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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:

AR-GFC	Arkansas Game and Fish Commission
CA	Clarkson Aerospace
CONICET	The National Scientific and Technical Research Council
CPMC	Calcasieu Parish Mosquito Control
GSU	Grambling State University
LC	Louisiana College
LHS	LaGrange High School
LSMA	Louisiana School for Math Sciences and Arts
LSU-A	Louisiana State University at Alexandria
LSU-BR	Louisiana State University, Baton Rouge
LSU-E	Louisiana State University, Eunice
LTU	Louisiana Tech University
LUNO	Loyola University, New Orleans
McSU	McNeese State University
NiSU	Nicholls State University
NSU	Northwestern State University
SLU	Southeastern Louisiana University
SRMCRI	Sri Ramachandra Medical College and Research Institute
SU-BR	Southern University, Baton Rouge
SU-NO	Southern University, New Orleans
TCU	Texas Christian University
TU	Tulane University
UA	University of Alabama
UAFS	University of Arkansas, Fort Smith
UH	University of Houston
ULL	University of Louisiana, Lafayette
ULM	University of Louisiana, Monroe
USUHS	Uniformed Services University of the Health Sciences, Bethesda, MD
UTA	University of Texas, Arlington, TX
UW-LC	University of Wisconsin—La Crosse
WMA-TPWD	Wildlife Management Area—Texas Parks and Wildlife Department, Port Arthur, TX
XU	Xavier University

Division of Agriculture, Forestry and Wildlife

Battaglia, C.D. and J.L. Carr. ULM. **A herpetofaunal comparison of a regenerating versus an established bottomland hardwood forest in northeastern Louisiana, USA.**—Upper Ouachita National Wildlife Refuge (UONWR) is located in northeastern Louisiana, USA. The major natural vegetation type is bottomland hardwood forest. The refuge is divided by the Ouachita River into two sections: the west side, a relatively undisturbed habitat, and the Mollicy Unit, a site of reforestation and hydrological restoration after agricultural abandonment. Reptiles and amphibians are an important part of bottomland hardwood forests and are significantly impacted by hydrology. We conducted a terrestrial herpetofaunal survey at 12 sites in the UONWR, six sites on the west side and six sites on the Mollicy Unit, comparing communities between the two sides. The surveys were conducted through the use of Y-shaped drift fence arrays, each with six funnel traps and four pitfall traps, time-constrained visual encounter surveys, and PVC pipes. For all techniques combined, total species richness for the west side and the Mollicy Unit are 25 and 19, respectively. Total species richness was significantly higher for the west side ($P=0.0197$). Catch-per-unit-effort was not significantly different between the two sides for drift fences ($P=0.9542$) or visual encounter surveys ($P=0.4271$), but was significantly higher for PVC pipes on the Mollicy Unit ($P=0.0412$).

Brown, C.S., D.D. Kee, C. Watson, B. Chung, A. Ledet and C. Richmond. McSU. **Above-ground biomass production of Timothy Canarygrass compared to annual ryegrass.**—Native plant species are rapidly vanishing from the landscape; therefore, native species are being replaced by non-native plant species. The non-native species annual ryegrass, *Lolium multiflorum* (RG), is the preferred forage for livestock producers in southwest Louisiana and east Texas. Annual ryegrass is also the key weed in southern grown wheat in the states of Texas and Louisiana. Cool season annual grass species have similarities in many respects; however, little information is available regarding yield of Timothy Canarygrass, *Phalaris angusta* (TC). A greenhouse study was initiated in the fall of 2011 and continued through the spring of 2012 to determine growth responses of RG and TC to watering intensity and nutrient application. Treatments were species, nutrient application (i.e., levels "yes" or "no"), and table position from table center (i.e., levels 10, 30, 50, 70 cm). After each six-week growth period, the plant materials were harvested and dried. Results showed that total biomass yield were greater for annual ryegrass than Timothy Canarygrass. It appears that Timothy Canarygrass is a more vertical growing while annual ryegrass grows more expansive. The major distinction of response to nutrient application was revealed in growth periods 2 and 3.

Faidley, C.R. and J.L. Carr. ULM. **Aquatic herpetofauna of bottomland hardwood forests on Boeuf Wildlife Management Area in northeastern Louisiana.**—Boeuf Wildlife Management Area (BWMA) is a state-owned and managed public recreation area in Caldwell and Catahoula parishes. Many reptiles and amphibians use a wide variety of water-bodies associated with bottomland hardwood forests, often using both the aquatic and terrestrial habitats at some point in their lives. Our goal is to sample a variety of the water-body types and the adjoining forest to see which species are using the different habitats. Aquatic herpetofaunal surveys were conducted at a total of 27 different localities on BWMA. Surveys were conducted through the use of non-baited aquatic drift-fences, baited collapsible traps and turtle hoop-nets. Each site also received time-constrained visual-encounter surveys (VES) during trapping season.

For all techniques combined, the total specimens recorded were 1,632 of 37 species. The most abundant species were Blanchard's Cricket Frog, *Acris blanchardi* (966) for VES, Stinkpot, *Sternotherus odoratus* (32) for aquatic drift-fences, and the Red-eared Slider, *Trachemys scripta elegans* (125) for turtle traps. Catch-per-unit-effort (CPUE) for aquatic drift-fences was 0.1554 and 0.1492 for turtle traps.

Falconi, R. and M. Merchant. McSU. V. Parachu and C. Pina. CONICET. A. Cooper. WMA-TPWD. **Effects of fire ant (*Solenopsis invicta*) predation on Alligator mississippiensis hatchlings.**—Red fire ants are known to colonize mound nests of American alligators, and attack hatchlings at the time of hatching. These predatory attacks often results in consumption of the hatchling(s) by fire ant colonies, and those that survive exhibit reduced growth rates and increased morbidity. We exposed newly hatched, wild-caught alligator hatchlings to red fire ant colonies for different amounts of time. Increased exposure of alligator hatchlings to fire ants resulted in increased morbidity. In addition, longer exposure times resulted in higher plasma corticosteroid levels, an indicator of physiological stress. We also observed a decrease in the total leukocyte counts, and a decrease in heterophil/leukocyte ratios, another indicator of stress. Data indicate that red fire ant attacks may have an immunosuppressive effect on alligator hatchlings.

Gaspard, C.M. and C.A. Corbat. LSU-A. **A comparison of trapping techniques for population estimation of the Eastern Woodrat.**—We compared two trapping methods for estimation of populations of Eastern Woodrats (*Neotoma floridana*) in bottomland hardwood forest in Central Louisiana. Woodrats were trapped using a traditional grid arrangement as well as with targeted trap placement at nests. We found no significant difference between the two methods in estimating woodrat abundance. Targeted trap placement at nests yielded a mean of 0.049 woodrats per trap night, while trapping on grids yielded a mean of 0.040 woodrats per trap night. Relative abundance rankings between areas were the same with both methods. Woodrat densities on our study site were very high compared to previous studies in the literature.

Longoria, S.R., J.E. Smith, D.D. Kee and C. Richmond. McSU. **A growth chamber study examining various methods of enhancing germination of Eastern Gamagrass seed.**—Eastern Gamagrass, *Tripsacum dactyloides*, has low germination rates due to seed dormancy; however it is an important plant in the re-establishment of native grasslands. If the optimum stratification period and correct seed treatments along with proper growing season could be identified, it would help in the attempt to reestablish the Cajun Prairie of Louisiana. This study used a total of 2980 seeds, half of the seeds scarified with a 15% peroxide solution and treated with a 0.01M gibberellic acid. Seeds were cold moist stratified for four time periods in a 1% captan solution: 0 week, 2 weeks, 4 weeks, and 6 weeks. The growth chambers were used to simulate different growing seasons (September and July). The seeds were placed in Petri dishes with blotter paper, distilled water was added to them, and covered with a lid. Data were collected weekly for eight weeks. Seed germination in cold temperatures was much less and at a slower rate than in the warm temperature growth chamber. In spite of increases, total germination was still low. The study suggests the need for additional research for identifying the conditions for a large germination percentage.

Murray, C., K. Pillar, M. Easter. SLU. M. Merchant. McSU. A. Cooper. WMA-TPWD. **Salinity and alligator egg shape variation: A geometric morphometric analysis.**—The harvest of alligator eggs is an important component to the commercial alligator ranching industry in Louisiana. Various methodologies have been used to monitor alligator populations including abundance counts, stress quantification, and nesting surveys. Past studies have dismissed the importance of egg shape in crocodylians, squamates, and turtles and deemed egg shape in birds and other amniotes as similar, in relation to functionality. The complexity of crocodylian eggs has been examined, and both turtle and squamate eggs have been regarded as physiologically more intricate than bird eggs. This study introduces a physiological approach to monitor alligator populations in freshwater and low salinity environments by quantifying egg shape in correlation with varying salinity. We introduce a fractional semi-landmark shape template method to quantify egg shape within a geometric morphometric framework. This approach allows for the quantification of shape for curved structures which lack homologous landmarks. The results from this study suggest that alligator egg shape is correlated with salinity levels, such that variation in alligator egg shapes at low salinities changes in gradient-like fashion while salinities high enough to be deemed stressful result in reversion back to a low salinity egg shape or desiccation.

Rajkarnikar, A., M. Herron, and J. Bhattacharjee. ULM. **Characterizing pit-mound microtopography in bottomland hardwood forests.**—Bottomland hardwood forests (BHF) are considered to be one of the richest ecosystems mainly due to the unique floral diversity that are critical habitats for wildlife. Forest ‘tree fall gaps’ have recently been an important subject of research. Tree gaps are formed as a consequence of small disturbances such as wind that causes the uprooting of trees. The uprooting events not only alter the light gradient, but also generate changes in the micro-topography of the site by the formation of pits and mounds. Mounds play a vital role in the growth of upland species within a lowland site, while the pits form pools that can trap seeds, organic debris, and provide a breeding habitat for amphibians during periods of stagnation, acting as sites of seed germination of wetland species. A stratified random sampling was performed on BHF lands in in the Russell Sage State Wildlife Management Area to locate such pit-mound features to characterize frequency, area, gap fraction, gap abundance, and their importance towards contributing to the stand heterogeneity of the forest ecosystem, which in turn is to enhance wildlife habitat. Supported by TriBeta National Biological Honor Society.

Savage, D. and M. Merchant. McSU. A. Cooper. WMA-TPWD. C. Murray. SLU. **Assessment of nest attendance of the American Alligator (*Alligator mississippiensis*) using a modified motion-sensitive camera trap.**—Existing data has shown that motion-sensitive, infrared (IR)-based camera traps are not reliable for the quantitative capture of images of alligators. Therefore, we designed a camera trigger mechanism which included an electrical circuit board, coupled to a camera, which powered an IR LED light. The circuit was designed to turn the IR LED on for two seconds every five minutes. In the field, the IR LED was positioned such that the light was pointing directly into the IR detector of the camera. Therefore, the cameras were stimulated to take photos every five minutes, throughout the entire nesting period. The data revealed that alligators attend and maintain their nests more frequently during the first four to seven days after egg deposition, and then attendance is decreased. Nest attendance increased toward the end of the incubation period as eggs neared the hatching stage. In addition, 87.3% of alligator nest attendance occurred during the nighttime hours, between 8:00 pm and 6:00 am.

Strimbu, V.F. and B.M. Strimbu. LTU. **A deterministic algorithm for tree identification using LIDAR data.**—A key element in forest management is the correct assessment of the resources of interest at the start of the planning horizon. The species, site index, number of trees, and volume per acre are the attributes driving the management plan. The most cost-effective methods of acquiring data describing a specific state of the forest are based on remote sensing techniques. The objective of the present research is to develop an algorithm for identifying trees using LIDAR data. The proposed algorithm delineates trees from tip to the ground gradually and simultaneously. Initially, a grid identifying the highest point from a normalized point cloud is computed. The grid is subsequently discretized in equal elevation intervals, which identify the crown. Trees are then delineated by an iterative process through the elevation layers, starting with the cells of highest elevation and attaching the patches of cells with same elevation to a tree. If the tree and patch are connected, then the patch belongs to the tree, otherwise, the patch generates a new tree. The algorithm was tested using LIDAR data with 22 points/m² from northern Louisiana, and led to correct identification of more than 95% of the trees.

VonWald, V.M. and C.A. Corbat. LSU-A. **Woodrat nest counts as an index of population abundance.**—Eastern Woodrats (*Neotoma floridana*) build large recognizable nests of sticks, bark, and other debris. We counted total and active woodrat nests on four, 60 x 60 m sites in bottomland hardwood forest in Central Louisiana in fall 2012. We trapped woodrats by two methods on these same plots and used simple linear regression to examine the relationship between number of unique individuals captured and number of nests. We found a total of 59 woodrat nests, with 41 of those being active. Twenty five unique individual woodrats were captured. Both active nests and total nests were highly correlated with the number of individual woodrats on a site, resulting in R-squared values of 1.0 and 0.93, respectively. Counts of woodrat nests seem to provide a good index to population abundance and could be used in lieu of trapping especially for studies where relative abundance between areas is more important than exact counts of individuals.

Division of Biological Sciences

Environmental Sciences Section

Brown, O.L., D.D. Kee, and C. Richmond. McSU. **Does planting date affect establishment success of native Louisiana perennial forbs?**—Seeding native species at the correct time of year may affect restoration success rates. However, little research has been published on when the various native plant species should be planted. A study was conducted on the McNeese University farm examining the effect of four planting dates (October, November, March and April of 2011/2012) on the plant counts of five Louisiana ecotypes (Rattlesnake Master, Yellow wild indigo, Ashy sunflower, Giant coneflower, and Rosinweed). One hundred seeds of each species were planted into individual rows at each planting date using 4 blocks. Monthly counts of seedlings are being conducted. Plant survival, as evident by the number of established plants in mid-September 2012, was affected by planting date. None of the species planted in April 2012 produced sufficient plants per row to be considered successful (<5% of planted seeds became a mature plant). Giant coneflower failed to establish at any of the dates planted. However, the remaining species attained close to or greater than 10% of the seeds planted proved a mature plant when planted in November. Rosinweed was particularly successful, attaining a 40+% establishment rate, in both fall plantings.

French, J.D. and J.E. Young. LTU. M.M. Chumchal. TCU. E. Brinkman. AR-GFC. B.C. Moore. LTU. **Hepatic melanomacrophage aggregates and mercury in Spotted Gar, *Lepisosteus oculatus*.**—Mercury is a known toxic metal that can pose serious health threats to fish occupying higher trophic levels. Through biomagnification, mercury may build up in tissues potentially impacting the immune system and overall fish health. It has been documented that mercury accumulation in the liver may increase the production of melanomacrophages as a consequence of chronic mercury-mediated tissue damage. This study investigated the relationship between increasing hepatic mercury concentrations and the frequency of liver melanomacrophages. Spotted Gar (*Lepisosteus oculatus*) liver specimens were collected from two southern Arkansas lakes. We quantified the number, size, and frequency of melanomacrophages and the concentration of total mercury in the liver tissues. Here we present the relationship between mercury liver concentrations and melanomacrophage aggregates. These associations will be discussed in light of possible detriments to spotted gar health and potentially other fish in similar environment conditions.

Kern, C. and R. Boopathy. NiSU. **Sustainability of water in shrimp aquaculture system through wastewater treatment and reuse.**—Creating fiscally and environmentally responsible waste treatment methods is one key for enhancing shrimp aquaculture in the United States. Sequencing batch reactors (SBRs) provide significant reduction in costs such as relocation of shrimp production system further inland, less infrastructure, smaller space requirements, and recycling of the water and salt. SBRs adapt the activated sludge process and enable it to be completed within a single reactor vessel cycling through aerobic and anaerobic conditions. Microbes contained within the activated sludge conduct nitrification and denitrification processes. Significant reduction of nutrients is possible creating environmentally responsible intensive recirculating raceways that meet USEPA regulations, while at the same time reducing

costs typically associated with these types of raceways. A pilot SBR was run successfully, which significantly removed nitrogen in the waste.

Samaha, D. and R. Boopathy. NiSU. **Combined biological and chemical pretreatment method for lignocellulosic ethanol production from energy cane.**—Ethanol produced from lignocellulosic biomass is a promising renewable alternative to diminishing oil and gas liquid fuels. Sugarcane is an important industry in Louisiana. The recently released variety of “energy cane” has great potential to sustain a competitive sugarcane industry. Lignocellulosic biomass consists of a network of cellulose and hemicellulose bound by lignin. The process of converting lignocellulosic biomass to ethanol involves pretreatment to disrupt the complex of lignin, cellulose, and hemicellulose, freeing cellulose and hemicellulose for enzymatic saccharification and fermentation. Determining optimal pretreatment techniques for fermentation is essential for the success of lignocellulosic energy production process. The purpose of this study was to evaluate energy cane for lignocellulosic ethanol production. Various pretreatment processes for energy cane variety L 79-1002 (type II) were evaluated including different concentrations of dilute acid hydrolysis and solid-state fungal pretreatment process using brown rot and white rot fungi. Pretreated biomass was enzymatically saccharified and fermented using a recombinant *Escherichia coli*. The results revealed that all pretreatment processes produced ethanol. However, the best result was observed in dilute acid hydrolysis of 3% sulfuric acid. Combination of fungal pretreatment with dilute acid hydrolysis reduced the acid requirement from 3% to 1% and this combined process could be more economical in a large-scale production system.

Smith, E.J., S.R. Longoria, D.D. Kee, and C. Richmond. McSU. **A greenhouse study of techniques to increase Eastern Gamagrass germination.**—Eastern Gamagrass (*Tripsacum dactyloides*) is a native, warm season perennial bunchgrass that is essential for prairie restoration and is recognized as high quality forage. Eastern Gamagrass has a hard seed coat and will often stay dormant for long periods of time, which results in low germination. Previous studies found that stratification and soaking in H₂O₂ and GA3 will increase germination rates. This study compared the effect of stratification period (0, 2, 4 or 6 weeks) and seed treatment (none or soaking with 15% H₂O₂ solution followed by a 0.01M GA3) on the germination and emergence of Eastern Gamagrass seed in greenhouse conditions. All treatments received a 1% mix of captan fungicide. The experimental unit was a tray containing 50 deepot cones with 2 seeds planted per cone. A total of 24 trays were used. A randomized complete block design was used and blocks were regularly rotated to ensure even watering. Data were collected on a biweekly basis. Increasing stratification period or soaking with the H₂O₂/GA3 solutions doubled the number of seeds germinated compared to the control. However, gamagrass germination remained low, with less than 15 percent germination in all treatments.

Young, J.E., J.D. French, and B.C. Moore. LTU. **Hepatic iron content in mercury-polluted fish livers.** Increased iron concentration in fish liver is an indicator of hepatic pathology. Environmental pollutants, such as mercury, can result in liver damage and increased hepatic iron loads. We collected Spotted Gar (*Lepisosteus oculatus*) livers from two southern Arkansas lakes with varying concentrations of mercury contamination. We quantified total mercury concentrations in the livers and stained histological sections for the presence of iron using the Prussian Blue technique. Here, we present the relationship between liver mercury concentrations and the observed degree of hepatic iron staining. We will present our findings in the context of

how environmental quality may directly impact fish health and the overall health of the ecosystem.

Microbiology Section

Aubin, A., D. Samaha, and R. Boopathy. NiSU. **A survey of methicillin-resistant *Staphylococcus aureus* (MRSA) in sewage and sewage treatment plant.**—Methicillin-resistant *Staphylococcus aureus* (MRSA) is a major human pathogen, capable of causing a variety of human skin and soft tissue diseases. Antibiotic resistance is becoming a very large problem throughout the world. After passing through the human or animal body, the antibiotics are entered into the sewage treatment plant, where water is processed and cleaned, then returned into the environment. During the sewage treatment process antibiotics come into contact with bacteria entering the treatment process, as well as bacteria used in the treatment process. The bacteria that are exposed to these antibiotics can become resistant during the treatment process and then expose the resistance genes to the environment upon release of treated water from the treatment plant. Because of the contact between bacteria and antibiotics during the treatment process, sewage treatment plants are considered prime habitat to create antibiotic resistant bacteria. There was no study reported on the presence of MRSA in sewage treatment plant. Therefore, this MRSA study was conducted from samples collected from raw sewage and various stages of Thibodaux sewage treatment plant. The results revealed the presence of MRSA in various stages of the treatment plant and even in the post-treated sewage effluent during five months of samples surveyed in this study.

Fairley, A.S., C-W. Lu and P. Yeung. GSU. **Aging-associated defects in DNA damage repair affects reprogramming into induced pluripotent stem cells.**—Adult cells are able to be reprogrammed back to an embryonic stem (ES) cell-like state through induced pluripotent stem (iPS) cell formation, by ectopic expression of four ES cell-specific transcription factors, Oct4, Sox2, Klf4, and c-Myc first reported by Dr. Shinya Yamanaka of Kyoto University, Japan 2007. When human adult fibroblasts are successfully reprogrammed into iPS cells, they share similar characteristics with human ES cells. Somatic cells reprogramming into iPS cells requires continuous proliferation, which predispose the cells to increased risk of DNA damage. Breast cancer susceptibility protein 1, BRCA1, is a DNA damage repair response protein which marks double-stranded breaks in DNA for repair. The objective of our study was to determine whether aging-associated defects in DNA damage repair reduce iPS cell formation efficiency. Since cell proliferation is required for the generation of iPS cells, we hypothesized that differences in DNA damage repair in cells derived from young and old patients will affect the iPS formation efficiency. To test this hypothesis, Oct4, Sox2, Klf4, and c-Myc were transduced into two adult human fibroblasts populations: AG3 and AG7 representing adult human fibroblast from a young (age 17) and an old (age 84) patient. The fibroblasts were examined for DNA damage response by monitoring the level of DNA double strand breaks, marked by levels of γ -H2AX. While irradiation-induced double strand breaks were repaired at a comparable kinetics in both young and old cells, significant differences in repairing DNA double strand breaks induced by iPS factors were observed between the young and the old cells during the early stages of reprogramming. DNA damage repair response was compared in AG3 and AG7 cell populations subjected to γ -irradiation, and iPS factors with γ -H2AX and BRCA1 were detected by Western

blotting. By comparing the efficiency of iPS cell formation scored by alkaline phosphatase and TRA-1-60 staining, we found that young fibroblasts with better DNA damage repair exhibited higher iPS formation efficiency. Consistent with this observation, suppression of a major component of the homologous recombination pathway protein, BRCA1, resulted in suppression of iPS formation. Understanding the role of DNA damage repair response and formation efficiency in iPS cells will be beneficial to the potential application of regenerative medicine in aging patients with degenerative conditions.

Creech, C.C., D.W. Jackson, and R.L Minton. ULM. **A preliminary survey of freshwater snail shell microbes from Bayou Bartholomew, Morehouse Parish, Louisiana.**—The diversity and ecology of bacteria in freshwater environments are not well understood; however, less is known about bacteria from the Mississippi Alluvial ecoregion of North America. In these systems, freshwater mollusk shells are frequently one of the most common hard substrates available for microbial colonization. In an effort to understand both the microbial diversity utilizing mollusk shells and the relationship between mollusk species and their external environment, we sampled the bacterial communities two benthic taxa, *Campeloma decisum* and *Pleurocera canaliculatum*, collected from Bayou Bartholomew near Bastrop, LA. Shells were swabbed and bacteria grown on R2A media, samples were isolated for pure culture, and biochemical tests were used for preliminary identification. Biofilms were removed from shells using sterile razor blades, and DNA was isolated from each sample. Samples were analyzed using next-generation sequencing methods to estimate the richness and abundance of microbes on each shell. Using biochemical tests, we confirmed that *Klebsiella ozaenae*, *Pantoea agglomerans*, and *Serratia liquefaciens* were found on both species, along with putative species in the genera *Bacillus*, *Enterococcus*, *Pasturella*, *Staphylococcus*, and *Streptococcus*. Results from the next-generation sequencing and bioinformatics analyses will be presented, along with a discussion of snails as mobile microbial carriers.

