. **A night or two in neander--a second reading of science poetry.**—Early in the history of scientific journals, at least those written in English, poetry on contemporaneous subjects, such as “The Heroes of Industry” in the first volume of *Scientific American* (1859), appeared alongside columns of scientific content. As frequently, select stanzas of famous poems were not infrequently found as direct quotations within articles and reports in support of the scientific arguments therein. Poetry has also appeared in early issues of such venerable titles as *Nature*, the *New England Journal of Medicine*, and our Academy’s own *Proceedings*. In revival of the tradition, this presentation is the second installment of original poetry on modern scientific topics. The poems employ the structurally concise tradition of the ancient epigram as emulation of concision in scientific writing. Subjects in this reading include those on such timely topics as the Neanderthal genome, the Smithsonian’s National Parasite Collection, and the first human-pig chimeras developed for organ harvesting.

Giguet, R., and R. Alexander. NSU. **What makes software understandable?**—The question was first asked during the Software Crisis of the 1960s, when the increasing complexity of software made many large projects “intellectually unmanageable.” The solution adopted at the time was to use a mathematical abstraction, specifically the Function, as the underlying structure of programming languages. Many felt that the precision of mathematics would increase coders’ ability to understand their code. Though widely adopted, languages with math-like syntax were often unpopular with programmers. An alternative paradigm, Object-Oriented (O.O.) programming, arose roughly 25 years ago. O.O. languages mimic a philosophical construct called “Forms,” first described by Plato and later critiqued by Aristotle. Many programmers feel O.O. languages are more intuitive than math-based languages. The surprising success of O.O. languages suggests that, contrary to long-held assumptions, the key to creating intellectually manageable software may lie with models taken from philosophy rather than from mathematics.

Horne, J., J. Newman, M. Caldorera-Moore, and N. Bustamante. LTU. **Illustration for new frontiers in biomedical.**—This past winter I took a digital painting class that was also an art initiative between three different colleges here at Louisiana Tech University; Applied and Natural Science, Engineering and Science, and Liberal Arts. We worked directly with Dr. Mary

Caldorera-Moore and Dr. Jamie Newman to make a digital illustration for a research seminar series on campus: The New Frontiers in Biomedical Research. The illustration had to be scientifically accurate and showed a biomedical process. After the works were finished, we would have a public showcase and auction of our creations. Once my illustration was completed and judged, I was placed within the top four illustrations for the class. I was overjoyed with this turn of events, because of my lacking in the science and technology fields. Now I can use this new digital art form to create illustrations and could successfully have a career in critical areas of science.

LaFleur, G. NSU. **Preserving lifeways of the Barataria-Terrebonne National Estuary by collecting forage techniques with Nicholls students.**—We have embarked on an initiative to collect traditional protocols for seasonal foraging across the Barataria-Terrebonne Estuary as a pedagogical technique to introduce students to Louisiana's natural history and community connections to the wetlands. Here we present stories collected from rural residents that highlight forage methods covering the four seasons. A popular item to be harvested in the fall is the oyster mushroom *Pleurotus ostreatus*, which can be found on fallen willow trees, and sautéed as an addition to gravies. Once winter arrives, the wolfberry, *Lycium barbarum*, can be harvested from coastal marshes and used as a tomato substitute in salads. In spring, tender stalks of Chadron, *Cirsium horridulum* are harvested from open fields, chopped, and included in recipes calling for celery. Seeds from the Graine a voler' *Nelumbo luteo* can be collected from still-water lakes, eaten raw, or boiled, and even crushed into a Cajun hummus.

Maloy, K., J. Newman, N. Bustamante, M. Caldorera-Moore. LTU. **Digital painting at Louisiana Tech University.**—Digital painting is a field of art that delivers the appearance of traditional media utilizing a specialized drawing tablet and Adobe Photoshop. Louisiana Tech recently initiated a class that combines the fields of medical illustration and digital painting. The students are taught the basics of illustrating digitally by repeating exercises that they are used to doing with traditional media. The first assignment is a rendering of different shapes in gray scale, teaching familiarity with the software and an understanding of basic digital painting techniques. Next students recreate a photo with a digital painting, learning how to integrate color into a piece. The final project for the course is a biologically themed composition. The course culminates in an exhibit and auction of student work open to the community. The course is a unique interdisciplinary opportunity, combining advancements in science communication, technology, and art, preparing students for a career in medical illustration.