Collins, J., E. Pierce, and P.L. Hindmarsh. LTU. **Using combination antifungal drug treatment to identify stress response in *Candida albicans*.**—*Candida albicans*, a unicellular budding yeast, is a common constituent of the human flora and resides in the gut, mouth and other mucosal surfaces. Our group has developed an assay system to identify antifungal drugs in combination to control growth in *C. albicans*. Several antifungal drugs are presently used to control *C. albicans* growth in infected individuals. Control of *C. albicans* infections faces two obstacles: toxicity to the infected individual and the development of resistance by *C. albicans* to the present antifungal therapies. Our goal is to identify combinations of antifungal drugs that decrease *C. albicans* growth using minimal inhibitory concentrations or sub-minimal inhibitory concentrations (MIC or sub-MIC) with the goal of reducing resistance and lowering host toxicity. We have been using growth curves and colony forming units to identify synergistic activity using several two-drug combinations. We have demonstrated that drugs delivered simultaneously have a noticeable decrease in growth of *C. albicans*, but when we administer these drugs sequentially there is a very dramatic decrease in cell growth. The highest synergistic activity using sequential addition of antifungal drugs occurs with a short duration prior to the second drug (1-hour) but is less effective with a longer duration (2-hour).

Dixon, K.S., K.R Williams, and J.L. Comeaux. **Inhibition of MRSA and other pathogens using old-school antiseptics.**—Mercury-based antiseptic treatments are no longer available in

the U.S. due to their potential to cause unintentional health consequences. However, compounds such as merthiolate and mercurochrome have a cult following among former users. We compared the antimicrobial properties of these compounds to more conventional antiseptics using the Kirby-Bauer disk diffusion method. We determined that these compounds are highly effective against MRSA *Staphylococcus aureus*, *Escherichia coli*, *Proteus vulgaris*, *Pseudomonas aeruginosa*, and *Candida albicans*. However, other antiseptics such as iodine and hydrogen peroxide were much more effective at inhibiting the growth of these pathogens.

Everage, T. and R. Boopathy. NiSU. **A survey of antibiotic resistant bacteria in sewage and sewage treatment plant.**—Antibiotic resistance is becoming a very large problem throughout the world. After passing through the human or animal body, the antibiotics are entered into the sewage treatment plant, where water is processed and cleaned, then returned into the environment. During the sewage treatment process antibiotics come into contact with bacteria entering the treatment process, as well as bacteria used in the treatment process. The bacteria that are exposed to these antibiotics can become resistant during the treatment process and then expose the resistance genes to the environment upon release of treated water from the treatment plant. Because of the contact between bacteria and antibiotics during the treatment process, sewage treatment plants are considered prime habitat to create antibiotic resistant bacteria. There were very limited studies on this subject and virtually none from a small town sewage treatment plant. Therefore, this study was conducted. Samples were collected monthly from Thibodaux sewage treatment plant, Louisiana for one year from various sites, namely, raw sewage, aerated lagoon, trickling filter, settling tank, UV treated waste effluent, and treated sewage outfall in the wetland. Antibiotic resistance was monitored using Kirby Baur Assay with 11 different antibiotics including streptomycin, bacitracin, chloramphenicol, clindamycin, erythromycin, kanamycin, neomycin novobiocin, oxacillin, penicillin, and tetracycline. The results indicated antibiotic resistance is common in all different sites and the degree of resistance varies from month to month and season to season. Bacteria that are commonly present in sewage that showed resistance include *E. coli*, *Staphylococcus aureus*, *Enterococcus faecalis*, and *Enterobacter cloacae*.

Griggs, E., M. Mallozi, T. Hanna, A. Driks, R. Giorno. LTU. **Understanding the role of spoVID and cotO in the proper assembly of the coat and exosporium of *Bacillus anthracis*.**—Spore formation in *Bacillus anthracis* occurs when the bacterium meets a nutrient poor environment. When this happens, the bacterium undergoes a transformation from rod form to the protective spore form. The spore is composed of genetic material housed by the cortex, and surrounded by a protective shell called the coat. In addition, *B. anthracis* also has a loosely fitting shell called the exosporium. Some genes which control the formation of the coat in *B. anthracis* also are thought to control the formation of the exosporium. The goal of this research is to complement spoVID and cotO mutant strains of *B. anthracis*. The cotO mutant forms no exosporium and the spoVID mutant has little coat formation, but maintains an exosporium. In order to show if disruption in spore morphology is caused by the mutated gene, a complementation of the spoVID and cotO mutant strains will be performed. Because spoVID is in a two gene operon with ysxE, either spoVID or spoVID ysxE will be used to complement the spoVID mutant strain. In addition, inosine hydrolase activity will be compared in wild type, spoVID, cotO, and IunH mutant spores, to see if morphological changes correlate with loss of inosine hydrolase activity.

Haynes, B.D. and W.H. Dees. McSU. D. Simon and A.E. Jerse. USUHS. **Iron transport in *Neisseria gonorrhoeae* - the FbpABC operon: construction of an fbpA knockout mutant.**—*Neisseria gonorrhoeae* is a pathogenic bacterium that uses host supplied iron sources during infection. Environmental conditions in the female genital tract make iron more readily available to the bacterium. The fact that *N. gonorrhoeae* has the ability to grow in the lower genital tract of female mice indicates that non-host restricted iron sources are available in this body site. The ferric binding protein A (FbpA) of *N. gonorrhoeae* is required for uptake of some forms of iron, although its role in the iron transport system is not fully understood. To test whether the FbpA protein is required for growth of *N. gonorrhoeae* during experimental murine infection, we made an isogenic fbpA mutant. The upstream promoter region of the fbpA gene and the upstream region of fbpB gene were conjoined via polymerase chain reaction (PCR) using a method called splice overlap extension (SOEing). A kanamycin resistance marker was added to aid in selection. The fbpA pro-fbpB fragment was transformed in *N. gonorrhoeae* and kanamycin resistant transformants were screened via PCR. A mutant with a disrupted fbpA gene was identified. This mutant should serve as a useful tool for studying the importance of FbpA in iron acquisition during infection of females.

Haynes, B.D. and W.H. Dees. McSU. D. Simon and A.E. Jerse. USUHS. **Iron transport in *Neisseria gonorrhoeae*: FbpA knockout mutant complementation in the lctP-aspC intergenic region.**—The role of the ferric binding protein A (FbpA) in the iron transport system of *Neisseria gonorrhoeae* is not fully understood and would better be studied by creating an isogenic mutant. A mutant was created lacking the fbpA gene and the mutant's failure to grow in mice would support the hypothesis that the FbpA protein is important in the pathogenesis of *N. gonorrhoeae*. The replacement of the gene back into the genome and the expression of the FbpA protein in vivo will prove that the gene is important in iron uptake and for survival in the host organism. The lctP-aspC intergenic region was amplified via polymerase chain reaction (PCR) along with a cat cassette and the fbpA gene. Attempts were made to conjoin the fragments by splice overlap and extension (SOEing) PCR. However, due to inconsistencies in the results, further testing is required. This complementation process in vitro is necessary for use in the mouse model and essential in confirming the importance of the fbpA gene.

James, E.S., N. Kumar, A. Simmons, and J.C. Larkin. GSU. **Interaction of the plant cell cycle inhibitor, SIAMESE, with specific cyclins and cyclin-dependent kinases.**—During the development of multicellular organisms, cell differentiation is tightly coordinated with cell division. In some cell types of both plants and animals, a modified cell cycle occurs during differentiation in which the DNA is replicated without concomitant cell division, resulting in an increase in nuclear DNA content. Previous work using *Arabidopsis* trichomes as a model for cell differentiation, demonstrated that the SIAMESE (SIM) gene encodes a cyclin-dependent kinase inhibitor that suppresses mitosis during establishment of endoreplication. Plants have many different cyclins and CDKs and the aim of this project is to better define the biochemical mechanisms by which the SIM protein inhibits cell division by testing the hypothesis that CYCB2;4 interacts with SIM and CDKB1;1 in bimolecular fluorescence complementation (BiFC). A CYCB2;4 cDNA clone was obtained from Dr. Jelle Van Leene (University of Ghent, Belgium). The CYCB2;4 split yellow fluorescence protein fusions were produced to test the interactions in onion cells by BiFC. This work is relevant in cancer research because, in animals, loss of control of cell division leads to cancer and in plants, this leads to endoreplication. The

comparison of plant and animal cell cycle control mechanisms may give useful insights relevant to this experiment.

LeBlanc, L.J., M.N. Rogers, and J.L. Comeaux. McSU. **Effects of turkey brining on pathogen survival and meat water content.**—Many popular recipes for cooking turkeys call for “brining” the turkey in order to increase the moistness and tenderness of the cooked meat. This treatment consists of soaking the turkey in a saturated salt and sugar solution for 1-2 days. We hypothesized that this would have the opposite effect, as the hypertonic brine solution should draw moisture from the meat. Experimental data support our hypothesis. We then hypothesized that this brining could have some beneficial effect by reducing potential pathogens associated with the raw turkey. We compared survival of *Salmonella Typhimurium*, *Escherichia coli*, *Campylobacter jejuni*, *Klebsiella pneumoniae*, and *Staphylococcus aureus* in brining solution to that in sterile deionized water. Brining reduced the number of viable cells but did not approach sterilization. As such, we determined that brining of turkeys does not provide significant benefit.

Li, X., Z. Allgood, and P.L. Hindmarsh. LTU. **Development of an autonomous replicating plasmid for *Candida albicans*.**—*Candida albicans* is an important human pathogen and is part of the normal human flora. Changes in the host immune machinery can allow an overgrowth of *C. albicans* leading to a serious infection, candidiasis. The goal of this project is to develop an autonomous replicating plasmid to serve as a genetic tool for analysis of *C. albicans* transcription, regulation, pathogenesis, and infectivity. An autonomous replicating plasmid requires two elements: an autonomous replicating sequence and a segregation element. For this work we will be using the mechanism identified in Epstein Barr Virus (EBV). The Family of Repeats (FR) sequence is a DNA from sequence from EBV. We are engineering this sequence into a plasmid (either pRC2312FR or pMK22FR). This sequence is recognized and will bind specifically to an EBV protein Epstein Barr Nuclear Antigen 1 (EBNA1). We will be expressing EBNA1 in *C. albicans* by knocking out the URA3 gene through homologous recombination. EBNA1 can bind both to FR and AT rich sequences in chromosomal DNA. Expression of EBNA1 and the presence of FR will tether the plasmid to the *C. albicans* chromosome and during cell division, will segregate the plasmids into daughter cells.

Martinez, S., A. Aubin, R. Adams, D. Ledet, A. Corbin, R. Nathaniel, B. Ramachandran, and M. Kilgen. NiSU. **Anthropogenic molecular markers for microbial source tracking in Bayou Lafourche.**—Bayou Lafourche, the sole drinking water source for 300,000 people in five parishes, has failed to consistently meet its designated use criteria set by the LA Department of Environmental Quality (LDEQ). Criteria include fecal coliform standards for drinking water supply, primary contact recreation, secondary contact recreation, oyster propagation and harvesting. This resulted in a “Total Maximum Daily Load” (TMDL) imposed on the bayou by the Environmental Protection Agency. The goal of this project was to identify anthropogenic sewage contamination to the bayou. Thirty-four sites in the Ascension and Assumption parish watersheds were selected for a year of monitoring. Samples were analyzed for optical brighteners (OBs), fecal coliforms, and *Escherichia coli*. Samples positive for these parameters were selected for PCR analysis with three anthropogenic molecular markers: Human polyoma virus - BK, *Methanobrevibacter smithii*, and human-associated Brevibacterioides HF 183. Results identified twelve “hot spots” of significant human sewage sources to the bayou. Overall, this project provided the LDEQ with data and information to address anthropogenic water quality

problems in the bayou's watershed. The identification of sources of human sewage contamination to this vital bayou is extremely important in working toward restoring its water quality to its designated use criteria. Supported by the LDEQ.

Miller, B.N., C. Davis, J.C. Putnam, and A. D. Wiedemeier. ULM. **Characterization of novel agrobacteriophage JP1L.**—*Agrobacterium* spp. are soil-borne pathogens. Some members of *Agrobacterium* have one or more tumor inducing plasmid(s). In pathogenic *Agrobacterium* species, the DNA is transferred (T-DNA) from these plasmids into the host plant chromosome, which up-regulates the plant hormones responsible for growth and cell division. *Agrobacterium tumefaciens* is the causative agent for crown gall disease affecting many economically important plants, such as walnut, cherry, and peach trees. Bacteriophages are viruses that infect bacteria and utilize different reproductive strategies dependent upon growth conditions. A lysogenic infection occurs as the phage DNA is inserted into the host chromosome and replicates simultaneously with its host. In contrast, lytic infections lyse the host cell, releasing viable phage progeny. Therefore, lytic phages are the best bio-control candidates. We present characteristic data of one novel, lytic agrobacteriophage, JP1L, including isolation procedures, plaque and phage structures, restriction enzyme digests, and immunity studies. The sequencing of JP1L is underway, and once the sequence is elucidated, we will begin analysis of the genome by subjecting it to multiple bioinformatics tools. Genomic sequence of JP1L will be compared with the single published agrobacteriophage sequence of 7-7-1. Preliminary results on the efficacy and employment as a bio-control agent also will be illustrated.

Naquin, A., D. Samaha, and R. Boopathy. NiSU. **Antibiotic resistant/Antimicrobial property of curcumin.**—Curcumin is an active ingredient present in turmeric, which is commonly used in cooking of Indian food. The curcumin has several functional groups in its structure. The aromatic ring systems are phenols, which are connected by carbonyl groups. Curcumin has been shown to have antitumor, antioxidant, antiarthritic, and anti-inflammatory properties in many studies. However, the antimicrobial property of curcumin is not well studied. Therefore, this study was conducted to investigate the antimicrobial property of curcumin on four common bacteria, namely, *E. coli* O157:H7, *Salmonella typhimurium*, *Vibrio vulnificus*, and *Staphylococcus aureus*. The results revealed that curcumin effectively inhibited the growth of these bacteria in *in vitro* as well as in *in vivo* studies. The meat products such as, chicken, beef, and pork marinated with curcumin for four hours and inoculated with a known concentration of *E. coli*, *Salmonella typhimurium*, and *Staphylococcus aureus* had significantly lower bacterial numbers compared to control. Similarly, the oysters marinated with curcumin had lower number of *Vibrio vulnificus*. This study revealed that curcumin has the potential to reduce food-borne illness.

Paidipalli, M. and N. Crews. LTU. **Quick and efficient quantification techniques in DNA damage analysis.**—DNA exposed to sources such as radiation and chemicals, ultimately leads to cell death or carcinogenesis. In order to have a better understanding of the damaged DNA, we have simulated few major types of DNA damage in *E. coli* bacteria both in plasmid and cultured cells. The sources used for the DNA damage simulation were UV radiation (to create photoproducts) and restriction enzyme digestion (to create double strand breaks). We also have been successful in the early detection and quantification of different types of DNA damage. To evaluate the DNA damage, we have compared the amplification levels of the undamaged and the damaged DNA through a technique called Quantitative Polymerase Chain Reaction (qPCR).

qPCR has been used to quantify the photoproducts formed from non-ionizing radiation (UV radiation in our experiments). Another technique called High-Resolution Melting Analysis (HRMA) has been used to detect the double strand breaks, usually caused by ionizing radiation (restriction digestion in our experiments). The bond strength between the DNA strands is used as a measure for HRMA, which again differs between the damaged and undamaged DNA. The techniques presented provide a rapid approach towards different types of damage detection thus enabling early chances of repair.

Patten, R., J. Comeaux, and K.A. Jackson. McSU. **Identification of *Salmonella* in Green Anoles of Calcasieu Parish.**—*Salmonella* is a Gram negative bacterium of the family Enterobacteriaceae known to cause two distinct diseases in humans referred to as salmonellosis. Common sources of *Salmonella* infections are uncooked poultry products or contact with fecal wastes of reptiles and amphibians. The overall goal of this project is to determine the rate of *Salmonella* infection in Green Anoles of Southwest Louisiana. Fecal samples were obtained from *Anolis carolinensis* (Green Anoles) captured in Calcasieu Parish and tested for the presence of *Salmonella* using XLD agar and PCR using primers specific for the *Salmonella* *invA* gene. Twelve out of 50 (24%) Green Anoles tested positive for *Salmonella* with one of the animals testing positive for *Salmonella enterica* serovar Enteritidis.

Pierce, E., J. Collins, and P.L. Hindmarsh. LTU. **Using combination antifungal drug treatment on resistant strains of *Candida albicans*.**—Our group has developed an assay system to identify antifungal drugs in combination to control growth in *C. albicans*. Control of *C. albicans* infections face two obstacles: toxicity to the infected individual and the development of resistance by *C. albicans* to the present antifungal therapies. Our goal is to identify combinations of antifungal drugs that decrease *C. albicans* growth using minimal inhibitory concentrations or sub-minimal inhibitory concentrations (MIC or sub-MIC) with the goal of reducing resistance and lowering host toxicity. We will be testing strains of *C. albicans* that are resistant to a single antifungal drug and determine whether our two-drug combination will overcome the resistance. We have been using growth curves and colony forming units to identify synergistic activity using several two-drug combinations. We have demonstrated that drugs delivered simultaneously have a noticeable decrease in growth of *C. albicans*, but when we administer these drugs sequentially there is a very dramatic decrease in cell growth. The highest synergistic activity using sequential addition of antifungal drugs occurs with a short duration prior to the second drug (1-hour) but is less effective with a longer duration (2-hour).

Pradhan, L. and R. Giorno. LTU. **To determine the roles of the spore coat and the exosporium in contributing to spore ozone resistance in *Bacillus anthracis* using aqueous ozone.**—In response to unfavorable environmental conditions *Bacillus anthracis* is capable of forming a specialized dormant cell type called a spore which can resume vegetative growth when the conditions become favorable. *Bacillus anthracis* spores are of interest because they are the infectious form of the disease anthrax and are highly resistant to environmental stresses such as extreme temperatures, pH, chemical damage, and drying that readily kill other cellular counterparts. One class of chemicals commonly used to inactivate spores is oxidizing agents. Ozone is a strong oxidizing agent and has well known sterilizing properties. Studies have been performed in *Bacillus subtilis* which demonstrate the protective role the spore coat plays against aqueous ozone. However, at present the role of the exosporium, the outer most layer of a *B.*

anthracis spore, has yet to be investigated with respect to ozone resistance. The objective of this study is to determine if the *B. anthracis* spore coat and/or exosporium play any role in providing resistance when challenged to aqueous ozone. Studies using spoVID and cotE mutant spores, which lack the coat and exosporium respectively, are underway to determine their ability to withstand different concentrations of time dependent aqueous ozone exposure.

Sanner, K., A. Aubin, S. Pradhan, L. Foreman, R. Nathaniel, and A.L. Corbin. NiSU. **The use of lytic bacteriophage for antibacterial therapy in shrimp aquaculture for the control of Vibrios.**—The use of bacteriophage to control infections has seen increased interest with the emergence of antibiotic resistant pathogens. Phage therapy is accomplished by the introduction of host-specific phage to cause lysis of the target pathogen. Vibriosis causes high mortality for *Litopenaeus vannamei*, the Pacific white shrimp, in aquaculture. During a recent outbreak in an aquaculture facility in Texas, samples of morbid shrimp hepatopancreas and hemolymph, and the pond water of the infected raceway were screened for potential shrimp pathogens. We used culture methods and PCR to determine the infectious agent. Shrimp hepatopancreas (5/5) and hemolymph (5/5) samples were confirmed as harboring *Vibrio parahaemolyticus*. In the aquaculture pond water the *Vibrio parahaemolyticus* level was 10⁶ organisms/mL. These pathogenic isolates were screened for sensitivities to the probiotics that were being used in the raceways and showed no susceptibility to these isolates of Bacillus. *V. parahaemolyticus* (ATCC 17802) was used as the host for the isolation of bacteriophage from wild caught oysters. Twelve different bacteriophage plaques were triple purified and used to test for lytic potential against the isolated aquaculture pathogens. Five isolates of *V. parahaemolyticus* from the outbreak tested for susceptibility. Ten of the twelve bacteriophage isolates showed lytic activity to one of the pathogenic isolates. Since phage are highly specific to target bacteria, increase in titer as they infect, multiply in and kill their target microbes, and are not able to infect plants or animal cells, bacteriophage are a strong candidate for biocontrol of vibriosis in aquaculture.

Seetala, P. and R. Giorno. LTU. **Do spore coat proteins in *Bacillus anthracis* play a role in superdormancy?**—*Bacillus anthracis* is a bacterial species which can create an endospore, the infectious particle of anthrax infections. A spore is a protective, dormant cell type which can survive routine decontamination attempts. One way to perform adequate decontamination is to take the spores out of this protective state through germination. This involves exposing spores to nucleosides and amino acids which trigger pathways that break apart the spore. However, a certain amount of spores do not germinate in response to normal germinant levels. If they do not germinate after two germination attempts, they are termed “superdormant”. We hypothesize that superdormancy could be affected by proteins that make up the coat and exosporium layers of the spore. SDS-PAGE was used to compare proteins present in naive spores (never exposed to germinants), to proteins in superdormant spores (put through two germination attempts). Data suggests superdormant spore coats contain more protein overall as evidenced by increased intensity of several protein species separated by SDS-PAGE compared to naive spores. Further research on these protein abundances could lead to better decontamination techniques, and help prevent ungerminated spores from infecting an individual at a later time.

Williams, K.R., K.S. Dixon, and J.L. Comeaux. McSU **Survival of pathogens on stainless steel.**—Stainless steel is used in many applications. It is the material of choice for many machines, tools, and furnishings in the medical, pharmaceutical, and food preparation industries.

Due to the frequent outbreaks of fecal-oral enteric infections such as *Salmonella*, *E. coli*, *Listeria*, and *Campylobacter*, it is a question of importance to the public health field to determine the role of publically used surfaces in transmitting infectious agents. In many high traffic areas, such as door handles, hospital trays, and food preparation surfaces, stainless steel is the most commonly used material because of its high durability and low maintenance level. This experiment tests the survival time of representative enteric pathogens *Salmonella* and *E. coli* on stainless steel and compares them to the survival of the non-enteric pathogen methicillin-resistant *S. aureus*. Neither of the representative enteric organisms used in the experiment survived on the stainless steel for more than one hour. This short window of survival suggests that enteric pathogens causing fecal-oral infections are not being transmitted on stainless steel surfaces in high traffic areas. Other pathogens, including the *S. aureus* used in this experiment, may, by virtue of their longer survival time, be transmitted on high traffic stainless steel surfaces.

Zhang W. and A.D. Radadia. LTU. **Evaluation of a low cost nanocrystalline diamond seeding procedure to carry out bacterial immunoassays.**—Microfabricated biosensor-based immunoassays for detection of bacterial pathogens rely on the cost, sensitivity, selectivity and stability of bio-recognition elements anchored to solid surfaces. Ultra nanocrystalline diamond (UNCD) and boron-doped ultra nanocrystalline diamond (BD-UNCD) surfaces have shown to be the excellent candidate for making microfabricated biosensors compared to conventional materials due to the stability of its surface and its UV-alkene bioconjugation chemistry. However, the cost of these diamond thin films is very high. In this paper, we introduce a low cost nanocrystalline diamond (NCD) seeding process to form a uniform NCD film which can tether antibody using the UV-alkene chemistry, capturing cells of the pathogenic bacterium *Escherichia coli* O157:H7. The result from scanning electron microscopy (SEM) and fluorescence microscopy shows the NCD particles surface coverage and bacteria capture ability is as good as UNCD and BD-UNCD, and can be used to develop a low cost biosensor.

Zhang, W. and A.D. Radadia. LTU. **Evaluation of boron doped ultra nanocrystalline diamond surfaces to carry out bacterial immunoassays.**—Microfabricated biosensor-based immunoassays for detection of bacterial pathogens rely on the sensitivity, selectivity and stability of bio-recognition elements anchored to solid surfaces. Ultra nanocrystalline diamond (UNCD) surfaces have been shown to be an excellent candidate for making microfabricated biosensors compared to conventional materials due to the stability of its surface and its UV-alkene bioconjugation chemistry. Studies so far report findings with electrically non-conductive UNCD surfaces. Such films can be doped with boron to make it electrically conducting and are an attractive alternative for low-noise biosensing electrodes. In this paper, we compare the ability to anchor antibodies on boron-doped UNCD using UV-alkene chemistry, capturing cells of the pathogenic bacterium *Escherichia coli* O157:H7 and non-specific binding of cells. The results from fluorescence microscopy suggest that the boron-doped UNCD performs better than UNCD, and can be used to develop new kinds of biosensors with improved signal to noise.

Molecular and Biomedical Biology Section

Bergeron E., K. Holloway, and K. Pruitt. NiSU. **Characteristics of aromatase expression in breast cancer cell line McF-7.**—Aromatase, an essential enzyme used to convert androgens to

estrogens, is expressed throughout the body and is encoded by the CYP19A1 gene. Over 75% of diagnosed breast cancers are estrogen-dependent, with anti-estrogen therapies currently being used to treat a majority of breast cancer cases. Anti-estrogen therapies such as Tamoxifen improve breast cancer survival rates, but have significant side effects. Aromatase inhibitors are new highly effective anti-estrogen therapies with benefit that surpass that of Tamoxifen, but the side effects of indiscriminate aromatase inhibition are significant. The mechanics and transcriptional regulators of aromatase expression are the new focus and are being studied in full. SIRT1, an NAD⁺-dependent deacetylase, has been shown to localize to the PI.3/II and I.4 transcriptional promoter regions in breast cancer cells and may be a vital component of aromatase expression, synthesis, and regulation. SIRT1 has been found to regulate non-histone proteins, namely disheveled proteins (Dvl), with inhibition of SIRT1 directly relating to decreases in Dvl expression. It is hypothesized that SIRT1 acts as a mediator for “promoter switching” in breast cancer tumorigenesis with Dvl proteins acting as a part of the pathway. Experimentation results suggest SIRT1’s aromatase regulatory relationship with McF-7 cell lines is more direct than that of SIRT1’s role in aromatase regulation in ovarian cancer cell lines. Inhibition of SIRT1 alone and SIRT1/2 together show a decrease in Dvl protein and mRNA expression, with SIRT1 inhibition alone marking a greater decrease in aromatase expression. A knockdown of Dvl genes reduces the expression of aromatase on an mRNA and protein level, suggesting that Dvl proteins are part of the pathway in which aromatase is transcribed. A knockdown of Dvl-1+2 shows a significant decrease in protein and mRNA expression, with cytoplasmic Dvl-2 seeming to have the greater effect on aromatase expression over nuclear Dvl-1.

Bishop, T., V. Bamberg, W. Johnston, J. Solow, J. Liman, and J. Trischler. LTU. **Structural genomics with the interactive chromatin modeling web server.**—An organism's hereditary information is encoded in its DNA. For eukaryotes, the DNA is part of a biomolecular complex called chromatin. The structure of chromatin is thus a primary determinate of information access. The fundamental unit of chromatin structure is the nucleosome. Our Interactive Chromatin Modeling web server (ICM Web at <http://www.latech.edu/~bishop>) is a tool for folding DNA into chromatin and assessing nucleosome stability. An ICM Web user can select from several different energy models, nucleosome structures and methods for placing nucleosomes in an energy landscape, including use of known nucleosome positions. ICM Web is suitable for interactively investigating nucleosome stability and chromatin folding for sequences up to tens of kilobases in length. Since chromatin structure depends on environmental conditions users can fold a given sequence of DNA into either an irregular and regular chromatin structure. Here, we model chromatin structure near four genes from *Saccharomyces cerevisiae* (CHA1, HIS3, MFA2 and PHO5) with known nucleosome positions. Ongoing development efforts include automated retrieval of sequence and positioning data from genome databases and inclusion of a molecular mechanics energy function. These efforts will allow for optimization of our 3D models, extend the functionality of ICM Web and eliminate potential errors.

Champagne, D.P. and P.E. Shockett. SLU. **Analysis of illegitimate V(D)J recombination events in Notch1 and Bcl11b during mouse development.**—Illegitimate V(D)J recombination events associated with cryptic recombination signal sequences (cRSSs) are implicated in the formation and/or progression of several T-cell malignancies. Notch1 (oncogene) and Bcl11b (tumor suppressor gene) are involved in T-cell development and contain hotspots for V(D)J-

recombinase mediated deletions. We are conducting expanded frequency and junctional analyses of deletions during mouse development to determine the age- and gender-specific detection and occurrence of these events. In thymus, deletions increase in frequency between fetal and neonatal stages, are detected through 7 months of age, exhibit clonality, and, as previously observed, are more frequent in Bcl11b. Deletions also are detected in spleen. Nucleotide loss at deletion junctions is more frequent and extensive in Bcl11b, and P nucleotides are more abundant in Notch1. N nucleotide insertions increase between fetal and juvenile stages, with inverted repeats at recessed coding ends (Pr nucleotides) consisting mostly of single nucleotide additions consistent with normal TdT activity. Detailed age and gender junctional processing analyses and determinations of postnatal inducibility of deletions using RAG transgenic mice are in progress. Results are presented in the context of similar studies of illegitimate V(D)J recombination events in the nonimmune HPRT gene and normal V(D)J recombination at antigen receptor loci.

Charles, J., H.T. Leung, and P. Kim. GSU. **Model organism for study of LRRK2 – Parkinson’s disease gene.**—The leucine rich repetitive kinase 2 gene (LRRK2), is one of five genes associated with the development of Parkinson’s disease (PD). The gene is located on the long (q) arm of chromosome 12 at position 12 from base pair 40,618,812 to base pair 40,763,086. It is responsible for the production of Dardarin, a protein active mainly in the brain. Dardarin is involved in GTP hydrolysis and phosphorylation. It comprises a leucine rich region which plays a role in protein/protein interactions within the cell. Research has shown that Dardarin mutations contribute to the development of late onset Parkinson’s disease as it alters protein structure and consequently its function. Over 100 different mutations have been identified in different races of families in different parts of the world. It is difficult to study the functions of Dardarin and the underlying mechanism of its malfunction leading to PD in humans, thus, different model organisms have been used in the past for the study of this gene. The aim of this project is to find out which organism will be the most suitable model organism for the study of the LRRK2 gene. Mutants could then be generated from these organisms later for testing.

Dahal, S. and C.R. Gissendanner. ULM. **Inhibitory interactions between novel extracellular leucine-rich repeat proteins (eLRRPs) in *Caenorhabditis elegans*.**—The eLRRP superfamily is a group of evolutionarily diverged signaling proteins with a wide variety of cellular functions. These proteins possess leucine-rich repeats which are evolutionarily conserved protein-protein interaction motifs. eLRRPs are secreted, GPI-linked, or are transmembrane with the LRR region in the extracellular domain. eLRRPs are highly evolvable with many structural forms. eLRRPs can associate with a large variety of conserved motifs. eLRRPs are largely taxon-specific with few proteins being broadly conserved across phyla. This suggests that these signaling proteins may play an important role in metazoan evolution. Our lab has been investigating the novel eLRRP, PAN-1, in *C. elegans*. PAN-1 is necessary for *C. elegans* development including the regulation of molting and development of the adult soma at the larva-to-adult transition. We propose that PAN-1 regulates a novel signaling system that promotes life cycle progression in nematodes. To further investigate PAN-1 signaling we have been testing for interactions between PAN-1 and other eLRRP encoding genes. We have found that genes encoding secreted or GPI-linked eLRRPs suppress PAN-1 loss of function. This suggests that there are extensive interactions among eLRRPs in *C. elegans* and that secreted or GPI-linked eLRRPs inhibit the activity of PAN-1.

Guergues, J. and W.C. Wolf. LTU. **Survey of human kallikrein 5 gene expression in various normal and malignant tissues.**—Human tissue kallikrein 5 (KLK5) is a part of a kallikrein gene family located on chromosome 19 and consisting of 15 different serine proteases. They are enzymes that are reportedly expressed in many different tissues, although their contribution to cell physiology remains poorly elucidated. One member, KLK 3, or prostate specific antigen, is well characterized as biomarker (PSA test) for hypertrophy and malignancy of the prostate gland. Our studies investigate the levels of KLK5 expression in normal and malignant samples from eight human organ systems: breast, colon, kidney, ovary, prostate, lung, liver, and thyroid as well as in the relative normal tissues using quantitative real time RT-PCR (qPCR). The samples are represented on a commercially available cDNA array. Samples are normalized by beta actin expression, and analysis is performed in triplicate. Absolute quantification is achieved by using a standard curve of serial dilutions of a plasmid containing a KLK5 cDNA clone. Positive results are confirmed by amplicon size, melt curve analysis, and DNA sequencing. Our results demonstrate a statistically significant increase in KLK5 expression in breast, ovarian, and thyroid tumors as compared to normal tissue counterparts. We are currently attempting to verify these results at the protein level by immunohistochemistry. Overall, our results indicate that KLK5 should be further evaluated as a potential biomarker for several malignancies.

Haywood, J.C., C. Tranter, and N. Crews. LTU. **Toward PCR-based genetic analysis in space.**—The astrobiology community will benefit from an instrument able to perform the polymerase chain reaction (PCR) and subsequent amplicon analysis *in situ*, in space. However, conventional instrumentation is not compatible with the requirements of space flight. Temperature control – Laboratory-based PCR equipment relies on thermal convection for temperature cycling. Natural convection relies on gravity; forced convection requires a plenteous working fluid and an infinite heat sink; neither approach would be functional in a space environment. Power consumption – Conventional PCR instrumentation operates by cyclically heating and cooling a large thermal mass containing a biological sample. For PCR to occur relatively quickly (< 1 hr), power on the order of 500W is typically required. This large power consumption also presents a barrier to space applications. We have developed a prototype system capable of simultaneous PCR and DNA spatial melting curve analysis (MCA), while consuming an average of less than 4W of electrical power. The instrument's core is a microfluidic component where qualitative PCR (qPCR) and MCA are performed simultaneously and repeatedly within a steady-state temperature gradient. The temperature control for this system relies solely on thermal conduction, which is unaffected by the presence or absence of gravity.

Hoffman, T.L. and K.A. Jackson. McSU. **Effects of atrazine on testosterone and corticosterone levels in *Xenopus laevis*.**—Atrazine is a chemical that has been used in agriculture as an herbicide for decades. Numerous studies have shown that Atrazine is detectable in waterways and groundwater in regions near agricultural areas. Some studies have shown that areas with high levels of Atrazine contamination have frogs with abnormalities such as decreased hatching success, limb abnormalities, and feminization of the gonads. Although these studies showed that Atrazine was present in the habitats of these frogs, other environmental pollutants also were present which could have been responsible for the abnormalities detected. The goal of this work was to determine if Atrazine exposure results in changes in testosterone and corticosterone levels in *Xenopus laevis*. We found that exposure to Atrazine at concentrations of 0.1 and 1 ppb had no effect on either testosterone or corticosterone levels in male frogs.

Ibole, P.C., and T.A. Murray. LTU. **Newly discovered neural receptor's role in amyloid beta1-42 pathogenesis in Alzheimer's disease.**—A recently discovered cholinergic neurotransmitter receptor subtype, the $\alpha 7\beta 2$ nicotinic acetylcholine receptor ($\alpha 7\beta 2$ -nAChR), is expressed in neurons in the septum and hippocampus of the rodent brain. These regions experience a loss of neurons expressing cholinergic receptors in Alzheimer's disease (AD), in humans and in rodent AD models. This loss contributes to the decline in cognition and memory as the disease progresses. Intracellular deposits of amyloid- $\beta 1-42$ peptide ($A\beta 1-42$) have been identified as an early step in AD etiopathology. Notably, $\alpha 7$ -nAChR-mediated endocytosis of $A\beta 1-42$ peptide results in intracellular deposits of $A\beta 1-42$ in AD. The $\alpha 7\beta 2$ -nAChR is similar in functional attributes to the well-characterized $\alpha 7$ -nAChR subtype. However, the potential for $\alpha 7\beta 2$ -nAChR-mediated endocytosis by this newly discovered receptor has not been studied. We have created cell lines expressing $\alpha 7\beta 2$ -nAChR and $\alpha 7$ -nAChR in the native nAChR-null neuroepithelial SH-EP1 cell line. Each receptor subunits contains either a yellow ($\alpha 7$) or cyan fluorescent protein, YFP or CFP, respectively. Cells were incubated with $A\beta 1-42$, or $A\beta 1-42$ scrambled peptide, stained, and then imaged to (1) quantify the volume and (2) intracellular position of peptide deposits and (3) co-localization with fluorescently-labeled receptors.

Jackson, S.A., E.N. Rizzo, A. Scott, S. Bhuiyan, B.N. Miller, J.S. Harmson, C.R. Gissendanner, P. Wiedemeier, A.D.M. Wiedemeier, and A.M. Findley. ULM. **Cluster identification and functional annotation of mycobacteriophage Trike.**—As part of the HHMI-SEA Phages bacteriophage genomics program, soil samples were processed for novel mycobacteriophage isolates. Following their purification and high-titer lysate preparation, DNA was isolated from each sample and subjected to a battery of restriction enzymes (BamHI, ClaI, EcoRI, HaeIII, and HindIII) for preliminary cluster assignment. Many of the ULM isolates only cut with HaeIII, which indicates that the isolate is likely a member of the 'A miscellaneous' group of mycobacteriophages. In an effort to gain further insight into their true assignment, the NEB Cutter 2.0 virtual restriction digestion utility was used to identify additional enzymes whose restriction patterns could distinguish between members of subclusters A2-A10. Restriction enzymes NaeI, PflFI, PpuMI, SacI, SacII, SbfI, ScaI, and StuI were chosen for additional digestion of targeted isolates. Based on the cutting patterns observed with these endonucleases, mycobacteriophage Trike was hypothesized to be a member of the A10 subcluster, an assignment that was confirmed by whole genome sequencing. A comparison of tabular and graphical tools for the use of restriction enzyme digestion patterns in cluster assignment will be presented. In addition, the functional annotation of Trike and its comparison to the A4 mycobacteriophage Peaches will be offered to provide justification for their observed homoimmunity.

Liman, J. and T.C. Bishop. LTU. **Geometric analysis of DNA in molecular dynamic simulations of nucleosomes.**—Higher order structures of DNA affect gene regulation, replication, transcription, and DNA repair, in all eukaryotic organisms. Even though it has been known for decades that DNA is polymorphic and bendable, the sequence specific material properties of DNA and their relation to higher order structures, e.g. nucleosome arrangement in chromatin, is not yet clear. Since nucleosomes represent the fundamental building block of higher order DNA structures, a proper understanding of how different DNA sequences behave in nucleosomes is required in order to completely comprehend genomic functions. The primary objective of this research is to gain insight into why nucleosomes position as they do on the

genome. Here we seek to determine if the conformation of DNA in nucleosomes, as described by DNA helical parameters, is conserved during all atom molecular dynamics simulations or whether different sequences of DNA assume distinct conformational states in the nucleosome. The molecular dynamic simulations represent nucleosomes with widely varying DNA sequences. The sequences correspond to the most highly occupied and well defined nucleosome positioning sequences in the yeast genome and to sequences in the yeast genome that are known to be free of nucleosomes. DNA conformations in the simulations are compared using a helical parameter Fourier filtering technique that previously allowed us to identify the necessary and sufficient conditions for DNA superhelix formation in x-ray structures of the nucleosome. Applying the same filtering techniques to our molecular dynamics simulations reveals that some helical parameter values are independent of sequences while others are strongly affected by DNA sequence. This project is funded by NSF.

Malaviya, A. and P.W. Sylvester. ULM. **Antiproliferative effects of combination treatment of γ -tocotrienol with PPAR γ agonists and antagonists can be mediated through PPAR γ -independent mechanisms in breast cancer cells.**— γ -tocotrienol is a member of vitamin E family of compounds that displays antiproliferative effects against breast cancer cells. Peroxisome proliferator-activated receptor gamma (PPAR γ) is a ligand activated transcription factor that regulates transcription of target genes. Upon activation by endogenous or synthetic ligands, it binds to specific PPAR response elements and acts as a transcriptional regulator. Recent studies have shown that PPAR γ is overexpressed in breast cancer cells and that combined treatment of γ -tocotrienol with PPAR γ antagonists shows potent anticancer effects by decreasing expression of PPAR γ in breast cancer cells. However, studies also suggest that PPAR γ ligands exhibit antiproliferative effects independent of PPAR γ . Therefore, we characterized studies to determine whether combined treatment of γ -tocotrienol with PPAR γ agonists or antagonists show anticancer effects which may be independent of PPAR γ . MTT assay results showed that antiproliferative effects of γ -tocotrienol were significantly reversed by treatment with PPAR γ agonists and these effects were significantly enhanced by treatment with PPAR γ antagonists. In addition, qRT-PCR and western blot studies showed that the anticancer effects of combined treatment of γ -tocotrienol and PPAR γ antagonist may be due to down regulation of COX-2, PGDHS, and up regulation of PGD2, without any changes in the expression of PPAR γ .

Patel, S., V. Vettriselvi, V. Jayanth, and S.F.D. Paul. SRMCRI. **Study of GSTM1 genetic polymorphism and risk of lung cancer in a Tamil population.**—The recognition of genetic traits that predispose individuals to cancer is important in order to recognize individual cancer risk. Therefore, individual variation in expression of enzymes have been widely studied. One such polymorphic enzyme is GSTM1, which belongs to the class Mu of glutathione S-transferases (GSTs). In this study, to check whether GSTM1 genetic polymorphism is associated with risk of lung cancer in Tamil population, peripheral blood DNA was taken from 20 lung cancer patients and 20 controls. Polymerase chain reaction (PCR)-based analysis was performed. In this study, 10% cases and 25% control showed GSTM1 null genotype. Results of this study did not show a positive correlation between the null allele and lung cancer in Tamil population.

Praslicka, B. and C.R. Gissendanner. ULM. **The *Caenorhabditis elegans* orphan nuclear receptor NHR-6 has a crucial role in both cell proliferation and differentiation in the developing hermaphrodite spermatheca.**—NR4A nuclear receptors (NRs) are emerging as

increasingly important transcriptional regulators of numerous metabolic and developmental processes. NR4A NRs have been implicated in several human diseases including cancer, atherosclerosis, and neurodegeneration. In our previous studies, we determined that the NR4A NR ortholog in *C. elegans*, NHR-6, is required for development of the spermatheca. In *nhr-6* mutants, the spermathecae are decreased in size and have ~half the normal number of cells. We performed genetic interaction and cell lineaging studies to determine if the loss of function of negative G1/S cell cycle regulators suppresses the *nhr-6* cell proliferation phenotype. We found that loss of function of *fzr-1*, but not *lin-35*, strongly suppresses the cell number phenotype of *nhr-6* mutants. While cell number is restored in *nhr-6; fzr-1* double mutants, the spermathecal cells still fail to properly differentiate. Thus, loss of *fzr-1* function uncouples the cell proliferation and cell differentiation phenotypes of *nhr-6* mutants suggesting a role for *nhr-6* in both processes. These data suggest a dualistic role for *nhr-6* in regulating both G1/S cell progression and cell differentiation during spermatheca development and establishes the spermatheca as an important model system in identifying the molecular mechanisms by which NR4A NRs regulate cellular transitions.

Prathipati, P., D.W. Jackson, and K.E. Jackson. ULM. **Role of nitric oxide in combating coronary endothelial dysfunction in septal coronary arteries of obese Zucker rats.**—Metabolic syndrome is a collection of ailments which results in prolonged endothelial dysfunction promoting hypertension. This study analyzes the acute effect of carbon monoxide (CO) inhibition and nitric oxide (NO) stimulation in septal coronary arteries. Inactin anesthetized obese (O) and lean (L) Zucker rats (ZR) (13-14 week old) were used. Coronary arteries were isolated from obese and lean Zucker rats and pre-treated with chromium mesoporphyrin (CrMP), a heme oxygenase inhibitor, and L-arginine, a NO precursor. Vessel diameter was measured during a dose response to AcH, which is an endothelial dependent vasodilator. Blood pressure, blood glucose, endogenous CO, body and organ (heart and kidney) weights were higher in OZR compared to the lean group. Low plasma nitrite levels with two fold increase in Arginase 1 expression was observed in OZR compared to the lean group. No difference in the diameters of the septal coronary artery were observed in both groups when treated with CrMP compared to that of vehicle, whereas pretreatment with L-arginine abolished the difference between the groups. This study demonstrates the potential of NO induction to improve coronary blood flow during metabolic syndrome, where alterations in CO levels appeared to have no significant coronary effects. Supported By: LEQSF(2009-12)-RD-A-22.

Reed, W. and K.A. Jackson. McSU. **Identification of *Pseudomonas aeruginosa* using PCR.**—*Pseudomonas aeruginosa* is a gram-negative bacterium that can be found in soil, water, on the skin, and can flourish on most surfaces. This bacterium can cause a number of diseases in humans including pneumonia, septic shock, and infections of the urinary and gastrointestinal tracts as well as skin and soft tissues. The overall goal of this project is to develop a PCR based technique for detection of *P. aeruginosa* in biological samples. We have primers that are designed to recognize the *algD* GDP mannose gene of *P. aeruginosa* which produce a 520-bp product. These primers were tested against multiple bacterial species including other members of the *Pseudomonas* genus and were found to be specific for *P. aeruginosa*. These primers will now be used to test for the presence of *P. aeruginosa* in fecal samples from Green Anoles.

Ren, F. and S. Wang. LTU. **Mixed flow dynamics of DNA molecules in hybrid force microfluidics (HFM).**—Visualizing single DNA dynamics in flow provides a wealth of physical insights in biophysics and complex flow study. One major challenge is high diversity of molecular configurations and deformation dynamics. Therefore, it is highly desired that a large population of DNA molecules could be maintained in uniform configuration at important moments (e.g., the initial configurations). In this presentation, we demonstrated a hybrid field microfluidics (HFM) approach to manipulate DNA molecules in flow. Basically, an electric field is applied on DNA molecules at a desired moment in the presence of a defined pressure driven flow of DNA solution. Electrophoresis of DNA molecules, having an opposite direction to the pressure driven flow, helps create a non-perturbation environment so that macromolecules are trapped at some flow planes. We used microchannels with different geometries to induce various flow patterns comprising of shear and extensional elements. The trapping and coil-to-stretch transitions of DNA were studied with a fluorescence microscopy. DNA molecules were found to be trapped in the focused planes and transformed into globular configuration at the presence of an appropriate electric field. After removing the electric field, the transient responses of the trapped DNA showed larger extension when compared with other flows at similar Weissenberg number.

Richters, M., A. Scott, D. Lovas, J.S. Harmson, C.R. Gissendanner, A.D.M. Wiedemeier, and A.M. Findley. ULM. **Sequence homology at repressor binding sites results in homoimmunity of related mycobacteriophages.**—A lysogen culture of *Mycobacterium smegmatis* containing the prophage Peaches was developed and confirmed by PCR. This culture was then utilized to screen novel phage isolates to determine their homo/heteroimmunity with mycobacteriophage Peaches. Two phage isolates, Rockstar and Trike, were unable to infect the Peaches lysogen culture and, therefore, were assumed to be probable members of the A4 cluster of mycobacteriophages. However, data from a restriction enzyme digestion panel screen and subsequent full genome sequencing of Rockstar and Trike indicated that they were members of the A3 and A10 clusters of mycobacteriophages, respectively. We present a comparative analysis of the repressor binding site sequence homology for A3, A4, and A10 mycobacteriophages that provides evidence for the observed homoimmunity between members of these related, but not identical, cluster representatives.

Scott, A., B.N. Miller, J.S. Harmson, C.R. Gissendanner, A.D.M. Wiedemeier, and A.M. Findley. ULM. **A genomic comparison of A4 cluster mycobacteriophages isolated from soil samples in northeast Louisiana - mycobacteriophages ICleared and Medusa.**—Novel bacteriophages were isolated via direct plating or enrichment regimes and subjected to spot test analysis, repetitive purification plating, and empirical testing that led to the harvesting of high-titer lysates. Lysates were processed for TEM and DNA was isolated from each phage and characterized with BamHI, ClaI, EcoRI, HaeIII, and HindIII endonucleases. Restriction fragments were separated with electrophoresis and gel profiles were compared with known mycobacteriophages to ascertain the novelty of phage isolates. A large number (25-50%) of our isolates cut only with the HaeIII restriction enzyme. Using the NEBCutter 2.0 virtual restriction digest utility and surveying phages from all known clusters, our supposition is that these phages most likely represent members of the ‘A miscellaneous’ group of mycobacteriophages and are predominantly A4 cluster members. Currently, www.phagesdb.org lists over 30 phages belonging to this subcluster. All of these phages were unknown prior to the HHMI-SEA program

and most were isolated using the enrichment protocol from soil samples collected in the eastern/southeastern United States. Evaluation of the genomic DNA of the 2011-2012 ULM isolates indicated that two isolates showing high quality/quantity DNA most likely belonged to this subcluster. In an effort to initiate a comparative genomic study of multiple A4 cluster phages, mycobacteriophage ICleared and Medusa were submitted for sequencing and their resultant genomes were annotated through the DNA Master workflow. ICleared shares highest sequence homology with mycobacteriophage Peaches, while the Medusa genome is more closely related to mycobacteriophage TinaFeyge. Utilizing the BLAST utility within DNA Master and Phamerator A4 cluster member side-by-side and family circle comparisons, we have identified gene regions that are highly conserved amongst the A4 phages and regions that evidence greater variation.