Mbarika, I. LSU-BR. O. Ekanoyo, S. Okuboyejo, F. Aveni, T. Olokunde, C. Donald, T. Princess, N. Vekima, and G. Jones. SU-BR. **Growth in EMR implementation: A case study of the United States.**—The United States falls among the top ten richest countries in the world, with 17.5% of its GDP spent on health care, (Becklely, 2004). Electronic Medical Records is an electronic software system, used in clinics and hospitals to improve the healthcare system. According to the National Institute of Health (2015), Mayo Clinic in Rochester, Minnesota was among the first medical and educational institutions to embrace EMR in the mid-1960s when it was first introduced. In 1965, about 73 health centers and clinical information projects for the storage and recovery of medical achieves, and clinical data were in progress. The Bush Administration projected a growth in EMR nationwide by 2014 (Becklely, 2004). In a recent study, 4472 hospitals were surveyed. Of this number, 2655 hospitals responded. Findings from

this study show a continuous and steady growth (HealthIT.gov, 2015). This study also reveals important implications for EMR improvement and technological innovations in EMR.

Mbarika, I. LSU-BR. O. Ekanoyo, S. Okuboyejo, F. Aveni, T. Olokunde, C. Donald, T. Princess, N. Vekima, and G. Jones. SU-BR. **The diffusion of EMR in healthcare environment: A case study of Japan.**—The history of Electronic Medical Records (EMR) in Japan began in 1988. Its prevalence varies with the size of the hospital (Ochieng & Hose, 2005). While an EMR works well in some cases, it is not considered an option for others. Some major hospitals encounter obstacles in the process of adopting full EMR databases. Standardization and the privacy act accounts for obstacles. This study examines the impact of three factors in the diffusion of EMR in Japan. Two EMR softwares are used for this study. Twenty institutions (Gastrointestinal Oncology Study Group of the JCOG) participated in this study. Participating physicians were briefed on the technical details for EMR, to make sure they are savvy and comfortable with it. Quality control of EMR and endoscopic technique were also put in place. Review and analysis of photographs at the semi-annual meeting reveals important implications for EMR implementation.

Newman, J., M. Caldorera-Moore, N. Bustamante. LTU. **Digital painting and medical illustration.**—The field of medical illustration is the ever-evolving profession that allows for the articulation of complicated concepts for educational and research purposes. Here we describe the interdisciplinary collaboration between three colleges: Applied and Natural Sciences, Engineering and Science, and Liberal Arts, to promote new art technology and introduce art students to a developing field of illustration through a new digital painting course. The climax of the interdisciplinary art and science initiative was an art exhibit and auction open to the public showcasing the creative works of the 14 students involved in the digital painting course. Even in its infancy, this collaboration between art and science has significantly impacted the students and faculty involved and Louisiana Tech University. The collaboration and events described here may serve as a model for other Universities looking to build upon their strengths and promote their students towards successful careers in critical areas of biomedical science.

Okuboyejo, S., F. Aveni, and V. Mbarika. SU-BR. **EMR Implementation in Mexico: A systematic review.**—In this work, we explore the Mexican EMR adoption, acceptance and use scenarios. A systematic literature review of the documented cases and studies will also be conducted. This review is conducted to identify interventions and their effect on patients, citing various cases. We will also validate the above factors necessary for a successful implementation of EMR in Mexico. We also enumerate the critical success factors for the implementation of the project.

Richard, C. NSU. **Topics in interdisciplinary studies: inspiration.**—According to Dr. Hal Urban (2003), famed professor of education at the University of California, Berkley, “Our schools, for the most part, do a great job, but there’s something missing in the curriculum. We don’t teach our students about life itself, about how it works or about what’s essential. Never has there been a greater need for that.” IDST 420-Topics in Interdisciplinary Studies: Inspiration is a humanities course that seeks to address these needs by focusing on bettering the human experience through the power of inspiration. When individuals become inspired, they are empowered with the desire to act. Through the examination of inspirational people, books, short stories, art, poetry, movies, music, quotations, children’s books, peoples of the world, and

service to the needy, the course helps participants to gain the understanding that inspiration can be found all around us on a daily basis and that acquiring and appreciating these resources propel human beings into bettering the quality of life.

Yapp, A., and K. Yurgil. LU-NO. **Post traumatic growth and altruism.**—After experiencing a traumatic life event, some individuals experience post-traumatic growth, defined as one's resilience after a challenging life event. However research is limited on how post-traumatic growth affects other aspects of long term functioning, such as altruism, or one's genuine interest in other's wellbeing. This within-subject study will examine associations between post-traumatic growth and altruism, while controlling for coping style and trait empathy. Fifty participants from Loyola University New Orleans will complete the Life Events Checklist to measure potentially traumatic events, the Post Traumatic Growth Inventory, the Toronto Empathy Questionnaire, the Resilience Assessment to measure coping styles, and the Self Report Altruism Scale. Linear regression will test whether post-traumatic growth is associated with altruism, while controlling for coping style and trait empathy. While data collecting is underway, we hypothesize that post-traumatic growth predicts higher levels of altruism, particularly for those with positive coping and trait empathy.