Stephenson, R., P. Kim, and H-T. Leung. GSU. **Search for a suitable model organism to study the function of ALS2 gene.**—This study aimed to determine whether *Drosophila* is a suitable model organism to investigate the role of Alsin in amyotrophic lateral sclerosis (ALS), one of the most common neurological diseases worldwide. At least eight mutations have been reported in the ALS2 gene (which encodes Alsin) in ALS patients; however, it is difficult to study Alsin function in humans. Although *Drosophila* has been used to study many human neurological diseases, there are no suitable *Drosophila* mutants currently available for the study of ALS. Recent advances in *Drosophila* neurogenetics allow the generation of inducible mutants in which the mis-expression of a particular gene can be induced in tissue and developmental-stage specific manners. NCBI protein BLAST analysis of Alsin showed that mouse, zebra fish and *Drosophila* express a protein with high homology to human Alsin while roundworm, another common model organism, has no Alsin homolog. Construction of a phylogenetic tree showed that the mouse protein is most closely related to that of human, followed by the zebra fish and *Drosophila* proteins. BLAST analysis of conserved domains in Alsin revealed no specific information regarding Alsin's putative function. We conclude that *Drosophila* would be a suitable model organism for preliminary studies of Alsin's functions.

Suchak, G. and W.C. Wolf. LTU. **Q-PCR survey of human kallikrein 6 (KLK6) in various human normal and malignant tissues.**—The human tissue kallikrein (KLK) family represents fifteen secreted serine proteases encoded by genes co-localized on chromosome 19q13.4. An aberrant expression pattern has been reported for several tissue kallikrein family members in various malignancies, implicating they may potentially serve as cancer biomarkers. The objective of this study was to survey KLK6 expression by quantitative real-time reverse transcription polymerase chain reaction (Q-PCR) in normal and cancerous tissue samples that are represented in a commercially available cDNA array. We compared changes in KLK6 expression in eight different types of tumors (breast, colon, kidney, ovary, prostate, lung, liver and thyroid) along with corresponding normal tissue. Each sample was quantified in triplicates. Positive samples were confirmed by amplicon size, melting curve analysis and DNA sequencing of Q-PCR products. Absolute quantification of mRNA expression was calculated using a standard curve of serial dilutions of a plasmid containing a human kallikrein 6 cDNA clone. Our results indicated that KLK6 expression of *klk6* increased significantly in breast, ovarian, colon, kidney, lung and thyroid tumor as compared to normal tissues (p value=0.002). KLK6 over-expression has been previously reported in ovarian and breast tumor tissues, but our evidence of over-expression in kidney and colon cancer is novel. We also are currently trying to corroborate

our Q-PCR data with evidence at the protein level. We are using immunohistochemistry on formalin fixed normal and cancer tissue sections to detect KLK6 protein in these samples. Overall, our study indicates KLK6 should be further evaluated as potential biomarker relevant to several human adenocarcinomas.

Zoology Section

Abudiab, O., M.K. Hutton, C.M. Watson, and C.A. Kersten. McSU. **Heart regeneration in *Carassius auratus*. Histology and response to epinephrine.**—Fish have the remarkable ability regenerate removed tissue such as fins, scales, retinal and reproductive tissues. Of particular interest is that cardiac muscle regeneration, distinct from wound healing as in mammals, has been documented in Zebra fish. This study uses goldfish (*Carassius auratus*) to document the early histological events after removal of approximately ten percent of heart muscle and its response when challenged with epinephrine. Collagen infiltration was seen by day seven, peaked by day 14, and was replaced by functional muscle by day 28. Heart rate significantly increased when challenged in control (unmanipulated) and regenerated hearts over that of saline injected hearts. Challenged regenerated hearts had a lower heart rate than pre-challenged (resting) regenerated and pre- and post-challenged controls. One possible explanation is that epinephrine receptors may not be present or fully functioning in the regenerated heart to significantly increase heart rate when challenged. This work was supported by the McNeese State University Chambers Professorship in Pre-Med.

Amundson, R.M., K.E. Perez, and R.L. Minton. ULM and UW-LC. **Evolution of shell shape in the land snail family Polygyridae.**—Polygyridae is a large, morphologically diverse family of land snails composed of widespread species, well-traveled invasives and narrow-range endemics, some of which are of conservation concern. Polygyridae presents several examples of sympatric convergences of shell morphology, where there are multiple examples of members of different genera having completely indistinguishable shell shapes. The extent of this convergence across the family is unknown, as are the evolutionary processes behind it. As part of a larger research program on Polygyridae, we directly assessed the phylogenetic signal in shell shape by mapping geometric morphometric shape variables onto a phylogeny of the family. In combination with ordination techniques such as principal components and canonical variate analysis, we investigated the evolution of shell shape in Polygyridae and discuss our results in the contexts of systematics and taxonomy of the family.

Arabie, L., L. Bruchhaus, and J.D. Hoffman. McSU. **Influence of forest edge on the occurrence and abundance of small mammals.**—Two anthropogenic disturbances that are commonly found in Louisiana forests include overhead power lines and underground pipelines. The areas that are cleared for these structures result in different edge habitat with the adjacent forest. Areas cleared for pipelines are regularly mowed and kept free of tall grass and brush, thus creating a defined forest edge. Overhead power lines are not maintained as often which allows grasses and shrubs to exist. This creates a gradual transition from grass to woody vegetation along the forest edge. Our objectives were to measure small mammal abundance and occurrence in relation to the forest edge for areas containing an underground pipeline and overhead power line. We set up grids of 70 Sherman live traps in each area. We checked traps for five

consecutive days and marked each individual with a Montel ear tag. Abundances were higher for all species (*Neotoma floridana*, *Peromyscus gossypinus*, *Reithrodontomys fulvescens*, *Sigmodon hispidus*) at the overhead power line habitat compared to the pipeline. Individuals captured at the pipeline occurred further away from the forest edge than individuals captured at the power line.

Bruchhaus, L., L. Arabie, and J.D. Hoffman. McSU. **Edge effects on richness and movements of small mammals in a mixed wetland forest.**—Two common anthropogenic disturbances in Louisiana forests include overhead power lines and underground pipelines. Areas cleared for pipelines are regularly mowed and kept free of tall grass and brush, whereas overhead power lines are not maintained as often allowing grasses and shrubs to exist. These two activities result in defined forest edges occurring at the pipeline and a gradual transition from grass to woody vegetation at the power lines. Little is known about the effects these differences have on small mammal communities. Our objectives were to measure small mammal richness and movement in areas with an overhead power line and an underground pipeline. We set up grids of 70 Sherman live traps in each habitat. We checked traps for five consecutive days and marked individuals with a Montel ear tag. Habitats surrounding the overhead power lines had higher species richness than the pipeline. At the power lines, we collected four species (*Neotoma floridana*, *Peromyscus gossypinus*, *Reithrodontomys fulvescens*, *Sigmodon hispidus*), whereas only two species (*N. floridana*, *P. gossypinus*) were caught at the pipeline. Individuals recaptured near the power lines moved longer distances than those caught near the pipeline.

Dees, W.H., J.P. Dupre, A.D. Richard, S.M. McMicken, O.E. Christian, C.W. Richmond and J.R. Woolman. McSU. J. Hightower. CPMC. **The effects of botanical extracts on adult mosquitoes.**—We evaluated the effects of plant extracts on female *Aedes aegypti* mosquitoes. Mosquitoes were exposed to hexane, acetone and methanolic extracts of the following plant parts: (1) cluster bushmint, *Hyptis alata* (HA, stems and roots), (2) woolly rose mallow, *Hibiscus lasiocarpus* (stems and roots), and (3) rattlesnake master, *Eryngium yuccifolium* (RM, buds, stems and roots). Mosquitoes were placed in standard glass Petri dishes treated with extracts. A 10% sucrose solution served as a food source for mosquitoes during the Petri dish tests. We recorded percent mortality at 24, 48, 72, 96 and 168 h. Methanolic extracts of the RM buds and stems and HA stems affected mosquitoes within 24 h of exposure. Mosquitoes exposed to these methanolic extracts demonstrated 57%, 27% and 23% mortality, respectively. Only 3% mortality was observed in controls after 24 h. After 7 days exposure, over 90% mortality was observed in Petri dishes with extracts of RM buds and HA stems. Hexane and acetone *Hibiscus lasiocarpus* root extracts demonstrated a delayed effect on mosquitoes. After 7 days exposure, approximately 50% mortality was observed. Supported in part by NRCS Chenier Plain Sustainability Initiative Collaboration and Louisiana Mosquito Control Association.

Dees, W.H., J.P. Dupre, A.D. Richard, S.M. McMicken, O.E. Christian, C.W. Richmond and J.R. Woolman. McSU. J. Hightower. CPMC. **The effects of botanical extracts on mosquito oviposition.**—We evaluated the effects of plant extracts on ovipositing *Aedes aegypti* mosquitoes. Choice bioassays were conducted in screened cages containing cups lined with seed paper on which eggs were deposited. The cups contained hexane, acetone and methanolic botanical extracts in distilled water. Extracts consisted of the following plant parts: (1) cluster bushmint, *Hyptis alata* (HA, stems and roots), (2) woolly rose mallow, *Hibiscus lasiocarpus* (stems and roots), and (3) rattlesnake master, *Eryngium yuccifolium* (RM, buds, stems and roots).

The bioassay was conducted for 24 h. After 24 h, the seed paper in each cup was removed and the eggs on each seed paper were counted. The oviposition activity index for each extract was calculated. Only the hexane extracts of RM buds and roots and the acetone extract of RM stems repelled ovipositing mosquitoes. Hexane extracts of RM stems slightly attracted ovipositing mosquitoes. Methanolic extracts of HA roots and RM stems and roots also were slightly attractive. All extracts of *Hibiscus lasiocarpus* roots showed the greatest attraction to ovipositing mosquitoes (range: (+)0.32-0.41 on a scale of +1 (attraction) to -1 (repellency)). Supported in part by NRCS Chenier Plain Sustainability Initiative Collaboration and Louisiana Mosquito Control Association.

Dees, W.H., J.P. Dupre, A.D. Richard, C.W. Richmond and J.R. Woolman. McSU. J. Hightower. CPMC. **The effects of freshly-cut plant parts on female mosquitoes.**—We evaluated the effects of freshly-cut berries, flowers, leaves, and petals on female *Aedes aegypti* mosquitoes. Standard plastic Petri dishes were used to hold mosquitoes and cut plant parts. Plants (with their experimental components) included: (1) Coreopsis, *Coreopsis lanceolata* (leaves, petals); (2) rattlesnake master (RM), *Eryngium yuccifolium* (leaves and flowers); (3) American beautyberry (aka French mulberry), *Callicarpa americana* (leaves, unripe berries); and (4) slender mountain mint (SMM), *Pycnanthemum tenuifolium* (leaves, flowers). We recorded percent mortality at 24, 48, 72 and 96 h. Three tests per plant part using ten mosquitoes per test were conducted. A 10% sucrose solution served as a food source for mosquitoes during the Petri dish tests. Mosquitoes exposed to fresh-cut leaves of all plants, except SMM, exhibited greater mortality than controls. In two studies, mosquitoes exposed to fresh-cut RM flowers exhibited much greater mortality than controls (treatment=85%, control=5% mortality after 24 h); however, mosquitoes exposed to 1.5-day old-cut RM flowers for 24 h demonstrated no mortality. Except for RM flowers, mosquitoes exposed to all other plant species and parts exhibited less than 50% mortality after 96 h. Supported in part by NRCS Chenier Plain Sustainability Initiative Collaboration and Louisiana Mosquito Control Association.

Dupré, M.C., J.G. Hinton, and H.A. Meyer. McSU. **The hunt for *Milnesium tardigradum*.**—Tardigrades, also known as "water bears," are miniscule invertebrates related to arthropods and found in moss, lichens, leaf litter, and freshwater. Recent advances in taxonomic classification within Phylum Tardigrada have shown that many species previously thought to be cosmopolitan are in fact species complexes. One prominent example is a recent revision (2012) of the genus *Milnesium*, which concluded that the existence of *Milnesium tardigradum*, hitherto thought to occur on every continent, must be confirmed outside Europe. For this purpose, we collected mosses and lichens along a latitudinal gradient spanning six national forests in Mississippi, Louisiana, and Texas. Using precise measurement techniques of buccal tube and other anatomical features recommended in the most recent revision of the genus, we will determine the degree of morphological variation of *Milnesium* along this transect, and ascertain whether *Milnesium tardigradum* occurs in the area. Preliminary results suggest that *Milnesium tardigradum* may not be present in these areas, and that significant morphological variation is present among sites.

Feltermann, M., A. Matherne, D. Nieland, C. Green, Q. Fontenot, and A. Ferrara. NiSU. **Comparison of seasonal reproductive patterns of two populations of female Alligator Gar, *Atractosteus spatula*, in coastal Louisiana.**—Alligator gar populations have declined in much

of the species' native range but are considered secure in south Louisiana. The objective was to quantify and compare reproductive patterns of female alligator gar collected from Terrebonne Estuary (N=87) and Rockefeller Wildlife Refuge (N=105). Fish were collected from March 2011 to August 2012 using gillnets, juglines, and bowfishing. To assess reproductive patterns, estradiol was quantified using ELISA, and individuals were classified by reproductive phase (immature, developing, spawning capable, regressing, and regenerating) using gonad histology. Terrebonne estradiol concentrations peaked in April (0.623 ng/ml) followed by declines in May (0.255 ng/ml) and June (0.14 ng/ml). Rockefeller estradiol concentrations peaked in March (2.34 ng/ml) followed by declines in April (1.09 ng/ml), May (0.162 ng/ml), and June (0.099 ng/ml). Regressing females (post-spawn) were most prevalent in Terrebonne during July (30%) and in Rockefeller during June (40%). Based on our data the majority of fish spawned during May and June in Terrebonne and during April and May in Rockefeller. Previous studies have examined gonad histology in alligator gar and other gar species in south Louisiana, but this is the first study to couple examination of gonad histology and reproductive steroid levels to more accurately define reproductive patterns.

Hinton, J.G., H.A. Meyer, and A.P. Dupuis. McSU. **Tardigrada of Dominica, West Indies.**—There have been few studies of terrestrial and freshwater tardigrades from the islands of the West Indies. These studies have been limited to Puerto Rico, the Dominican Republic, Cuba and Grand Cayman in the Greater Antilles, and Curaçao, Los Testigos, Saint Lucia and Barbados in the Lesser Antilles. This paper presents the results of a survey of the terrestrial Tardigrada of Dominica, the most northerly of the Windward Islands of the Lesser Antilles in the West Indies. Dominica (750 km²) is a volcanic island of very rugged topography. Unlike many Caribbean islands, it retains large expanses of virgin tropical wet rainforest. One hundred eight samples of moss, lichen, liverwort and leaf litter were collected in June 2009 from seven sites in Dominica. Specimens were found in 35 samples, representing nine genera, and 23 species: *Echiniscus barbara*, *E. cavagnaroi*, *Pseudechiniscus brevimontanus*, *Pseudechiniscus suillus*, *Milnesium cf. tardigradum*, *Milnesium sp.*, *Diphascion (Diphascion) pingue*, *Hypsibius convergens*, *Astatumen trinacriae*, *Doryphoribius flavus*, *Doryphoribius quadrituberculatus*, *Doryphoribius taiwanus*, *Macrobotus echinogenitus*, *Macrobotus cf. harmsworthi* (two species), *Macrobotus cf. hufelandi*, *Macrobotus occidentalis*, *Macrobotus cf. polyopus*, *Paramacrobotus cf. areolatus*, *Paramacrobotus richtersi*, *Minibiotus julianae*, *Minibiotus fallax*, *Minibiotus furcatus* and *Minibiotus cf. intermedius*.

Hinton, J.G., H.A. Meyer, N.D. McDaniel, C.B. Bergeron, S.J. Keely, and A.M. Matte. McSU. **The Tardigrada of Big Thicket National Preserve, Texas, USA: Final results of an All Taxa Biological Inventory.**—We have completed an All Taxa Biological Inventory (ATBI) for water bears (Phylum Tardigrada) in the Big Thicket National Preserve (BTNP) of southeastern Texas, USA. We sampled lichens, mosses, liverworts, leaf litter, soil, and aquatic vegetation in nine units. Tardigrades were present in 47% of terrestrial and 3% of freshwater samples. We identified 631 tardigrade specimens and 63 eggs, representing 13 genera and 37 species. Ten species are new to the fauna of Texas; two are new records for North America. Mean estimates of tardigrade species richness at BTNP ranged from 41 to 68; tardigrade species richness in BTNP is approximately half that in Great Smoky Mountains National Park (GSMNP). Lower diversity in BTNP is partly explained by the absence of the altitudinal variation characteristic of GSMNP. Freshwater tardigrades were especially poorly represented at BTNP. Streams and lakes

in BTNP are eutrophic and muddy, and may be poor habitats for tardigrades. This study emphasizes that the high tardigrade diversity found in mountainous areas may not be typical of other landscapes. In North America, tardigrades are less numerous and diverse in southern coastal plains and flatlands than in northern forests and mountains.

Holloway, L., N. Zhang, and C.M. Watson. McSU. **Efficacy of a new method for producing morphologically accurate operative temperature (Te) models for studies in lizard thermal ecology.**—In studies of lizard thermal ecology, researchers must establish a random set of operative temperatures for comparison with measured animal body temperatures from the field. By comparing field body temperatures to operative temperatures, researchers can learn a lot about the animal's thermal physiology and associated behavior. In order to obtain a set of operative temperatures at a relevant scale, investigators have historically fitted temperature data loggers into multiple lizard models produced via electroforming copper over wax lizard models. Recent advances in 3D scanning and printing technology offers a new method of producing multiple lizard models at relevant scale and morphological accuracy without many of the drawbacks of the established method. Here we use euthanized specimens of *Anolis carolinensis* to produce copper models and exact polymer models via a 3D printer. We compare the effectiveness of the models by measuring differences in thermal response of (1) the euthanized animal, (2) the classic copper model, and (3) the polymer model. We also compare time, effort, and cost between the classic copper model and the polymer model to determine if the use of 3D printer technology is a viable alternative to the classic method of producing such models.

Kravchuk, L.E., J. Savoie, and C.M. Watson. McSU. **Corn snakes, crypsis, and substrate complexity: Do cryptic snakes choose complex backgrounds?**—Crypsis (camouflage) is an effective concealment mechanism employed by many animals to avoid detection by would-be predators and/or prey. By remaining unseen in its microhabitat, a cryptic organism would theoretically exhibit increased fitness associated with more effective crypsis. Some animals, such as squid and octopi, have been shown to recognize their surroundings and their own color and pattern in order to increase the effectiveness of this strategy. If a cryptic organism can recognize its own pattern and color and choose backgrounds that closely match it within its habitat, then it could increase the effectiveness of crypsis and therefore increase its own fitness. Here we use pair wise choice trials to determine if the corn snake (*Pantherophis guttatus*) chooses lighter or darker homogeneous substrate, substrate of greater complexity, substrate that matches their own color and pattern, or simply doesn't exhibit substrate choice at all. These findings will provide insight into the selective pressures that drive and maintain crypsis in snakes.

LeDoux, L., D. Cormier, and C. M. Watson. McSU. **A comparison of specific dynamic action in the Ground Skink (*Scincella lateralis*) after ingesting two commonly-encountered prey items, Coleoptera and Lepidoptera larvae.**—After ingestion of food, an animal's resting metabolic rate increases for the duration of digestion and then returns to normal levels. This phenomenon is termed Specific Dynamic Action, or SDA. The duration and the amount of energy expended vary among animals and their food. SDA is actually a sum of complex physiological responses to the process of digestion. As a thermo-conformer, the Ground Skink is somewhat physiologically unique among temperate lizards. Here we document SDA as a function of oxygen consumption for this species using respirometry techniques at 30°C following ingestion of two types of prey items. Waxworms, or moth (Lepidoptera) larvae

typically contain twice the amount of fat and over six times the amount of fiber found in beetle (Coleoptera) larvae. Both of these groups are routinely eaten by wild ground skinks as they forage among the leaf litter. These data will help us better understand the physiological consequences of ingesting different prey items by this remarkably small and physiologically unique vertebrate predator.

Leonards, A. LSU-BR. **Efficacy of Prevathon™ in the control of key Lepidoptera pests in soybeans.**—Soybeans (*Glycine max*) play a big part of Louisiana's agriculture economy. Just this year alone, there were over one million acres of soybeans planted in the state. The primary objective of this research was to provide a measure of Prevathon™ effectiveness against Soybean Looper, and to determine if the insecticide resulted in any unintended outcomes. Soybeans planted at the LSU Agriculture Center Dean Lee Research Station in Alexandria, Louisiana, were sprayed with varying concentrations of Prevathon, and insect pests were sampled to measure its effectiveness. Prevathon at all tested concentrations was found to have a significant (>95%) influence on lowering Soybean Looper attendance and leaf defoliation. No unintended side-effects were detected.

McKoin, M.W. and E. Melancon. NiSU. **The prevalence of three grass shrimp species in a Louisiana estuary and the intensity of infection by the ectoparasite, *Probopyrus pandalicola*, on the grass shrimp, *Palaemonetes pugio*.**—We documented the prevalence of the three species of grass shrimp, *Palaemonetes pugio*, *P. vulgaris* and *P. intermedius*, found along the northern shores of a Terrebonne Bay marsh and adjacent shoreline located near constructed and natural oyster reefs. In this study, the grass shrimp *P. pugio* is the principal definitive host for the bopyrid ectoparasitic isopod, *Probopyrus pandalicola*, while its intermediate host is the calanoid copepod, *Acartia tonsa*. This parasite attaches to the branchial chamber of juvenile *P. pugio* and sexually sterilizes the shrimp by hormone disruption or nutritional drain. Although no published Louisiana information could be found on the relative abundance of each grass shrimp species or degree of parasitism, *P. pugio* parasitism, 1-3%, is similarly low compared to studies from southeast U.S. estuaries. This suggests that the parasite may not be a limiting factor in the abundance of the species in a Louisiana estuary. Results through August 2012 (N=2,528 shrimp) indicate a community of *P. pugio* (58%), *P. vulgaris* (34%) and *P. intermedius* (8%). Mean adult lengths and male:female ratios appear to be similar for all three species of grass shrimp, but will require additional analyses.

Merchant, M., P.A. Siroski, G. Poletta, V. Parachu Marco, and H. Ortega. McSU. **Characterization of chitotriosidase enzyme activity in *Caiman latirostris* plasma.**—Chitin, a repeating unit of b(1→4)-linked N-acetyl-b-D-glucosamine, is a polysaccharide found in the outer coating of many microbes. Chitotriosidase (ChT), a chitin-cleaving enzyme, is an enzyme found in higher vertebrates. ChT is thought to be an enzyme with important immunological function, as it cleaves chitin in the cell walls and membranes of potentially pathogenic microbes, thus compromising membrane function. ChT was characterized in the plasma of the broad-snouted caiman (*Caiman latirostris*). The activity was measured by incubation of plasma with a chitin-based fluorimetric substrate. The ChT activity dependent on the volume of plasma incubated with substrate, with substantial activity measured in only 2-5 microliters of plasma. The activity occurred rapidly, with accumulation of product measured at only 5 min of incubation with substrate. In addition, activity was temperature dependent with low activities at

low temperatures (5-15°C), and maximal activities at 30-35°C. This is the first report of ChT activity in a crocodylian species.

Meyer, H.A. McSU. **Freshwater and terrestrial Tardigrada of the Americas.**—Tardigrade (water bear) studies in the Americas date back to the mid-Nineteenth Century. No comprehensive list since 1994 has covered all the Americas. I consulted nearly 300 references for data on the distribution of freshwater and terrestrial tardigrades and the substrates from which they have been collected. Authors' identifications were accepted at face value unless subsequently emended. Taxa were assigned to states, provinces, etc., depending on the country. Many areas, in particular large portions of Central America and the West Indies, have no reported tardigrade fauna. Fifty-two genera and 368 species have been reported for the Americas. Among the tardigrade species found in the Americas, 51 are currently considered cosmopolitan, while 149 species have known distributions restricted to the Americas. Most terrestrial tardigrade sampling in the Americas has focused on mosses, lichens and liverworts, and 89.9% of the species have been collected in such substrates. The proportion of species collected in other habitats is lower: e.g., 13.9% in leaf litter, 19.6% in soil, and 23.8% in aquatic samples. Most freshwater tardigrades are collected from aquatic vegetation and sediment. For nine species in the Americas no substrates have been reported.

Meyer, H.A., J.G. Hinton, and M.C. Dupre. McSU. **Two new water bear (tardigrade) species of the genus *Milnesium* from the U.S. Virgin Islands and southern United States.**—Until recently all tardigrades (water bears) in the genus *Milnesium* were automatically placed in the species *tardigradum*, which was thought to be worldwide in distribution. However, application of more rigorous criteria for species identification and description, including variations in cuticular and buccal structure and morphometric characters, has resulted in a large increase in described species. Moss and lichens we collected in southwest Louisiana and Saint John, U.S. Virgin Islands, contained two new species of *Milnesium*. Specimens from Lake Charles and Sam Houston Jones State Park were similar to a species known only from the Seychelles Islands and Africa, *Milnesium reticulatum*. The two species have very similar patterns of cuticular ornamentation, but differ significantly in overall size and the dimensions of the claws and oral apparatus. Some specimens from Florida previously identified as *M. tardigradum* also belong to the new species. Specimens from Saint John superficially resemble *M. tardigradum*, but differ in having a more funnel shaped buccal tube and much smaller claws.

Meyer, H.A., J.G. Hinton, and C.A. Samletzka. McSU. **Variation in water bear diversity between urban and woodland environments in Calcasieu Parish.**—Tardigrades (water bears) have often been collected in cities, but studies dedicated to urban tardigrade biodiversity are few, and those comparing urban diversity with nearby rural or “natural” sites even fewer. In this study we compare the diversity of tardigrade species in urban Lake Charles (LC), Louisiana, with a nearby woodland site (Sam Houston Jones State Park (SHJSP)). We collected lichen, moss and leaf litter samples from LC and SHJSP in spring 2011 (50 samples total at each site). Although tardigrade density (specimens per gram substrate) did not differ markedly between LC and SHJSP, species richness and diversity were greater in SHJSP (16 species, H1=3.06) than in Lake Charles (8 species, H1=1.42). Seven species were common to both sites. Almost 75% of all specimens found in Lake Charles belonged to a single species, *Minibiotus acadianus*; the most abundant species in SHJSP, *Macrobiotus cf. echinogenitus*, represented slightly over a third of

all specimens there. The number of species found in Lake Charles lies within the range (5–10) found in previous urban surveys. All tardigrade studies comparing urban with nearby nonurban habitats have found lower diversity in cities.

Sorrells, D.A., K.D. Smelker, and R.A. Valverde. SLU. **Hematological effects of in vitro exposure to PCB in *Trachemys scripta*.**—Immune system dysregulation has been correlated with environmental exposure to polychlorinated biphenyls (PCBs) in various species. This study used the freshwater turtle *Trachemys scripta elegans* to test the hypothesis that exposure to an estrogenic PCB causes alteration of the immune system in turtles. Forty captive turtles were divided into 5 test groups, each having eight turtles. Turtles received a 70 μ L injection of one of the following: vehicle (corn oil and hexane), estradiol-17 β , or 1, 10, or 100 μ g/g body weight of PCB on experimental days 1, 5 and 10. Blood samples were taken from all turtles before and after the injection series, and differential counts were performed. Prior to injections there was no significant difference in differential counts across test groups. After the injection series, turtles in the 100 μ g/g PCB group had a significantly higher percentage of leukocytes in comparison to the control. In addition, the control group turtles had a significantly higher percentage of azurophils in comparison to all other groups. These results indicate that the immune system modification described in animals exposed to PCBs may not be a direct effect, or may be due to chronic environmental exposure rather than acute direct exposure.

Stark, J and C.M. Watson. McSU. **Digestive efficiency in a remarkably small vertebrate predator, the Ground Skink (*Scincella lateralis*).**—The ground skink is among the smallest of North America's vertebrates. They are active predators in their forest-floor habitat, continually scouring the leaf litter for even smaller invertebrates to eat. This species is of particular interest because it is a temperate thermo-conformer, continually foraging without stopping to bask or otherwise thermoregulate. We hypothesize that this active lifestyle requires a relatively large amount of energy, thereby requiring the ground skink to be relatively efficient at digesting and retaining energy from prey items. By measuring inputs (mealworms at 10% of the lizard's body weight) and outputs (fecal dry mass) we can determine the digestive efficiency of the ground skink when feeding upon Coleoptera larvae. Using these methods, we can gain further insight into this animal's physiology and behavior based upon its ability to effectively extract energy from prey. Future extensions of this study will include a field component and also directly measure caloric content of both prey and feces using different temperatures and prey items.

Styga, J.M. and R.L. Minton. ULM. **Environmental factors affecting shell shape plasticity in the land snail *Mesodon thyroidus* (Gastropoda: Polygyridae).**—*Mesodon thyroidus* is a widespread species of land snail, occurring in a variety of habitats. The species has been shown to exhibit a wide-range of intraspecific phenotypic variation. This phenotypic plasticity is a result of both genetic and environmental factors. However, the origin of phenotypic plasticity and to what extent it is controlled by genetic and/or environmental factors remains unknown. Likewise, the specific ways in which environmental variables shape phenotypic traits in organisms is little understood. This study will attempt to determine, using geometric morphometrics, which environmental variables are important in shaping the phenotypic traits of land snails, using *Mesodon thyroidus* (Say, 1817) as a model. Also, this study will show how land snails "adjust" shell morphology in response to these environmental variables. Of the 15 environmental variables examined, this study shows that temperature, precipitation, elevation, subbasin-

characteristics, geographic location, and soil properties are the most important in determining shell shape.

Tietje, D., M. Merchant, and C.M. Watson. McSU. **Thermal physiology of the Spectacled Caiman, *Caiman crocodilus***.—The spectacled caiman is a small, widespread crocodylian found in water bodies of Central and South America. Due to escapes from the pet trade and niches opened by overhunting of natural competitors, this species has expanded its range in South America and can now be found in Southern Florida and Cuba. While this is a very adaptable and widespread species, previous studies and personal observations indicate that the spectacled caiman cannot survive the cold winters of temperate areas and therefore poses a minimal threat of invasiveness to other parts of North America. However, with continuously warming climates, this may not always prove true. Here, we characterize additional aspects of the spectacled caiman's thermal physiology by establishing resting metabolic rate, sprint speed, and swim speed over a range of ecologically-relevant temperatures as well as the temperature sensitivity (Q10) of these measures. By better understanding the physiology of this crocodylian, we can make more informed conservation decisions regarding potential invasiveness and management of this species.

Division of Physical Sciences

Chemistry Section

Adaka, O.B. and A. Pia. GSU. **Catalytic activity of copper(II), iron(II), and nickel(II) complexes with N-[(3-trimethoxysilyl)propyl]ethylenediamine.**—First row transition metals were used at different molar ratios as reagents to synthesize complexes with N-[(3-trimethoxysilyl)propyl]ethylenediamine, N-3TMSPED, nickel(II) chloride, copper(II) chloride, and iron(II) chloride were the starting materials. Copper(II) and nickel(II) complexes with N-[(3-trimethoxysilyl)propyl]ethylenediamine showed activity as heterogeneous catalysts for the coupling reaction of thiophenol to diphenyl sulfide. Results of catalytic activity studies showed dramatic differences among complexes. Spectroscopic analysis of solid catalysts illustrated the structure of metal complexes. Infrared spectra of solid metal complexes confirmed the presence of metal-nitrogen bonds. UV-Vis spectra provided evidence for metal ligand ratios in copper(II) complexes.

Adhikari, S. and D.D. Dolliver. SLU. K.H. Shaughnessy and J. Moore. UA. **Optimization of Negishi coupling of N-alkoxyimidoyl halides.**—Palladium-catalyzed coupling reactions are widely used to make new carbon-carbon covalent bonds under relatively mild conditions with good functional group tolerance. Negishi coupling reactions are commonly used to couple aryl halides with organozinc compounds. Although there has been a wide range of research on Negishi coupling, there are no comprehensive studies on the coupling of imidoyl halides under these conditions. We report the first coupling of N-alkoxybenzimidoyl halides [ArC(X)=NOR] using this technique. The effect of ligand, palladium source, concentration, additive, temperature, and the type of imidoyl halide were examined in an attempt to optimize the yield of the coupling product.

Ayer, S.K., B.S. Poudel, and J. Fotie. SLU. **Iodine-catalyzed cycloalkenylation of arylamines through a reaction with cyclic ketones.**—An iodine-catalyzed regioselective cycloalkenylation of arylamines through a reaction with cyclic ketones in a single pot has been developed. Through this presentation, we will discuss the optimization of the reaction conditions as well as the potential mechanism.

Barber, E., M. Mouawad, A. Klingman, B. Mouawad, C. Schilling, and E. El-Giar. ULM. **Cyclic voltammetry for the analysis of different redox systems at the surface of conventional electrodes.**—Cyclic voltammetry (CV) is a rapid, simple, inexpensive, versatile, and powerful electrochemical technique that is generally used to study the oxidation-reduction (redox) properties of an analyte in solution. The technique is used also for the evaluation of metal electrodes. In a CV experiment, the working electrode potential is swept between two potential values (V1 and V2) at a constant sweep rate. When the working electrode potential reaches V2, the scan direction is then reversed and the potential is swept back to V1. The current at the working electrode is plotted versus the applied voltage to give a cyclic voltammogram. The measured current provides information on the overall rate of the processes taking place at the working electrode surface. One of the very common applications of CV is its use for the characterization of the oxidation-reduction (redox) properties of any given analyte in solution. In the current investigation, CV will be used for studying the electrochemical properties of three

different redox systems ($K_3Fe(CN)_6$, $Ru(NH_3)_6Cl_3$, and ferrocenemethanol) at the surface of platinum and glassy carbon conventional electrodes (2 mm in diameter). This research also will involve the study of the effect of the scan rate on the shape of the voltammograms.

Cudd, T., T.A. Estrada Mendoza, P. Sconzert-Hall, A.D. Richard, C. Richmond, J.P. Dupre, S.M. McMicken W.H. Dees, and O.E. Christian. McSU. J. Hightower. CPMC. **Antibacterial and mosquitocidal activity of native Louisiana plant species.**—Louisiana's coastal prairie is home to over 500 native plant species. As a part of our ongoing conservation efforts in exploring biomedical properties of native plants, we examined the biological activities of extracts from three species; *Hyptis alata*, *Hibiscus lasiocarpus* and *Eryngium yuccifolium*. Plant parts were sequentially extracted with hexane, acetone and methanol. Methanolic and acetone extracts of *Hyptis alata* roots and stems, and the methanolic extract of roots and stems of *Hibiscus lasiocarpus* inhibited *Staphylococcus aureus* at a concentration of 50 mg/mL. Mosquitocidal studies showed the methanolic extract of *E. yuccifolium* to cause approximately 50% mortality 24 hours post-exposure. We also observed mortality in female mosquitoes exposed to the hexane extract of *Hyptis alata*. This is the first phytochemical study of these native plants. We intend to identify biologically active metabolites responsible for the observed activities by a combination of spectroscopic and spectrometric methods including LC-MS and NMR.

Cummings, O.T. and C.D. Wick. LTU. **Computational study on sodium halides in water and influence of the ions and electrostatic dampening on surface tension and surface excess.**—A thorough understanding of the interfacial properties of aqueous electrolyte solutions is vital for the explanation of many important mechanisms and processes. In this study, molecular dynamics simulations of aqueous sodium halides (chloride, bromide, and iodide) are carried out at two different concentrations. Polarizable interactions and electrostatic dampening with Kirkwood-Buff Integrals are included in these simulations. We investigate the relationship between the propensity of the halides' ions for the air-water interface and surface tension and surface excess. We also examine the effect of electrostatic dampening, and electrolyte concentration on surface tension and surface excess. The strength with which the halide ions interact with the air-water interface increases in the order of $NaCl < NaBr < NaI$. The magnitude of the surface tension and surface excess (which is negative) for the sodium halide ions increases in the order of $NaI < NaBr < NaCl$. Higher aqueous solution concentrations led to increased surface tension and surface excess for each of the halide groups explored. Comparison of our results to those of the Dang-Chang model, where electrostatic dampening is excluded, shows that including electrostatic dampening in our simulations led to more negative surface excess and higher surface tension.

Cutright, M. McSU. **Boron rich boranes and gold borides.**—A systematic investigation was conducted on a family of closo-boranes, B_nH_{n-xy} (x, y) (0, -2) (1, -1) (2, 0) (3, +1), obtained by successive removal of a hydride (H^-) from the parent dianion, B_nH_{n2-} , while maintaining the $n+1$ skeletal electron pairs. Studies were based on the state of art ab initio calculations, demonstrating that the higher members of the family, $n = 8-12$, maintain closo-structures. The transition between cage and planar occurs at different stages for different n . Global minima search for the clusters was performed using genetic algorithm. Four low-lying isomers were optimized at B3LYP/6311+G** within symmetry restrictions, as well as the frequencies of each isomer. The lowest energy isomer was characterized by zero imaginary frequency. With the intent of similar

behaviors between gold and hydrogen, auroboride clusters were generated. Through the use of density functional theory, the catalytic and electronic properties were studied by comparison clusters with formulas: Au_nB_{n2} , Au_nB , and AuB_n in Gaussian 5.0. In order to test whether lower energies exist in auroboride clusters containing rings either in the same plane or terminal gold atoms in opposing planes of the rings, quantum chemical calculations were performed utilizing hybrid density functional theory (DFT) method B3LYP 12.

Davis, J. and R.S. Srivastava. ULL. **Deoxygenation of biomass-derived feedstocks: Oxorhenium-catalyzed deoxydehydration of cellulose-derived carbohydrates.**—Biomass carbohydrates are not only the most abundant organic feedstock, but they are renewable and pre-oxygenated. The use of biomass as a source of fuels and chemicals has been discussed for quite some time. The high oxygen content of these carbohydrates relative to fuel and value-added chemicals require efficient and selective catalytic reactions, which reduce their oxygen content. We have recently developed a new and simple methodology for the deoxygenation of polyols and epoxides to alkenes and alkanes. Results of these studies will be presented.

Day, P.J. LTU. **Nanoparticle research.**—The uses of nanoparticles are vast, from the medical field creating time-released drugs to the electronics industry and making parts with greater surface area and therefore better heat dispersion. Nanoparticles are formed in different shapes and sizes and these properties determine the use. The process of creating nanoparticles is a fairly simple experiment which I was able to obtain a blueprint from Dr. Eklund's platinum nanoparticle research. Mostly dealing with nickel nanoparticles myself, there are a few differences in the procedure and results. The idea behind making nanoparticles is that in the reaction process the nickel should react with long chain thiol ligands in organic solvent to form small clusters of nickel atoms. These clusters are surrounded by the sulfur compounds making many individualized groups of these nickel nanoparticles. To push this reaction, a reducing agent such as LiTBH is added under heavy stirring. The solution should turn a brownish color that indicates the particles have formed. The nanoparticles are then centrifuged out and characterized. For characterizing the nanoparticles, I have used Raman Spectroscopy, IR Spectroscopy, and UV-vis spectroscopy. I plan to use many different sulfur compounds to find as many nanoparticle products as possible.

Fronczek, F.R. LSU-BR. Y. Liu, and T. Junk. ULL. **Preparation and characterization of nitroaromatic compounds related to 2,4,6-trinitrotoluene (TNT).**—Contamination of soils and aquifers with 2,4,6-trinitrotoluene (TNT) at sites of munitions loading and testing is of ongoing environmental concern. Five representative TNT transformation products were targeted for synthesis and further study. These included the suspected key transformation products 2-nitroso-4,6-dinitrotoluene and 4-nitroso-2,6-dinitrotoluene, which had not been prepared in pure form previously. In addition, suitable methods for the preparation of deuterated analogs of TNT transformation products were developed, suitable to prepare standards for stable isotope dilution techniques. Initial comparisons between experimentally determined (X-ray, IR, Raman) and calculated (MP2, B3LYP) structural parameters showed that considerable discrepancies exist between them, indicating that caution needs to be exercised when applying DFT methods to simulations of aromatic explosives.

Gilles, M., S. Murru, A.A. Gallo, and R.S. Srivastava. ULL. **Novel synthesis of beta-alkyl N-aryl Aza Baylis-Hillman (ABH) adducts.**—A direct method for the synthesis of ABH adducts using an iron catalyst will be described. The synthetic approach involves a C-N bond formation via a nitroso-ene reaction when compared to the traditional ABH reaction which involves the formation of a C-C bond. Our method uses aryl nitroso compounds which are generated from arylhydroxylamines under mild conditions to form ABH adducts in a convenient and efficient manner. The reaction works well with a variety of carbonyl compounds including esters, aldehydes, ketones and nitriles. The yields of the various ABH adducts by our procedure range from 12-88%. Our alternative method overcomes a major limitation of the substrate structure in the ABH reaction. A proposed mechanism for the formation of the title compounds via a nitroso-ene pathway will be discussed.

Hassan, A., R. Ramachandran, and C. Wick. LTU. A. Navulla, and L. Meda. XU. **Investigations of Ru, Sn, and W metal oxides as potential lithium ion battery electrode materials.**—There has been considerable research interest in the development of stable, safe Li-graphite anode alternatives, with higher capacity and high cyclability, in order to improve the application of Li-ion batteries in electric and hybrid electric vehicles, and everyday micro- and nano-scale devices. Success in these endeavors will improve the cycle life of Li-ion batteries, as well as reduce their cost. Nanostructured metal oxides have been found to be extremely promising as electrode materials for increasing the energy density of solid-state lithium ion batteries. We present a Density Functional Theory investigation of metal oxides (MO₂)₁₁ where M = Ru, Sn, and W as potential electrode materials. Each of the studied metal oxides has Li storage capacity of at least two lithium atoms per each metal atom. These calculations show (RuO₂)₁₁ and (WO₂)₁₁ to be feasible and attractive substitutes for the graphite electrode. They exhibit higher capacity than graphite, and show very little volume expansion compared to S_nO₂. The large volume change, of up to 300% observed in bulk crystalline S_nO₂ is also absent in the S_nO₂ cluster examined here.

Kimbal, E., B. Mobley, and J. Fotie. SLU. **Structural analysis of anthracene Diels-Alder adducts.**—A series of Diels-Alder adducts of anthracene have been prepared and their structure analyzed using spectroscopic and spectrometric techniques including NMR, HR-ESIMS and single crystal X-ray diffraction. Maleic anhydride and maleimide derivatives were used as dienophiles. Through this presentation, we will discuss their key structural features.

Konda, S.K., C.J. Hardaway, and J. Sneddon. McSU. **Determination of selected metals by inductively coupled plasma-optical emission spectrometry in rice.**—The determination of selected metals (arsenic, copper, cadmium chromium and zinc) in various rice species from around the world was obtained and compared. Sample preparation involved digestion via microwave technology. Quality control/Quality assurance protocol was established using certified standards. Results obtained showed, in some cases, marked differences, suggesting that the origin of the soil in which the rice was grown or in the processing caused these differences. Results will be discussed.

Lu, Y. LC. **Zwitterionic molecular quantum-dot cellular automata.**—There has long been great interest in mixed-valence complexes as potential candidates for promising molecular electronic devices. However, most mixed-valence complexes are positively charged cations or negatively charged anions, and thus require corresponding counterions to maintain charge

neutrality. These neighboring counterions inevitably disturb the local electric field and are thus detrimental to information storage and transport. Here we propose using neutral mixed-valence complexes which are free of unwanted counterion effects, as candidates for molecular electronic devices. The specific paradigm of molecular electronics considered in this work is the quantum-dot cellular automata (QCA), in which the binary information is encoded in the molecular charge configuration and communicated via intermolecular Coulomb interaction.¹ We employ state-of-the-art quantum chemistry techniques to investigate the electronic structure of several charge-neutral, zwitterionic mixed-valence complexes. A number of closo-borate compounds are suggested as built-in counterions, which are covalently incorporated into QCA molecules and thus avoiding the complicated cation–anion pairing that may impede information processes. Our studies demonstrate that bi-stable, switchable, and counterion-free QCA cells can be realized at the single molecular scale.² [¹Lent, C.S., *Science*, 288, 1597 (2000). ²Lu, Y. and C.S. Lent, *Phys. Chem. Chem. Phys.* 13, 14928 (2011).]

Manandhar, A., M. Cutright, A. Shakya, and K. Boggavarapu. McSU. **Boron rich boranes and gold borides.**—Icosahedron is an iconic structural unit of boron. Even at high pressures, as demonstrated by studies, the new allotrope consists of icosahedral B₁₂ units. Among the closo-boranes icosahedral-B₁₂H₁₂ is the most stable structural unit, often referred as three-dimensional benzene. While the smaller clusters (<20 atoms) adopt either planar or quasi-planar structures, larger clusters (>20 atoms) prefer to form ‘tubular’ arrangement. Quasi-planar B₁₂ cluster, as if forming a complimentary unit in two-dimensions, is also unique among planar boron clusters. It is by far the most stable boron cluster and by about 3.0 eV lower in energy compared to the icosahedral-B₁₂. Photoelectron spectral studies show that B₁₂ has the largest HOMO-LUMO gap (~2.0 eV) among all the other planar boron clusters. Theoretical studies reveal that much of the stability is due to the strong delocalization of both sigma and pi electrons constituting multiple-aromatic sextets which impart extra stability. If boron clusters prefer to form either planar or tubular structural units, then how to make icosahedral-B₁₂ cluster stable? In this report, with the help of global minima methods we identify that at least four hydrogens radially attached are necessary to stabilize the icosahedral unit.

Mouawad, B., A. Klingman, M. Mouawad, E. Barber, D. Leblanc, and E. El-Giar. ULM. **The use of cyclic voltammetry to compare the behavior of ultramicroelectrodes vs. conventional electrodes.**—Ultramicroelectrodes (UMEs) are electrodes in which at least one dimension (e.g., radius of a disk) ranges from a few nanometers to 25 micrometers. Since their introduction to electroanalytical chemistry about 30 years ago, these tiny voltammetric probes have led to unprecedented advances in electrochemical science and have greatly extended the range of sample environments and experimental timescales that are useful in electroanalytical and electrochemical research. The advantages of UMEs over conventional electrodes include small and time-independent currents, high current densities, high mass flux, better signal-to-noise ratios, short response time, reduced double layer capacitance, reduced ohmic drop and the capability of carrying out measurements in highly resistive media and in ultra-small environments. Cyclic voltammetry (CV) is one of the most common electrochemical techniques that is used for acquiring qualitative and quantitative information about electrochemical reactions. CV is also used for the characterization of UMEs. The current study focuses on the use of CV to characterize and contrast the behavior of a Pt UME disk electrode (diameter = 25 μm)

vs. that of a conventional Pt electrode (diameter = 2 mm) in aqueous solutions of $K_3[Fe(CN)_6]$ and $Ru(NH_3)_6Cl_3$ solutions in 1.0 M KCl at different scan rates.

Nyby, C., J. Leger, V. Kireev, N. Rubtsova, Y. Yue, V. Kasyanenko, and I. Rubtsov. TU. **Development of an automated dual-frequency 2D-IR spectrometer.**—Compared to its linear counterpart, dual-frequency two-dimensional infrared (2D-IR) vibrational echo spectroscopy has proven useful for studying the dynamics and structure of complex systems including transition-metal complexes, peptides and other biological systems because of its ability to produce simplified spectra providing information on coupling between vibrational modes. We report on the first attempt of building a fully automated 2D-IR spectrometer with dual-frequency capabilities. The instrument features automatic, tuning free measurements of any cross peak of a choice covering the spectral region from 3 to 11 μm . Several functional units of the instrument will be discussed in this work, including a beam stabilization scheme, schematics for satisfying the phase-matching conditions, and the HeNe based phase stabilization scheme. This project involves designing a compact optical schematic, motorizing optical components, and building software to control the instrument.