Division of Social Sciences

Dufour, R. LU-NO. **Experimentally generated interpersonal closeness among heterosexual undergraduates.**—This study's purpose is to replicate Aron et al.'s (1997) experimentally generated interpersonal closeness research. Heterosexual undergraduates (N =80) will volunteer to engage in a 45-minute verbal interaction with a randomly assigned, unknown participant of the opposite sex. Participant pairs will be assigned to 1 of 2 standardized questions and interaction conditions: Closeness Generated Questions, or Small Talk Questions. Then, participants will complete two scales quantifying the participants' perceived interpersonal closeness, and a demographic questionnaire. Statistical analysis of the data will compare the mean scores between both groups and the potential differences of males' and females' Interpersonal Closeness scores. Due to the changes in the average age of first time marriage, number of women in college, and the usage of several social media sites since Aron et al. (1997), it is hypothesized that the Closeness Generating Questions and the Small Talk Questions will not affect participants' self-reported Interpersonal Closeness scores.

Harrison, E., and K. Yurgil. LU-NO. **The relationship between instructor job satisfaction and student outcomes.**—Prior research suggests a positive correlation between job satisfaction and job performance, however, many factors influence job satisfaction. In education, factors that affect teacher satisfaction may, in turn, predict overall teacher effectiveness. One way to measure effectiveness is through student performance, namely, grades and test scores. This study will investigate the relationship between teacher job satisfaction and student final grades. Fifty Loyola University undergraduate faculty members from a variety of Colleges will complete the Spector Job Satisfaction Survey, which measures job satisfaction according to 9 factors. De-identified student letter grades of faculty participants will be obtained from Student Records and will be converted to a numerical scale. The relationship between teacher job satisfaction and students' grades will be analyzed using a Linear Regression. While data collection is forthcoming, it is hypothesized that that teacher satisfaction will positively correlate with student performance.

Hasty, A., and E. Zucker. LU-NO. **Social anxiety and characteristics of romantic relationships.**—For most individuals, the development and maintenance of social relationships, including romantic relationships, are important components of overall life satisfaction. However, various personality factors can be detrimental to these relationships. In this study, several personality variables (need satisfaction, protection against potential pain, and jealousy) will be assessed as a function of levels of social anxiety. Participants (100 undergraduate volunteers of any gender, ethnicity, or sexual orientation) will complete the Basic Need Satisfaction Scale (9 items), Experiences in Close Relationships Scale (36 items), the Multidimensional Jealousy Scale (8 items each for the cognitive, behavioral, and emotional aspects of jealousy), and the Liebowitz Social Anxiety Scale (24 situations evaluated as fearful and/or avoided) while considering a current or previous romantic relationship. It is hypothesized that higher levels of social anxiety will be correlated significantly and positively with scores for basic need satisfaction, protecting oneself against potential pain, and pathological and/or delusional jealousy.

Joseph, S., and K. Ernst. LU-NO. **When too much becomes deadly: A study on the health effects of sugar intake on youth in America.**—Americans' consumption of dietary sugar is

leading to alarming increases in the prevalence and incidence of diabetes and obesity. Recent research also indicates that excess added sugar is associated with heart disease and liver disease. Using a quasi-experimental design, this study will investigate undergraduates' knowledge about dietary sugars, dietary sugar intake, dietary guidelines, and participant demographic characteristics. Volunteer participants' (N = ~75) knowledge will be measured with the SugarScience.org Sugar Test. Participants will also complete a demographic questionnaire which includes participants' dietary habits and lifestyle behaviors, with particular emphasis on sugar intake, exercise, and body weight. Statistical analyses will involve testing potential differences in participants' Sugar Test scores and the self-reported, subject variables. Results of this investigation are expected to support research attempts to unravel conflicting findings in previous research and further examine the reasons knowledge about sugar in young adults is subordinate.

Yehya, R. SU-BR. **Challenges facing HBCU institutions of higher education.**—This paper examines the major challenges facing Historically Black Colleges and Universities (HBCUs) in the United States. These challenges include: finances and affordability, instable leadership, decrease in enrollment, infrastructure, attracting and retaining Africa-American faculty, retention and degree completion/graduation rates, provision of state-of-the-art technologies, and federal and state policy. Special attention is paid to how these challenges could be addressed.

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