Parikh, K. and Y. Lu. LC. **A three-state QCA molecule free of unwanted counterion effects.**—Quantum-dot cellular automata (QCA) provide one approach to nanoscale computing.¹ In the QCA paradigm, information is encoded in the charge configuration of QCA cells and transferred due to the intercellular Coulomb interaction. One of the challenges of implementing molecular QCA technology is to control the counterion effects. Because mobile charges used to represent information are normally produced via chemical oxidation/reduction, these inevitably introduce counterions into the array and thus disturb the local field. A promising solution of controlling unwanted counterion effect is using charge neutral, zwitterionic mixed-valence complexes as QCA cells.² We provide a proof-of-concept demonstration that a charge neutral, tri-stable QCA molecule can be realized by incorporating closo-B₅H₅ cluster as counterion. We employ state-of-the-art quantum chemistry techniques to show that the three stable charge configurations of our model molecule can be used to encode “null”, “0”, and “1” state.³ Meanwhile the counterions are covalently bound inside cells therefore counterion effects are more tractable and controllable. [¹Lent, C.S.; Tougaw, P. D.; Porod, W.; Bernstein, G. H. *Nanotechnology* 1993, 4, 49. ²Lu, Y. and C.S. Lent, *Phys. Chem. Chem. Phys.* 13, 14928 (2011). ³Lent, C.S.; Isaksen, B. *IEEE Transactions on electron devices* 2003, 50, 1890.]

Rahman, A., T. Pham, E. Sullivan, C. Richmond, R. Neyland, and O.E. Christian. McSU. Z. Williams. LHS. **Antioxidant activity of *Hypericum brachyphyllum*.**—*Hypericum brachyphyllum* (coastal plains St. John's wort) is a member of the Clusiaceae family and grows primarily in the southern U.S.A. Native American tribes from Louisiana, Houma and Koasati, have for many years utilized decoctions of this plant to treat urinary tract infections, colic, fever and toothache. As part of our phytochemical survey of the Louisiana clusiaceous plant species, we have evaluated the extracts of *H. brachyphyllum* for antioxidant activity using a 3-(4,5-dimethylthiazole-2-yl)-2,5-diphenyltetrazolium bromide colorimetric (MTT) assay. The organic extracts of the roots and aerial parts were evaluated. The acetone extract of the aerial parts displayed the most potent antioxidant activity, equivalent to an ascorbic acid concentration of 55 x 10³ ppm. This report describes the antioxidant activity of the crude plant extracts as well as the

isolation and structure elucidation of two known metabolites from the hexane extract of the aerial parts of the plant.

Riggs, J., S. Yao, C. Wick, and B. Ramachandran. LTU. **Characterizing the catalytic activity in Fischer-Tropsch reactions by analyzing the binding energy of carbon monoxide to metals.**—Fischer-Tropsch reactions convert carbon monoxide and hydrogen into liquid hydrocarbons with the assistance of transition metal catalysts. The most commonly used catalysts are cobalt and iron. Fischer-Tropsch reactions have great potential to provide a sustainable energy source, but the reactions are not completely understood, leaving open the possibility that more effective catalysts may be found. One of the goals of this research is to characterize the catalytic activity of the metals by computation. The CO binding energy at different absorption sites on clusters of iron, cobalt, and a combination of the two are being studied using CP2K. The bond dissociation energy of the absorbed CO will be studied in the near future. The hope is that these two properties will provide a relatively rapid diagnostic of the catalytic activity of the absorbate and thus provide a tool for the rapid screening of various catalyst materials.

Roteff, P. and C.C. Huval. LSU-E. **Melting point studies of tartaric acid isomeric mixtures.**—The melting behavior of isomeric mixtures of tartaric acid (TA) is an oft cited example of how some physical properties, such as melting point, of enantiomers are identical; yet, mixtures of the enantiomers of a compound may have different properties than pure samples of each. This study reexamines the melting behavior of isomeric mixtures of TA. The general trend of higher final melting temperature of isomeric mixtures compared with single isomers was reproduced: when initial and final melting temperatures are plotted against mol:mol ratio of (+)- and (-)-TA from (0:100 to 100:0) a general increase in final melting temperature of mixtures from pure isomer to 50:50 racemic mixtures was observed. But, non-racemic mixtures show an initial formation of a liquid phase (initial melting) at a lower temperature, and, a solid phase remaining in the middle of the mixture that completely becomes liquid (final melting) at higher temperature. Interestingly, for the racemic mixture, upon heating the initial liquid phase appears to become a single solid phase, which then completely melts upon further heating. Overall, the different solubilities of enantiomers in enantiomerically enriched solvents are expressed in the melting behavior seen with isomeric mixtures of TA.

Shrestha, A., S. Libi, and D. Norwood. SLU. **Characterization of acryl amide resins using static and dynamic light scattering.**—Our research is based on the use of dynamic and static light scattering for the characterization of known and unknown particles and to measure size of these particles suspended within a liquid. The research focused specially on the detection of acrylamides resins that may be present in the given samples. DLS (dynamic light scattering) was used to measure the light scattered by diffusion of suspended macromolecules and relate it to the size of the particle. The sample was delivered into a high performance liquid chromatography system with static light scattering, refractive index and viscosity detectors. Static Light scattering measures the intensity of the light scattered as the function of scattering angle and polymer sample concentration. Based on these results the molecular weight and radius of gyration of the given sample can be calculated.

Sneddon, E.J., C.J. Hardaway, J. Sneddon, and N. Zhang. McSU. **Continued studies on selected metals in oysters from southwest Louisiana.**—This work will present results on continued studies of six metals (Cu, Cr, Cd, Fe, Mn, and Zn) in oysters from Southwest Louisiana. Metals were determined after sample preparation via microwave technology and inductively coupled plasma optical emission spectrometry. Quality control/Quality assurance was established using certified standards. Results obtained were compared to two previous studies in 2008 and 2010. Comparison of results showed significant lower concentrations for selected metals and was attributed to initial increases (in 2008) from Hurricanes Ike and Gustov which significantly changed metal concentrations in water.

Thatikonda, S., C.J. Hardaway, and J. Sneddon. McSU. **Laboratory controlled study of the uptake and release of selected metals from oysters.**—Using ten-gallon aquaria, oysters were transferred from southwest Louisiana oyster beds and “regrown”. A series of experiments were undertaken involving spiked selected metals (copper and chromium at low concentrations of around 5 ppm and high concentrations of around 100 ppm) in the waters in which the oysters resided. Also, control with pristine water was used with oysters. Oysters were periodically removed, digested using microwave technology and determined for the selected metals using inductively coupled plasma-optical emission spectrometry (ICP-OES). Oysters were removed from “contaminated” water, rinsed and placed in pristine water for subsequent metal determination. Results of the study of the uptake and subsequent release of the two metals will be presented.

Traina, S.A., S. Eklund, and H. Cardenas. LTU. **Corrosion protection of rebar in concrete via electrokinetic impregnation with a cationic monomer.**—Corrosion of the iron rebar within concrete comes from many sources and can lead to cracking and loss of integrity. Polymer coatings on the rebar can help to slow the rate of corrosion, but the iron must be coated beforehand. One method that could show promise in slowing further corrosion of rebar in preexisting concrete structures is to electrokinetically deposit a polymer directly upon the rebar. Using the rebar as a cathode, a cationic monomer could be pulled through the pores of the concrete onto the rebar, and polymerization initialized. The goal would be the formation of a layer of protective polymer on the rebar, and reduction of the porosity of the surrounding concrete. This would help to extend the life of the structure, and may help improve tensile and compressive strength.

Velaga, S, C. Gibb, and B.C. Gibb. TU. **ITC analysis of anion binding to hydrophobic concavity and its implications for the Hofmeister effect.**—Since the 19th century scientists have known that salts dramatically affect the way proteins interact with water. More specifically, different anionic salt species influence the solubility of proteins to varying degrees. Some anions such as SCN^- , ClO_4^- , I^- , and ClO_3^- increase the solubility of proteins while other anions such as Cl^- and F^- decrease the solubility of proteins. The anionic species that increase protein solubility are defined as chaotropes while the anionic species that decrease protein solubility are defined as kosmotropes. The Hofmeister effect entails this idea that chaotropes and kosmotropes differentially influence protein solubility. The Hofmeister effect is well established in the literature; however, the exact molecular mechanisms that underpin this phenomenon remain unclear. We will describe our research, which utilizes isothermal titration calorimetry (ITC), in order to elucidate the manner in which chaotropic and kosmotropic anion salts influence the

binding of guests to a concave host. The results will shed light on the mechanistic details of how salts interact with protein to impact solubility.

Velazquez, P.A., S. Eklund, and H. Cardenas. LTU. **Corrosion studies of rebar in launch pad concrete.**—Flame trench concrete undergoes both physical and chemical damage during rocket ignition. In order to form a suitable thermal barrier, the concrete is very porous by design. This porosity also makes the concrete susceptible to corrosion. There is need to develop a means of protecting the reinforcement without reducing the porosity of the bulk concrete. A repair strategy is being developed to enhance the concrete durability by electrokinetic nanoparticle treatment and electrokinetic polymer deposition directly onto the reinforcement. For negatively charged polymers, part of this strategy involves coating the rebar with mixed metal oxides prior to the electrokinetic treatment. Research into electrokinetic treatment with cationic monomers will also be performed based on ammonium and phosphonium polymers. This proposal will study the coating products and corrosion of the rebar during the electrokinetic treatment in order to improve the rebar durability and corrosion resistance, and explore the use of positively charged monomers for electrokinetic polymerization in the concrete. Supported by LaSPACE.

Computer Science Section

Athill, T., R. Christian., S. Jn-Francois, and Y.B. Reddy. GSU. **Multiplication using different implementation methods in CUDA.**—CUDA is a general purpose parallel architecture that utilizes a parallel computations engine in Graphical Processing Units (GPUs) to carry out complex computational problem in a lesser time span than it would have, if that same problem would have been executed on a central processing unit (CPU). GPUs have been utilized within the graphics field for the past few years and have now moved into other fields that need high-performance computation. Fields such as medical imagining, fluid dynamics and environmental science are some fields that are seeking to utilize the potential power of GPUs to solve existing and current problems. In this paper, we will take a critical look at different performance techniques such as tiling, memory coalescing, perfecting, and loop unrolling, in trying to evaluate which method is the most efficient approach for our problem set (matrix operation of n size matrices). From the results, it shows that test-base matrix size 32×32 , the best performance technique utilized, resulted in tiling with shared memory. Since shared memory is located near to the registers in the underlining system architecture, it would result in the best performance for our scenario. To further increase performance for large matrix sizes, care needs have to be taken in the arrangement of the threads within the blocks so as to prevent huge latency within the block of shared memory.

Elashhab, H. and M.A. Salam. SU-BR. **The significance of laboratory based hands-on experiments on wireless sensor networks.**—Due to the distributed nature of wireless sensor network (WSN), it has drawn great amounts of attention from scientists around the globe. WSN has a lot of applications in various sectors such as healthcare, agriculture, and military. A new trend has already spread, showing some universities are taking wireless sensor networks to the next level by teaching it to students as a curriculum. Students who would take such courses have to know the basics of networks, programming languages, and algorithms. Programming is one of the difficulties facing students that stand between them and understanding important aspects of

the nature of the wireless sensor networks simulations. However, a study is being conducted and developed about a new simulation that does not require a programming experience; this new simulation is called Wirelessly Associable Sensor Populations (WASP). Wireless sensor networks simulation is essential and important, but the significance of the laboratory work and how lab work can dramatically extend students' knowledge is also very critical. We will develop hands-on laboratory experiments for undergraduate students which will help students to apply theoretical concepts in practice. It will improve and accelerate students' learning process of a new technology.

Ellis, S. and Y.B. Reddy. GSU. **Eliminating hidden terminal problem in cognitive radio networks using cloud architecture.**—Radio spectrum is a precious and limited available resource which is in high demand. Cognitive radio (CR) is an intelligent transceiver to detect the available channels in a wireless spectrum. CR is adaptable, reconfigurable, and dynamic in hostile battlefield environments. Once CR finds the free spectrum, it adjusts its reception parameters to utilize the spectrum concurrently. The detection of spectrum, adjusting its parameters, and efficient utilization is also called dynamic spectrum management. Connecting all cognitive radio nodes form a cognitive radio network (CRN). Cognitive radio network takes intelligent decisions to utilize the unused spectrum and allocate the users efficiently. We proposed a method to solve the hidden terminal problem through cloud computing. The idea is that the cloud can store the status of cognitive network, compute, reorganize, and make available the current state of cognitive networks for future decisions. The role of hidden terminal problem and solution using cloud was discussed in [1]. The cognitive radio networks (CRN) structure proposed by Reddy [1] was implemented through simulations. In our simulations, the interface was connected to CRN nodes and CRN cloud (CRNC) black board. The controller receives messages from CRN nodes, schedules messages, and executes needed actions. The hidden node problem and dynamic spectrum allocation are very important in cognitive radio networks. The hidden node problem is eliminated by using cloud, since CRNC board has current status of CRN nodes. Further, the changes will be triggered automatically using the blackboard structure. The simulations were conducted using 10 cognitive nodes and transferring the packets from one node to any other node. Further, the best path was calculated and appropriate paths were locked to transfer the packets. Since the actions are taken at cloud, the hidden terminal problem is eliminated automatically and clearly seen. The cloud simulation helps to eliminate IEEE RTS/CTS (request to send /clear to send) creation in IEEE 802.11 protocol. [1]. Y. B. Reddy., "Solving Hidden Terminal Problem in Cognitive Networks Using Cloud", SENSORCOMM 2012, August 19 - 24, 2012.

Eweni, S.O., J. Meyinsse, and J. B. Namwamba. SU-BR. **A study of e-readiness assessment: The case of three universities in Nigeria.**—This study investigated the readiness of three higher educational institutions in Nigeria in their attempt to introduce and maintain technology-driven services to students, faculty, and support staff. The prerequisites for participation in the digital, networked economy include the affordable Information Communication Technology (ICT), reliable electric supply, reliable and up-to-date infrastructure, and above all connectivity. Connectivity addresses the overall reliability of infrastructure. The sample for this study consisted of 74 faculty members, 55 students, and 24 support staff from the three state universities in Nigeria. Descriptive statistics and both exploratory and confirmatory factor analyses were used to analyze the data. The findings reveal that three factors were positive.

Component resulted from Factor 1 tells us that respondents from these three universities are looking beyond e-readiness in ICT use. The score coefficient matrix reveals the following factors: Factor 1-Project management and computer speaker loaded strongly; Factor 2-spreadsheets and statistical tools also loaded strongly; and Factor 3: E-mail usage and Internet browsing loaded strongly. The results confirm active adoption, adaption and use of ICT in the three higher education institutions in Nigeria. However, the speed of adoption is low but expanding. The study reveals absence of institutionalized systematic and well-articulated strategies for rapid adoption, training, and use of ICT in the three Nigerian universities. There is the need to have a well-articulated policy and strategies for e-readiness adoption and adaption for rapid educational development.

Ferdous, T. and M.A. Salam. SU-BR. **Directed diffusion based secured aggregation tree for wireless sensor networks.**—Wireless Sensor Network (WSN) has a broad spectrum of applications in many different fields. Sensors are convenient in size and cost to be deployed and perform a significant role in a network to pull information from areas where access is difficult or almost impossible. The key concern is to build a proficient network to utilize the resources to its best. Among various established routing algorithms, tree-based algorithm structures are very powerful, organized and efficient. Among them, Directed Diffusion (DD) and Secure Aggregation Tree (SAT) are two tree-based routing protocols offering simple data propagation procedure but focusing on two different issues – DD on data and SAT on security. DD is about data processing and propagating throughout the network. SAT provides a concept to handle the network security as well as reliability in a simple way for a tree-based network where no cryptography is necessary. When the data propagation platform is DD-based, there should be consideration for security issues. This consideration motivates our research to deal with the security concern in Directed Diffusion by implementing SAT. The research shows that by implementing SAT in DD-based networks, we can enhance security without utilizing complex cryptography and calculation.

Frederick, E. and S.L. Banks. GSU. **Influence of the replacement policies in cache management.**—Once the cache has been filled, when a new block is brought into the cache, one of the existing blocks must be replaced. The efficiency of the replacement policy affects both the hit rate and the access latency of a cache system. The higher the associability of the cache, the more vital the replacement policy becomes. There are several types of replacement: Optimal Replacement (OR), Least Recently Used (LRU), Random Replacement (RR), Least Frequently Used (LFU) and First-in First-out (FIFO). With the investigation cache management using these replacement policies, we conducted our experiments on SMP Cache with different scenarios. From the simulation, we observed that RR has the lowest hit ratio and LRU has the highest. Different caching policies have different effects on system performance. This can help reduce cost and increase performance. From this project we can conclude that replacement policy influences the miss rate in cache.

Freeman, K.J. SU-BR. **Diseases, medical data, and information systems: Data mining at its best.**—Medical data and information systems can work hand in hand. Information systems are used to gather massive amounts of medical data about patients. These data can be used to calculate approximately when a person can contract certain diseases when given the age, body mass, gender, and nationality of a person. This presentation will describe certain data mining

techniques to analyze more accurately patient data. The techniques include creating a knowledge management system to capture, store, retrieve and process medical data sets. This information would be very important to medicine and patients to help determine how to reduce risk factors of diseases, particularly diabetes.

Jn-Francois, S.F., A. Shaw, and K. Alnafisah. GSU. **Influence of the mapping on the miss rate for several cache sizes.**—In cache management there are two general rules of thumb that can be gleaned. The first is that eight-way set associative is as effective in reducing misses for these sized caches as fully associative. The second observation, called the 2:1 cache rule of thumb, is that a direct-mapped cache of size N has about the same miss rate as a two-way set-associative cache of size $N/2$. Like many of these examples, improving one aspect of the average memory access time comes at the expense of another. Increasing block size reduces miss rate while increasing miss penalty, and greater associativity can come at the cost of increased hit time. The investigation of these influences is conducted on SMP cache with direct, two-way, four-way, eight-way set associative, and fully-associative mappings. These simulations show that the miss rate decreases when the associativity ways increase. Conflict misses decrease significantly with increased associativity, especially for smaller caches. The associative ways influence decreases with larger caches because the benefits are less significant.

Reddy, Y.B. GSU. **Security in cognitive radio networks.**—Cognitive radio is a recent innovative technique to exploit the current limitations on spectrum scarcity. Defined from software-defined radio, the cognitive users use the spectrum holes (unused spectrum) with various techniques to detect and allocate the unused spectrum efficiently. Further, spectrum sensing is the basic functionality in CRs. Reliable detection of primary signals avoids harmful interference. Recent study shows that 4G mobile phones require 3 GOPs of processing and the trend of placing the cognitive radio technology in these devices. The future smart phones will incorporate the CR technology and less processing at the device level, but security of the spectrum allocation is one of the major issues in current day technologies. Cognitive Radio Network (CRN) is composed of nodes making use of cognitive radios. The CRN was modeled to use spectrum holes efficiently by secondary users which require meeting many security issues. In this presentation, we discuss the security and privacy issues in CRNs by identifying various security threats in these networks and various defense mechanisms to counter these vulnerabilities. Various types of attacks on CRNs are categorized under different classes based on their natures and targets, and corresponding to each attack class, appropriate security mechanisms also are discussed. Some critical research issues on security and privacy in CRNs also are identified.

Romeo, R., Y. Chao, and Y.B. Reddy. GSU. **GPU based vector addition.**—With recent advancements in GPU technology allowing parallel processing to become available to more individuals; we are now able to solve old problems in a parallel manner. By using graphics processing units, we are now able to speed up older programs and algorithms. This will improve efficiency to those who run these programs on a regular basis. This was the motivation to update the commonly utilized method of vector addition using parallel processing techniques. For the improvement to be recorded, the results of the vector addition program run with and without a GPU had to be compared. The program had to be edited to run the CUDA C code and the regular program was run in C++. The programs ran several times using large numbers of variables.

After completing the experiment we realized that GPU had a much large processing capacity than CPU. Large amounts of data were generated to verify the findings. We also learned more efficient ways of using the CPU in different situations. In conclusion, we can safely state that a GPU performs vector additions faster than a CPU. However, in instances of small variable sets, the CPU performs the tasks faster, likely due to less latency.

Salam, M.A. SU-BR. **Trust model for distributed sensor networks.**—Distributed sensor network (DSN) is composed of set spatially scattered intelligent sensors to obtain measurements from the environment and abstract relevant information from the gathered data. DSN depends on multiple processors to simultaneously gather and process information from many sensors. Reliability and trustworthiness of those sources are an important factor to derive appropriate inferences from collected data. In this research, we develop a trust model for a distributed system. The following are the commonly used trust metrics for distributed sensor networks: (1) rate of data packets forwarded, (2) rate of control packets forwarded, (3) availability factor, (4) routing protocol execution, (5) energy-based and reputation factor, and (6) consistency of reported data. We use energy-efficient hierarchical cluster based configuration. Each cluster has a cluster head and is responsible to collect and send data to the base station. The cluster head is selected based on the level of trust-worthiness of the sensor node of each cluster. The highest trust factor node among the cluster has the highest priority to become a cluster head node along with the energy level consideration. The cluster head will rotate with a certain time interval. We evaluate the performance of the trust model based on the vulnerability against various types of attacks.

Sarkar, T., and M.A. Salam. SU-BR. **Analysis and classification of LEACH protocol improvisations.**—Low Energy Adaptive Clustering Hierarchy (LEACH) is a clustering based protocol to collect data from Wireless Sensor Network (WSN). Since its introduction in the year 2000, there have been several approaches to improvise the protocol. This paper attempts to classify and compares a few of the improvisations using a VBA-EXCEL based simulation program. The improvised protocols that were specifically selected for the simulation were concerned only about the energy efficiency among other aspects of LEACH. The VBA scripting was used to create XY coordinates to generate nodes which were plotted using built in Excel functions from within the script. The amount of nodes created was small, but the total number of rounds varied based on methods used for selecting the cluster-head. Since the sensor nodes are simple and inexpensive, they cannot be replaced from within the network. Therefore, each sensor took a turn to be the cluster head at one point during their energy life cycle. This was achieved by the number of iterations or rounds in the program until all nodes had a chance to be a cluster-head. The program is generic and has scope to include more protocols for simulation and comparison for further studies.

Wallace, N. and T. Atkison. LTU. **Industrial control system security concerns and measures.**—Industrial Control Systems (ICS) are present across several industries ranging from automotive to utilities. The devices that encompass ICSs have recently been fitted with networking capabilities and have unintentionally found their way connected to the Internet. In addition, some of these ICS devices are currently equipped with wireless communication capabilities through either open WiFi or Bluetooth. Generally, ICS devices communicate over unencrypted communication channels making them vulnerable to several attacks (i.e. replay

attacks). Interconnections of this type provide an attack vector for people with malicious intent and therefore are a critical cyber security concern. These vulnerabilities can lead to complete remote control of a vulnerable industrial control system. This research is an examination of past, present, and future cyber security concerns of industrial control systems. Furthermore, this research offers an examination of security measures that can be implemented in tomorrow's smart industrial control systems to prevent and mitigate these attack vectors.

Washington, K. SU-BR. **Digital forensics: A case study.**—Digital forensics is a branch of forensic science that involves recovery and investigation of files and other items found on digital devices in order to solve a crime. As an extension of computer forensics, digital forensics covers not only computers, but any device that can store digital data, such as cell phones and tablets, databases, and networks. Video and audio extraction and analysis of the digital data are integral in solving crimes not necessarily related to computers. My presentation will highlight various cutting-edge tools, such as EnCase and bulk_extractor that are used to extract and analyze digital data. The presentation also will cover the 2010 Kim Proctor homicide case, an investigation that brought two Canadian teens to justice after analysis of their Wikipedia and Google Maps searches, text messages, World of Warcraft chat logs, and Windows IMs. By means of digital forensics, investigators were able to recover 1.4 billion pages of data: substantial evidence indeed, without which the case would have gone cold.

Earth Science Section

Hopper, L.J. and J.I. Pullin. ULM. **Geographical variability in storm modes that produce significant tornadoes in the United States.**—This study's primary objective is to determine if statistically significant differences in storm modes and structures exist for certain regions relative to the mean climatological distribution by analyzing approximately 900 significant tornadoes identified in Storm Data between 2007-2011. Each tornadic storm's convective mode is classified as a discrete supercell, mesoscale or quasi-linear convective system (MCS/QLCSs), or other. Discrete supercells and MCS/QLCSs are further subdivided into non-mergers and mergers based on whether they were isolated cells or merged with another cell or line within one hour of tornadogenesis. Preliminary research analyzing 360 tornadoes between 2007 and 2010 suggests that significant tornadoes produced by QLCS/MCSs are more likely to occur in Mississippi, Alabama, and Georgia relative to other Southeast or Plains states. This study includes significant tornadoes from all states and an active year in 2011 to help solidify or nullify the importance of MCS/QLCSs in the aforementioned states. Interannual, seasonal and diurnal variations associated with each storm type and variability in storm structures (CL, HP, LP, or mini for supercells and TS, PS, LS, TS-AS, QS-BB, or other QLCSs for MCSs) also will be investigated to help forecasters and emergency managers better understand tornadic threats for their respective regions.

Viramontez, A.G., A.T. Gildwarg, and L.J. Hopper. ULM. **Investigating instrumental and environmental contributions to microscale rain gauge variability.**—Heavy rainfall frequently causes flash flooding in low-lying areas of the southeastern United States. Obtaining high quality surface rainfall measurements is critical because they provide ground truth comparisons to quantitative precipitation estimates derived from radar and satellite imagery. This research

examines the instrumental variability among individual rain gauges located in an 8.5 by 13 meter area at the University of Louisiana at Monroe, focusing on the comparison between a tipping bucket rain gauge and six Community Collaborative Rain, Hail, and Snow network (CoCoRaHS) rain gauges. Six additional CoCoRaHS gauges are deliberately sited at varying distances near obstructions to quantify how much rainfall is underestimated relative to the control rain gauges located 1-7 meters from the obstructions. Environmental factors that may contribute to inconsistencies among rain gauge measurements like wind speed, wind direction, rain rate, and storm type are also analyzed. Time series from a few case studies exhibiting variety of storm modes and types also will be presented to better understand this correlation. This research has the potential to impact the scientific community and society by providing a better understanding of environmental and instrumental factors that contribute to natural gauge variability and estimation errors.

Materials Science and Engineering Section

Badar, M.S., M. Carlos, P.L. Hindmarsh, and E.N. Allouche. LTU. **Resistance of geopolymers to microbial induced corrosion (MIC).**—MIC is a major form of deterioration of concrete structures. According to a report published by the U.S. FHWA 2002, the cost of corrosion in water and wastewater conveyance, storage and treatment facilities in the U.S. is about \$138 billion per year. A main form of corrosion in wastewater collection systems is Microbial Induced Corrosion (MIC). However, the conditions present in industrial or municipal wastewater pipes or storage facility are induced by the production of sulfuric acid by biological corrosion, which cannot be fully mimicked by simple acid corrosion. The present study is intended to provide similar conditions inside pipe specimens that mimic a true sewer atmosphere. Sulfate reducing bacteria (*Desulfovibrio desulfuricans*) will be inoculated in the pipes. The hydrogen sulfide will be metabolized by sulfate oxidizing bacteria, producing sulfuric acid. The experimental setup will consist of six 12" diameter and 12" long pipe specimens made by OPC as well as five formulations of GPC, with and without biocide inhibitor agents. Both ends of the pipe specimen will be sealed to prevent escape of hydrogen sulfide gas. The comparative study of corrosion of different type of pipes concludes the pipes made of GPC are the most resistant to MIC.

Cole, S. and D. Mainardi. LTU. **Ethanol oxidation on trimetallic $Pt_xRu_ySn_z$ nanocluster for fuel cell applications.**—Attributable to its ability to produce alternative, clean, and renewable energy while conferring efficient energy generation, fuel cells offer novel means to address an ever-growing global energy concern. More specifically, direct ethanol fuel cells have been studied because of the combustible's high energy density, probable production from renewable sources, and ease of storage properties. However, before commercialization, such problems as cost of production, languid reaction rates, fuel crossover, overall energy loss, and material limitations must be averted. In view of that, this research uses first-principles calculations and ab-initio molecular dynamics to study the catalysis of ethanol via electrooxidation on a trimetallic $Pt_xRu_ySn_z$ nanoelectrocatalyst. Various molar ratios of Pt-Ru-Sn are used in quantum level, Density Functional Theory (DFT) and molecular level, Kinetic Monte Carlo (KMC) assays to assess the electrocatalysts' structural and electrochemical activity while evaluating surface diffusion information that corresponds to the time evolution simulation of the reactions along the

electrocatalysts. Catalytic design in fuel cell applications leads to an enhanced understanding of improving fuel cell efficiency.

Edward, V. and T. Ismael. GSU. N. Charles. LTU. P. Derosa. GSU & LTU. **Effect of energetic landscape on charge carrier mobility in amorphous-crystalline boundaries in conductive polymer devices.**—Semi-conductive polymers have been the subject of much interest in academic and industrial circles due to their low cost of production, ease of fabrication, and limitless polymer modifications. However, lower charge mobilities make them less competitive against conventional semiconductors. Charge carrier mobilities in organic semiconductors are known to be affected by temperature, electric field, energetic landscape, and configuration. Indeed, the more crystalline the polymer, the larger the mobility. Due to limitations in fabrication techniques, most microcrystalline polymers contain pockets of amorphous regions that greatly affect their performance. With the intention to characterize the effect of the crystal-amorphous interface in charge transport, an integrated model using the Monte Carlo method was developed. An in-depth study of the effect of two cases of energetic landscape on carrier mobilities in various configurations of crystalline-amorphous regions is performed. The effect of having the amorphous region with higher energy than the crystalline region (energy mismatch) and that of having different width in the energy distribution (energetic disorder) is tested. Results show that under energy mismatch, the higher energy amorphous regions behave as a barrier. One consequence of this is that although intermolecular transport in the crystal region is favored over intramolecular transport, the latest is preferred over crossing the boundary into the amorphous region. The second study revealed that higher energetic disorder leads to a decrease in mobility in that region.

Huang, S., Y. Zu, Y. Lu, and S. Wang. LTU. **Application of AuNPs and AuNRs to enhance electroporation for gene delivery to mammalian cells.**—Electroporation serves as an efficient approach to deliver exogenous probes (e.g., DNA, RNA, and drugs) into cells for its balance of simplicity, transfection effectiveness, and less restrictions on probe or cell type. However, it carries several drawbacks associated with high applied electric voltage, impeding its wide acceptance for gene delivery. Here we presented the use of gold nanoparticles (AuNPs) and nanorods (AuNRs) to improve the transfection performance. With high conductivity, AuNPs and AuNRs could significantly reduce the potential drop consumed between the two electrodes and thus the local pulse strength on cells was highly focused. In this way, the applied voltage could be greatly reduced. We demonstrate this concept with model systems for pWizGFP/pWizSEAP transfection to both anchor-type (e.g., NIH 3T3) and suspension cells (e.g., K562). Generally, significant gene expression was accomplished with relatively low applied voltages with which conventional electroporation cannot work well. A series of AuNPs and AuNRs with different sizes, aspect ratios, and concentrations are tested. Optimization of these factors under a series of voltage also is investigated. This new delivery concept may stimulate many in vitro and in vivo biomedical applications which rely on the efficient delivery of nucleic acids, anticancer drugs, or other therapeutic materials.

Iasemidis, L.D., I. Vlachos, R. Liu, and J. Adkinson. LTU. **Dynamics of epileptic seizures as revealed by analysis of EEG.**—Understanding the genesis of epileptic seizures is critical for the diagnosis and treatment of epilepsy. Epilepsy is the second most common neurological disorder to stroke affecting 1% to 2% of the population worldwide. Epileptic seizures typically occur

intermittently without a warning. By application of state-of-the-art mathematical analysis techniques to long-term electroencephalograms (EEGs) recorded from scalp and intracranial electrodes in patients undergoing clinical evaluation for epilepsy, we have shown that seizures do not occur randomly but result from progressive increase of recruitment of normal brain sites by the epileptogenic focus. The novel techniques we employ take advantage of the directional flow of information from the focus to critical brain sites long prior to the occurrence of a seizure. The capability of the proposed methodology to explain seizures' occurrence may lead to prediction of seizures long prior to their occurrence as well as to identification of the existence, location and extent of single or multiple epileptogenic foci. Potential applications of these findings include a better selection of surgical candidates for accurate focus removal or implantation of neuromodulatory electromagnetic stimulators and drug infusion devices for monitoring and timely disruption of the brain dynamics that lead to seizures.

Jackson, I.P., D.L. Awafford, and S-J. Lee. GSU. **A traffic light control system design.**—Traffic light control systems which control flowing traffic at various cross intersections need to be reliable, safe, economic, and power efficient. The objective of this project is to design such a system by using analog and digital electric/electronic components and devices. They include 555 Timer, 5-stage Johnson Counter, relay switches, LED display modules, and other components. Safety features were included to prevent possible faulty operations or accidents from happening. The National Instruments Circuit Design Suite 12.0 (a circuit analysis/design software) was used to simulate, analyze, and troubleshoot this system. Simulation results demonstrated that the system's green, yellow, and red lights are controlled just the way they are designed to be. A prototype of the designed circuit was constructed and its performance was demonstrated experimentally. The developed traffic light control system is flexible and its timing parameters can be easily adjusted to fit a specific intersection needs. The designed circuit can be used as a stand-alone system or combined with other systems.

Johnson, L., A.T. Morrison, A.L. Clark, and S-J. Lee. GSU. **An automated lighting system design.**—The need for energy conservation has been constantly growing. One way to conserve energy is by lowering the use of electricity. This research project is to develop an automated lighting system which can automatically turn on the light when there are people entering a building and/or are present in the building. The light is turned off when all the people exit the building. The electric/electronic components used in the system include power supplies, resistors, photo-transistors, motion detectors, logic gates, digital counters, light sensors, relay switches, LEDs, and other output devices. All the sensors along with the counters are logically connected to generate the desired outputs. A main/safety switch is used for safety and emergency purpose. The designed circuit was first simulated by using the National Instruments Circuit Design Suite 12.0, a circuit analysis/design software, to test/verify its performance. After satisfactory simulation results were obtained, a prototype of the designed circuit was constructed on the NI Elvis II platform to demonstrate its performance experimentally. Promising results were observed. This system is simple and expandable. More input/output devices can be integrated into this system easily.

Kharidehal, P. and D.S. Mainardi. LTU. **Methanol oxidation by ion modified MDH enzymes for bio-fuel cell applications.**—Enzymes that are present in bacteria found in rice fields are able to produce methanol and further oxidize it for the production of an electrical current. Methanol

dehydrogenase (MDH) is one such enzyme, which oxidizes methanol and the active site of MDH contains a Ca^{2+} ion, a co-factor pyrrolo-quinoline quinone (PQQ), several amino acids, and water molecules. Ca^{2+} ion holds the PQQ in place, and also acts as a Lewis acid, contributing to the methanol electro-oxidation reaction mechanism. It was demonstrated that the divalent cation has a central role in the proton abstraction catalysis and, replacing Ca^{2+} with another divalent ion could modify the methanol oxidation pathways. Thus, understanding how these ion-modified enzymes function at molecular level is important, as they could lead to the development of new bio-inspired synthetic catalysts that could impact the use of methanol as fuel. In this study, the binding of methanol to the active site models of ion modified MDH is determined and the effect of ion on methanol oxidation is investigated. A combination of tools involving Density Functional Theory (DFT), Transition State Theory (TST), and Molecular Mechanics (MM) were combined in a Kinetic Monte Carlo (kMC) approach to model enzyme kinetics.

Merille, A. and N. Seetala. GSU. K. Dooley and R. Li. LSU-BR. **Positron lifetime and magnetization studies of Mn/rare earth oxides.**—Mn/Rare Earth Oxide (REOs) nanoparticle catalysts are used as desulfurization adsorbents. The nanoporosity of these catalysts may influence the diffusion characteristics that may affect the desulfurization absorption efficiencies. Positron annihilation lifetime spectroscopy (PALS) can provide information on vacancy defects and nanoporosity (pore size and concentration of pores). Bulk Mn is mostly paramagnetic, but it shows ferromagnetic character when a thin film is coated on semiconductors/metals even though the interacting metal is nonmagnetic. The exchange interaction at the interface provides ferromagnetism for Mn. Here we study the nanoporosity and magnetic character of Mn/REOs with different compositions. A ^{22}Na positron source was used for lifetime spectrum, and POSFIT computer program provided three lifetime components for each sample. The third lifetime component provided the information on pore size (lifetimes) and concentration of pores (intensities) using a simple model. The second lifetime component showed variations in vacancy clusters and their concentrations. The magnetic curves consisted of paramagnetic and ferromagnetic components. The ferromagnetic character is presumed to be mainly coming from the exchange interaction at the interface for Mn with other oxides. The saturation magnetization follows the order of Mn composition in these Mn/REO catalysts. This work is supported by DOE-EFRC and LA-SiGMA grants.

Ranjitkar, N. and P. Derosa. LTU. V. McCall. GSU. **Electronic and conductive properties of polythiophene containing cobaltabisdicarbollide structures.**—Magnetic, electrical, and electronic properties of organo-metallic compounds consisting of carborane cages containing transition metals and inserted in polythiophene chains, were analyzed. The spin state and magnetic properties of carborane cages are not very simple to calculate accurately. One of the main reasons is the different response that different computational methods give when this property is calculated. In this work computational methods like Density Functional Theory (DFT) are used to compute the properties of carborane cages. The geometrical optimization of the compounds with different DFT functionals and basis sets are conducted, and multiplicity is predicted using six different DFT functional including GGA, hybrid, and meta hybrid. Current vs. voltage is calculated using green functions. Simulations were carried out in Gaussian-09. Particularly, since the spin of electrons is relevant to different parameters like magnetic moment, determination of the spin state at which organo-metallic compounds are stable is required. The effects due to various factors of different transition metals cobalt, titanium, iron, and manganese

on the carboranes were analyzed. Results were compared to existing information on these systems with very good agreement. For iron atom, two oxidation states, +2 and +3, typical for this ferromagnetic atom, were studied and compared.

Richard, G.M., A.R. Smith, and S-J. Lee. GSU. **Temperature warning systems.**—Temperature warning systems have always been in high demand for safety reasons. The objective of this project is to design and construct a temperature warning system that triggers alarms when the measured temperature is above the preset high temperature set point or drops below the preset low temperature set point. The system was designed by using both hardware and software approaches. In the hardware approach, the system was designed and constructed by using electric and electronic components/devices. By using the software approach, a temperature sensing circuitry was first constructed on NI Elvis II, a computer integrated platform. The real time temperature signal was acquired and processed by LabVIEW, a graphical programming software, which has user interface capability. Warning signals and appropriate actions are triggered when the measured temperature is either above or below the temperature set points. Current temperature also is displayed on the monitor in digital and graphical formats. Computer simulations and experiments demonstrated that the system worked as expected. This system is reliable, simple, and expandable.

Soto, F.A. and D.S. Mainardi. LTU. **Computational materials science approach to study NaMgH₃ as a promising material for hydrogen storage applications.**—One of the major challenges to the development and operation of the Hydrogen Economy is the lack of a hydrogen storage material. Due to its complex process involving surface desorption, bulk diffusion, and nucleation; the exact mechanism for H₂ desorption from complex metal hydrides is unclear. For this reason, first-principles calculations and ab-initio molecular dynamics have been used to study perovskite-type hydrides at an atomistic scale. Particularly, NaMgH₃ was studied by first-principles calculations with the following results: i) explanation of Ti bonding nature in (001) surface and ii) mixed co-dopants such as Ti and Zn produce lower H₂ desorption free-energy barriers than single additives. The decrease in energy cost for H₂ desorption suggests that the addition of 3d-transition metals leads to a disorder in the crystal structure that promotes the short-circuit diffusion of H atoms. The design of novel material for hydrogen storage applications leads to a greater understanding of the phenomena that determine the properties of materials. Financial support from the National Science Foundation, “Louisiana Alliance for Simulation-Guided Materials Applications”, The Louisiana Optical Network Initiative (LONI), Louisiana Board of Regents-Contract LEQSF (2007-08)-ENH-TR-46, and Louisiana Tech University Student Technology Fee Board grant 2007 are gratefully acknowledged.

Stone, S.D. and B.C. Hollins. LTU. **Modeling geometric microfluidic fluid flow to optimize protein capture.**—Oxidative stress can play a role in many human diseases. The primary markers of oxidative stress in vivo are low abundance carbonylated proteins that require enrichment for further analysis. Current technology for carbonylated protein enrichment, avid in affinity chromatography, requires large sample volumes, significant time investment, high sample waste, and dilution of the target molecule. We have designed a microfluidic technique for protein capture that overcomes these obstacles, utilizing oxalyldihydrazide as a novel crosslinker. The technique takes advantage of carbonyl-hydrazide affinity, similar to antigen-antibody binding. Quantifying and optimizing on-chip binding requires an understanding of fluid

flow profiles within the chip, which is linked to mass transfer. The goal of this study is to design the most optimal interior chip geometry for carbonylated protein capture, based on fluid flow profiles. We tested different geometries to determine the optimal flow conditions that result in maximum protein capture. The geometries were built in SolidWorks, and the fluid flow modeled using COMSOL. The results allow optimization of the microfluidic channel geometry and flow rate for maximum protein capture.

Webb, M. and N. Seetala. GSU. B. Eranezhuth and L. Smith. CA. J. Meen. UH. **Study of ZrB₂, HfB₂, TiB₂, and SiC composites using PALS & SEM.**—We characterized the pre-cursors ZrB₂ and HfB₂ and SiC powders; and TiB₂-TiC and TiB₂-SiC composites chemically synthesized and spark plasma heat treated samples supplied by Clarkson Aerospace (CA). Positron Annihilation Lifetime Spectrometer (PALS) is used to study the micro-porosity and Scanning Electron Microscope (SEM) to examine the powders for granule size in the pre-cursors. The micro-porosity and granule sizes will greatly influence the mechanical properties. The PALS spectra were analyzed into three components: 1) positrons annihilating in bulk material, 2) in vacancy clusters, and 3) Positronium annihilating in pores. The second lifetime relative to size of vacancy clusters is longer in HfB₂ compared to ZrB₂ and SiC indicating that HfB₂ has larger vacancy clusters. The third lifetime component relative to pore size distribution indicates that HfB₂ has larger pores with less concentration compared to ZrB₂ and SiC. The pore size and concentration are in agreement with the SEM observations where HfB₂ has larger granules compared to ZrB₂ and SiC. The PALS results for TiB₂-TiC (1650 VHN) and TiB₂-SiC (1800 VHN) composite samples show that TiB₂-TiC has larger pores in lesser concentration compared to TiB₂-SiC and over all fractional free volume is higher for TiB₂-TiC compared to TiB₂-SiC. Work supported by Clarkson Aerospace.

Mathematics and Statistics Section

Bracey, S., K.A. Evans, I. Magana, P. Adhikari, and P. O'Neal. LTU. **LQR tracking of a least error model for the study of nanoparticle dosing strategies for cancer therapy.**—Currently, the most commonly used treatments for cancerous tumors (chemotherapy, radiation, etc.) have almost no method of monitoring the administration of the treatment for adverse effects in real time. In this work, mathematical modeling and analysis techniques are joined together with experimentation to gain further insight into the challenges of nanoparticle delivery to tumor sites. There exists a commonly accepted model of drug clearance in the pharmacokinetics community, and it is demonstrated here that this model provides an accurate reflection of reality, as observed in experiments for delivery of gold-coated nanorods. This model is then utilized in a state space feedback control framework to regulate the nanoparticle concentration in the bloodstream. This study will aid in the prediction of the effects of the drugs in a patient's body, thus leading to better models for drug regimen and administration.

Hou, S. and Y. Jiang. LTU. **Direct and inverse scattering problems for non-smooth obstacles.**—We present numerical methods for solving direct and inverse scattering problems for general non-smooth obstacles. Numerical experiments are provided to justify the effectiveness of our methods.

Lin, Y. and D. Liu. LTU. **Particulate flow simulations with smoothed particle hydrodynamics method.**—Smoothed particle hydrodynamics (SPH), a particle based mesh-free method for fluid dynamics simulation, treats the fluid as numerous moving “particles”. Using integral interpolation, SPH transforms the continuous partial differential equations into integrals over each particle’s neighboring particles. The mesh-free feature of SPH has obvious advantages in simulating complex flows such as free-surface flow, flows with large deformation and rate of strain, and two-phase flow. SPH could be more efficient than conventional mesh-based methods to simulate particulate flows and fluid-solid interactions where the moving boundary is handled via treating particles as different particles from the fluid in a Lagrangian approach. The interaction between the solid and the fluid is handled as between different particles. As an improvement to the standard SPH, surface tension is taken into consideration and included in the simulation. The performance of the method is evaluated through analyzing simulation results. The improved SPH could be an alternative for complex flows involving wave breaking, instability, and multi-phase flows in irregular geometry.

Su, J., J. Kanno, and D.J. VanHeeswijk. LTU. **H-minor free graphs and outer-thickness two.** In VLSI circuit design, a chip-designer must place macrocells on a printed circuit board according to several designing rules. One requirement is to avoid crossings, which can be achieved using two methods: changing the layer of one of the wires or to decompose the circuit into several smaller circuits with no crossings. To find the minimum number of layers required to avoid crossings for a particular circuit, each circuit can be represented using a graph, which consists of lines (edges) and points (vertices). A graph is said to be planar if the graph can be drawn on a plane surface without edges crossing. An outer-planar graph is a planar graph with the special property that every vertex can be drawn on the outer boundary. The outer-thickness of a graph G is the smallest number t such that G can be represented as the union of t outer-planar subgraphs. Goncalves proved that all planar graphs have outer-thickness 2, which is equivalent to saying that graphs that are K_5 and $K_{3,3}$ minor free have outer-thickness 2. We will extend this result to locate other graphs with the property of being H-minor free that have outer-thickness 2.

Yifan, W. and L. Don. LTU. **Three-dimensional model for reaction-diffusion system at neuromuscular junction via high-order Galerkin finite element method.**—The neuromuscular junction (NMJ) is where neurons and muscle fibers communicate with each other and muscle contractions take place. In particular, the “communication” process is commonly recognized as a reaction-diffusion course involving acetylcholine, acetylcholine receptors and enzyme. Various studies of the reaction dynamics in the NMJ are carried out to better understand neural diseases and improve clinical therapy. Dr. Khaliq et al. presented a model based on finite difference method to simulate the diffusion-reaction processes. However, NMJ actually has very complex geometry rather than a simple cylinder considered in this model. Dr. K. Tai et al. proposed a lower-order finite element based simulation to the same problem, although this model is adapted to simulate the system with more realistic geometry of postsynaptic of NMJ. In my work, a new three-dimensional model for simulating the complete reaction-diffusion system is proposed. It is based on nodal Galerkin spectral element method. This model is not only suitable to solve the system with complex geometry, but also can achieve high-order numerical accuracy. Results of the simulation is presented and compared with others’ work to illustrate the advantage and efficiency.

Zhang, H. LTU. **Simulation of micro-flows with spectral nodal element method.**—Microflow phenomenon was important to the emergence of biochemical lab-on-the-chip systems and micro-electromechanical system fabrication technologies in the late 1980s. Since then, microflow has become an interdisciplinary research between applied mathematics and computational fluid dynamics. Based on an existing two dimensional simulation model, a three-dimensional model is under development which adds another dimension in studying the inherent physics and renders more details of the flow field than before. At different Knudsen numbers and Reynolds numbers, the Navier-Stokes equations and the energy equation are coupled and numerically solved with a nodal spectral element method. Simulation examples are presented along with comparisons of the Maxwell boundary condition and a boundary condition developed by Beskok. This research has applications in many areas such as bio-microfluidics, microlithography, micro-fabrication, micro-self-assembly, etc.

Physics Section

Invited Talk: Sawyer, L. (on behalf of the ATLAS collaboration). LTU. **The discovery of the Higgs boson.**—In this talk, I will describe the July 2012, announcement of the discovery of a particle consistent with the long sought after Higgs boson. The ATLAS detector at the Large Hadron Collider will be described, along with the techniques used to identify the most effective discovery channels and separate them from Standard Model background processes. Updates to the original discovery signal also will be presented. The discovery of Higgs boson will be placed into the context of the historical development of the Standard Model of particle physics.

Adtani, S., P. Koirala, and A. K. Kandalam. McSU. **The superhalogen properties of gold oxide nanoclusters.**—Clusters possessing anomalously large electron affinity (EA) values ($EA > 3.7$ eV) are termed as “superhalogens.” Superhalogens play an important role in a wide variety of areas, such as oxidizing agents, nucleating centers of aerosols in the atmosphere, and bio-catalysis. The existence of several superhalogens were first predicted and later verified experimentally. In this work, we present results of our DFT based calculations, along with the supporting experimental results, of the superhalogen behavior of Au_3O_x [$x = 0-4$] clusters. This is the first-time the gold-oxide clusters have been reported to show superhalogen characteristics.

Alexander, D. and A. Kargol. LUNO. **Conductance hysteresis in voltage gated potassium channels.**—Conductance hysteresis in voltage-gated ion channels has been recently studied in silico [1, 2] yet little experimental data is available to verify these numerical results. In this work we: A) induce measurable hysteresis in voltage-gated Shaker potassium channels in patch-clamping experiments and B) compare the experimentally obtained data with various mathematical models of ion channel gating. Patch-clamping technique in a voltage-clamp mode is used to induce hysteresis through the application of oscillating voltages. Ionic currents through ion channels are plotted against the oscillating potential and a hysteretic loop is obtained. The magnitude of the effect depends on the properties (amplitude, frequency, mean value) of the applied voltage. Discrete Markov chains are commonly used to model ion channel gating kinetics, although different competing models are often proposed for the same channel. In this work the evolution of the hysteretic loop is compared to various existing Markov models for the Shaker channel. The model ionic currents are computed using the master equation approach. The

comparison of the experimental data to model predictions is used as a tool aiding model testing and validation. [1] Andersson T., *Math. Biosci.* 226 (2010) 16-27 [2] Das B. et al., *Phys. Rev. E*, 86 (2012) 061915.

Animilli, S.R. and D.A. Genov. LTU. **Metal-dielectric transitions in 3D optical electromagnetic fields.**—We present an efficient numerical method for the calculation of the conductivity and local-field distributions in three dimensional inhomogeneous metal-dielectric composite materials. In the optical and infrared spectral ranges, the metal-dielectric composites can be considered as random R-L-C network with the metal components described by RL elements while the dielectric host is represented by distributed capacitances. Using the developed finite difference frequency domain method we have performed detailed studies of the metal-dielectric phase transition that takes place in these random composite materials. Specifically, we have obtained highly accurate estimates of the conductivity t and correlation length v exponents, which are found to be in good agreement with previous estimates. It also is shown that the local field distribution at the percolation threshold and frequencies close to the single particle surface plasmon resonance has a form close to the log-normal function, which is a clear signature of the metal-dielectric transition that takes place in the system.

Bagayoko, D. and L. Franklin. SU-BR. E.C. Ekuma. LSU-BR. Y. Malozovsky. SU-BR. **Robust predictions from density functional theory (DFT).**—Starting with the fundamental system of coupled equations that defines density functional theory or its local density approximation (LDA), we show that eigenvalues obtained from the theory cannot necessarily represent physical reality, unless the system of equations (not just the eigenvalue equation) is solved self consistently. In particular, we demonstrate the existence of an infinite number of self-consistent solutions of the eigenvalue equation. This fact renders it extremely difficult to obtain physically meaningful eigenvalues with single trial basis set calculations. The Bagayoko, Zhao, and Williams' (BZW) method, recently enhanced by Ekuma and Franklin (BZW-EF), leads to the minima of the occupied energies and to converged, low lying unoccupied energies. These energies are not only physically meaningful, but also agree totally with experimental findings. We present selected results that confirm the robustness of the predictive capability of the BZW-EF method. The method solves the long standing band gap problem and places theory in a position to inform and to guide the design and fabrication of semiconductor based devices, among other feats. Research funded in part by the National Science Foundation (NSF) and the Louisiana Board of Regents, through LASiGMA [Award Nos. EPS- 1003897, NSF (2010-15)-RII-SUBR] and NSF HRD-1002541, the US Department of Energy – National, Nuclear Security Administration (NNSA) (Award No. DE-NA0001861), LaSPACE, and LONI-SUBR.

Didie, D.R., D.T. Didie, G. Bishwas, A. Sushovit, and Y. Sanichiro. SLU. **Analysis of coating characteristics of titanium thin-film systems.**—Our previously developed opto-acoustic technique has been applied to evaluate the adhesion strength of a thin titanium-film coated on a silicon substrate. The goal of this research is to assess the effectiveness of pre-coating surface treatment on the substrate. The thin-film specimen is configured as an end-mirror of a Michelson interferometer, and driven from the rear with an acoustic transducer at audible frequencies. By slightly tilting one of the end-mirrors, we visualize the relative interferometric path length as an interferometric fringe pattern consisting of vertical dark lines. When the specimen experiences oscillation due to the acoustic transducer, the dark lines shift in proportion to the amplitude of

the oscillation. By viewing the fringe pattern with a digital imaging device whose frame rate is considerably lower than the oscillation frequency, the line shift can be evaluated as decrease in the fringe contrast. Our preliminary results indicate that the treated and untreated specimen show substantial difference in the frequency dependence of the decrease in the fringe contrast. Our final goal is to find out the best surface treatment for a given application of the thin-film system.

Didie, D.R., D.T. Didie, R. Nepal, S. Craft, J.P Haase, Y. Sanichiro. **Characterization of magnetic environmental noise with a simple antenna.**—The magnetic environmental noise at 60 Hz, also known as the line noise, disturbs various systems. As an example, it is one of the major noise sources for the laser interferometric gravitational wave (LIGO) detector. Our research team is interested in characterizing this noise on the campus of Southeastern Louisiana University. We assembled a small-scale antenna comprised of an LC resonance circuit, and used it to measure the noise at various locations on campus. The measurement was conducted in two modes. In the first mode, we made the measurement at two reference points in our department building every day at the same time over one month. In the second mode, we carried the antenna around the campus and made the measurement over five different spots. In either case, we rotated the antenna horizontally with an increment of 15° for 360° to analyze the directionality of the noise. These sets of measurement have revealed certain temporal and spatial patterns of the noise. They also have convinced us the source of the noise is the ac power line running on the campus.

Elumalai, D.N. and A. Thapa. LTU. P. Derosa. LTU/GSU. **Simulation of the controlled release of molecular species from single and multi-walled nanotubes.**—Encouraged by potential applications in rust coatings, self-healing composites, selective delivery of drugs, catalysis, gas separation, and nanofluidics, the transport of molecular species through nanotubes, specifically the storage and sustained release of these molecules when needed, has attracted strong interest in recent years. By varying the internal fluidic properties, the formation of nano-shells over the nanotubes and by creation of smart caps at the tube ends it is possible to further control the rate of release of the molecules. The intent of the simulations is to facilitate fundamental research to enable the control of release rates and vary them from hours to months. The simulations show that the intermolecular and molecule-nanotube interactions strongly influence both dynamic molecular flow and molecular diffusion. The characterization and functionalization of the single and multi-walled nanotubes allows us to further control the release rates.

Khamala, B. and L. Franklin. SU-BR. E.C. Ekuma. LSU-BR. G.L. Zhao, Y. Malozovsky, A. Stewart, and D. Bagayoko. SU-BR. **Ab-initio calculations of accurate electronic properties of ZnS.**—We present results from ab-initio, self-consistent, local density approximation (LDA) calculations of electronic and related properties of zinc blende zinc sulphide (zb-ZnS). We employed the Ceperley and Alder LDA potential and the linear combination of atomic orbital (LCAO) formalism in our non-relativistic computations. The implementation of the LCAO formalism followed the Bagayoko, Zhao, and Williams' method as enhanced by Ekuma and Franklin (BZW-EF). The BZW-EF method includes a methodical search for the optimal basis set that yields the minima of the occupied energies. This search entails increases of the size of the basis set and the related modifications of angular symmetry and of radial orbitals. Our calculated, direct gap of 3.72 eV, at the Γ point, is in excellent agreement with experiment. We also have calculated the total (DOS) and partial (pDOS) densities of states and electron and hole effective

masses for ZnS. Research funded in part by the National Science Foundation (NSF) and the Louisiana Board of Regents, through LASiGMA [Award Nos. EPS- 1003897, NSF (2010-15)-RII-SUBR] and NSF HRD-1002541, the US Department of Energy – National, Nuclear Security Administration (NNSA) (Award No. DE-NA0001861), LaSPACE, and LONI-SUBR.

Malozovsky, Y. and L. Franklin. SU-BR. E.C. Ekuma. LSU-BR. G.L. Zhao and D. Bagayoko. SU-BR. **Ab-initio calculations of accurate electronic properties of GaP.**—We present results from ab-initio, self-consistent local density approximation (LDA) calculations of electronic and related properties of zinc blende gallium phosphide (GaP). Our non-relativistic computations employed the Ceperley and Alder LDA potential and the linear combination of atomic orbital (LCAO) formalism. The implementation of the LCAO formalism followed the Bagayoko, Zhao, and Williams’ method as enhanced by Ekuma and Franklin (BZW-EF). In this method, we solve self consistently two coupled equations. Doing so entail searching for the optimal basis set that produces the minima of the occupied energies and hence the correct ground state charge density. This search entails increases of the size of the basis set attendant modifications of angular symmetry and of radial orbitals. Our calculated indirect gap of 2.29 eV from Γ to X, is in excellent agreement with experimental values. We also have calculated the total (DOS) and partial (pDOS) densities of states and electron and hole effective masses for GaP. These calculated properties also agree with experimental findings. Research funded in part by the National Science Foundation (NSF) and the Louisiana Board of Regents, through LASiGMA [Award Nos. EPS- 1003897, NSF (2010-15)-RII-SUBR] and NSF HRD-1002541, the US Department of Energy – National, Nuclear Security Administration (NNSA) (Award No. DE-NA0001861), LaSPACE, and LONI-SUBR.

Sircar, A. and D. Greenwood (on behalf of the ATLAS collaboration). LTU. **Measurement of the tt bar cross section in the tau plus jets final state using the ATLAS detector.**—We present a measurement of the top quark pair tt bar production cross section in the tau plus jets final state at a center-of-mass energy 7 TeV. The analysis is based on proton-proton collisions collected with the ATLAS detector at the CERN LHC. A multivariate analysis technique is used to identify the tau lepton. Our results are in good agreement with standard model predictions and other top pair cross section measurement.

Sissay, A., L. Franklin, B. Khamala, G.L. Zhao, Y. Malozovsky, and D. Bagayoko. SU-BR. **First principle local density approximation description of the electronic properties of zinc-blende indium arsenide (InAs).**—The electronic structure of indium arsenide (InAs) in the zinc-blende structure is studied by means of the first-principles, local density calculations. Our ab-initio, non-relativistic calculations employed a local density functional approximation (LDA) potential and the linear combination of atomic orbitals (LCAO). Following the Bagayoko, Zhao, Williams, method as enhanced by Ekuma and Franklin (BZW-EF), we solved self-consistency both the Kohn-Sham equation and the equation giving the ground state charge density in terms of the wave functions of the occupied states. The BZW procedure avoids a recently identified spurious effect which has been instrumental in successfully reproducing or predicting the band gaps of numerous semiconductors. This effect, inherent to the use of basis sets in variational calculations, has plagued ab-initio calculations of electronic properties of semiconductors since their inception. This research is funded in part by the National Science Foundation (NSF) and the Louisiana Board of Regents, through LASiGMA [Award Nos. EPS- 1003897, NSF (2010-15)-

RII-SUBR] and NSF HRD-1002541, the US Department of Energy – National, Nuclear Security Administration (NNSA) (Award No. DE-NA0001861), LaSPACE, and LONI-SUBR.

Stewart, A., B. Khamala, Y. Malozovsky, and D. Bagayoko. SU-BR. **Calculations of electronic properties of cubic cadmium selenide (CdSe).**—We have studied the electronic structure of cubic CdSe by means of first principle, self-consistent calculations. Our non-relativistic calculations implemented the linear combination of atomic orbital (LCAO) formalism and employed a local density approximation (LDA) potential. The distinctive feature of our computations consists of our use of the Bagayoko, Zhao, and Williams’ method (BZW), as enhanced by Ekuma and Franklin (BZW-EF). This method solves the system of two coupled equations comprising the Kohn-Sham equation and the one giving the ground state charge density in terms of wave functions of the occupied states. The explicit attainment of the minima of the occupied energies endows of our DFT results with much physical meaning, not only for these occupied energies, but also for low lying unoccupied ones. We discuss our preliminary results for the band gap of CdSe, the electron and hole effective masses, and the total (DOS) and partial (pDOS) densities of states. Research funded in part by the National Science Foundation (NSF) and the Louisiana Board of Regents, through LASiGMA [Award Nos. EPS- 1003897, NSF (2010-15)-RII-SUBR] and NSF HRD-1002541, the US Department of Energy – National, Nuclear Security Administration (NNSA) (Award No. DE-NA0001861), LaSPACE, and LONI-SUBR.

Subramaniam, R., L. Sawyer, M. Tamsett, and M. Wobisch (on behalf of the ATLAS collaboration). LTU. **Measurement of angular correlations of jets at the Large Hadron Collider, LHC.**—We present a measurement of angular correlations of jets at the Large Hadron Collider, LHC. This measurement is sensitive to QCD dynamics and to the strong coupling constant, while being only weakly sensitive to parton distribution functions. The variable R_{dR} measures the angular correlations of jets and is defined as the number of neighboring jets above a given transverse momentum threshold which accompany a given jet within a given distance Δ_R in the plane of rapidity and azimuthal angle. The ensemble average over all jets in an inclusive jet sample is measured and the results are presented as a function of transverse momentum of the inclusive jets, in different regions of Δ_R and for different transverse momentum requirements for the neighboring jets. The measurement is based on a data set corresponding to an integrated luminosity of 13 fb^{-1} in pp collisions at $\sqrt{s} = 8 \text{ TeV}$, collected with the ATLAS detector at the LHC. The results are compared to the expectations from Monte Carlo event generators, and to the results of a perturbative QCD calculation in next-to-leading order in the strong coupling constant, corrected for non-perturbative effects. Supported by: LONI, DOE.

Division of Science Education

Higher Education Section

Elder, E.D. LSU-A. **Hands-on model of translation.**—Even with the videos that are available in ancillary materials with current textbooks and available through other electronic resources, many undergraduate students have difficulty understanding the process of translation. Depending on their backgrounds, some teachers also have difficulty with the topic. Although commercial models are available, they are frequently cost prohibitive, especially in institutions with limited budgets. This presentation will cover the development and application of a hands-on model illustrating translation. The model can be adapted to different levels of students from high school through several undergraduate levels. It can also be used in training and review for science teachers. It is composed of scrap lumber, Velcro, a plastic container, and paper clips. Since the components are inexpensive, multiple copies can be made for use in larger classes. It is easily assembled, repaired, replaced, and stored. Student comments indicated the model helps in visualizing the process. They also indicated that assembling and manipulating the model helped them to remember the process.

Hopper, L.J. ULM. **Assessing undergraduate learning in introductory atmospheric science courses with blended active learning strategies.**—Engaging students and improving their content knowledge in introductory atmospheric science courses is critical to producing scientifically literate college graduates who will drive future economic and policy decisions. Although several studies have assessed student learning in online courses, relatively few have evaluated hybrid courses that “blend” traditional classroom instruction with online learning. This study compares student performance and satisfaction in traditional face-to-face and blended sections of two different introductory atmospheric science and severe weather courses over the past two years at ULM. Vignettes of blended online activities with classroom lecture components utilizing a variety of active learning strategies incorporated into both courses are presented, including lessons on hurricane impacts and forecasting daily temperature and precipitation. Selected common exam questions and course evaluation items are used to assess and compare student learning and satisfaction in traditional and blended sections of both courses. Qualitative and quantitative survey items also are used to gather student feedback on whether they prefer traditional, blended, or online courses and how engaged and challenged they perceive themselves to be in each. Results from this pilot study may be used in making recommendations for best advising practices and incorporating new pedagogies and material into blended courses.

Namwamba, J.B.O. SU-BR. E. Samwel. SU-NO. **Effect of classical instrumental background music volume on performance in algebra tests, self-efficacy, and test anxiety of college students.**—The goals of this study were to investigate effects of volume of background classical instrumental music on algebra test scores, mathematics test anxiety and mathematics self-efficacy of students in college in Louisiana. Most research findings are based on comparison test scores between students who had music instruction and those who did not. Researchers suggest that academic benefits from music could be linked to improvement in reasoning and visualization in space due to development of the brain caused by stimulation of some senses by music. Research also shows that music listening enhanced the workers’ productivity and morale at work. To meet the objectives of this study, experiments involving a class of 30 students

divided into five groups, one control and four treatment groups were carried out. Self-efficacy, mathematics anxiety and mathematics test scores were carried out while listening to classical instrumental music of volume ranging from approximately 40 decibel to 79 decibel. Six hypotheses were tested. The students' mean scores in the algebra test were found to be the lowest at lowest volume of classical instrumental music. As the volume of music was gradually increased, the corresponding algebra mean test scores increased.

Negatu, Z. LSU-A. **Student preparation of an atlas as a learning tool in anatomy and histology classes.**—To develop students' interest in laboratory exercises and to facilitate the learning process, health science students taking Human Anatomy and Physiology and biology majors taking Histology are required to prepare an atlas of the organ-systems and histology slides that they examine in the laboratory. In this hands-on exercise students take photos of the models or microscope slides they examine, and use PowerPoint or image analysis software to label the pictures and prepare a PowerPoint presentation. This approach has increased students' interest and made them more involved in the learning process. In addition to facilitating the learning process students also learn to use PowerPoint effectively to modify and label pictures and to prepare slides for presentations. Students taking histology also will gain more experience to efficiently use the microscope since this is essential to taking good photomicrographs. They also will be familiarized to use any microscope equipped for digital microscopy and image analysis. Examples of photographs/photomicrographs submitted by students will be presented.

Regner, S.M. and L.B. Lewis. LUNO. **Does social interaction facilitate adult language learning?**—Investigating which factors can maximize language learning in adults has become increasingly popular due to the value of bilingualism in business, medicine, and international affairs. In this study, the effects of exposure to non-social language cues, one-directional social cues, and interactive social cues will be examined to determine their influence on novel language learning in adults. Sixty undergraduate students will be randomly assigned to three experimental groups, one group receiving written, non-social information regarding noun-based vocabulary words of a novel language, the next receiving verbal, non-interactive instruction, and the last receiving instruction via a social-interactive game. Prior to instruction, participants will complete a brief language history questionnaire to assess language education level and previous language experience. After a 10-minute exposure to either the written, verbal, or interactive instruction of novel language rules, each group will be asked to complete a brief quiz regarding the rules of the novel language. According to previous research in adult language education, participants exposed to the two-directional interactive condition will perform better on the quiz than those exposed to the written or one-way verbal conditions.

Stumpf, C.F. LSU-A. **Integration of inquiry-based research with bean beetles into class curricula.**—Inquiry-based learning is an active learning approach that fosters a highly integrative method of acquiring knowledge. Students have to develop their own research plan in class including experimental design, description of variables, and data analysis. Bean beetles develop as larvae on beans in the genus *Vigna*. Adult beetles do not feed or drink and can easily be maintained in Petri dishes. The exciting part of the bean beetle project is that it is all encompassing, i.e., students design their own research projects in peer groups, which facilitates learning and understanding. The research focuses less on the results themselves, but more on the methods and how meaningful results can be achieved with a scientific experiment. Using bean

beetles for inquiry-based undergraduate research has become more and more popular in the U.S. and other countries. So far the bean beetles are being used in inquiry-based research assignments in my Entomology course and as research subjects in a research course. The advantages and challenges of this approach for a better understanding of the scientific method and its integration into different university courses will be discussed.

Division of Sciences and Humanities

Blanchard, L. NiSU. **Leonardo da Vinci and science.**—Leonardo da Vinci is famously known for being an artist; however, this project will explore his scientific side, specifically in regards to anatomy. Leonardo da Vinci was born in Vinci, Italy, in 1452, and began apprenticing under an artist at age 14. At age 30, he moved to Milan to serve as the Duke's engineer and artist. It was here he began his vast array of studies. His areas of scientific study were numerous, and, as a result, Kenneth Clark stated he was "the most relentlessly curious man in history." His scientific inquiries fill over 13,000 pages of his notebooks. His observations and inventions were advanced for his time; some of his studies, including the flow of blood through the aortic valve, showed observations that would not be noted again for 400 years. Although he made discoveries that no doctor had, he also made several mistakes by relying on classical anatomy texts. Nonetheless, scholars say that if he had published his anatomical studies, it would have been the most important anatomical work ever written. This presentation will discuss some of Leonardo da Vinci's discoveries that could have improved science.

Cibelli, D.H. NiSU. **Pictures of anatomy in Vesalius' *On the Fabric of the Human Body*.**—This paper will introduce a session on Renaissance art and anatomy and will further discuss woodcut illustrations in Andrea Vesalius' *De Humani Corporis Fabrica*, published in Basel in 1543. Vesalius' text on anatomy includes the title page depicting a dissected body within an anatomical theater. It will be argued that the theater is an important motif in the title page because anatomical theaters were sites that allowed for the empirical study of the body. The theater in Vesalius' text signaled a new way of organizing and accessing information as the theater space was used to conceptualize knowledge of the body based upon dissection. Anatomists and artists started to revise their view of the whole organism based upon their knowledge of the different parts of the body examined during dissection.

Dufrene, T.P. NiSU. **Anatomical accuracies and inaccuracies of Leonardo da Vinci's "The Great Lady."**—For men of the 16th century, internal aspects of the female body held little or no particular fascination. For Leonardo da Vinci, it held answers that would appease his curiosity, for he understood that there was significantly more complexity to the "great" female body than that of the male body. Thus, his 1508 creation titled "The Great Lady" became one of his most well-known masterworks. Subtitled "View of the organs of the chest and abdomen and of the vascular system of a woman," Leonardo incorporated brown ink and black chalk to create a fairly accurate anatomical representation of the female body. The purpose of this study was to examine the accuracy with which da Vinci presented the female body. The results of this undertaking were reached using photographs and medical illustrations to show the accuracies and inaccuracies of da Vinci's drawing, including, but not limited to, the locations, sizes, and structures of the female organs. This project also discovered how beneficial these drawings were in the 16th century because they encouraged empirical study.

Giguette, R.R. and R.A. Alexander. NiSU. **Big Brother shattered and scattered: emerging information technology and the diminishment of the dystopian nightmare.**—The dystopia described in the novel *1984* depends heavily on futuristic technology, such as Big Brother surveillance and Ministry of Truth information control. Technology itself is portrayed as a largely negative societal influence. However, when George Orwell published his book in 1949,

none of this technology existed. Computing was in its infancy, satellites and GPS tracking devices were decades in the future, and the Internet had yet to be imagined. Today, technological advances have caught up to and even surpassed those described by Orwell, but despite their many negative effects, these technologies have not led to totalitarian control. On the contrary, many of these technologies—things like personal computers, smart phones, and the Internet—have increased rather than decreased individual freedom. Ironically, it appears that the very technologies needed to create an Orwellian society may actually prevent it from coming to pass. Our presentation examines the effects of 1984-like technologies in modern society, the reasons they have not (yet) led to a Soviet-type dystopia, and why the development of such technologies by a totalitarian government is unlikely.

Granda, R.E., V.A. Felix, D.L. Merritt, K. Nelson, J. McDaniel, and W. Buboltz. LTU. **Sleep, emotional exhaustion, stress, and well-being.**—As college students adjust to their autonomous lifestyles, they learn how to balance academics with social activities. This adjustment may be stressful, possibly leading to burnout. Research supports that as stress levels increase people are more likely to experience emotional exhaustion. Stress and emotional exhaustion also have been correlated with sleep complaints. The purpose of this study was to investigate the relationships between stress, emotional exhaustion, sleep, and well-being of college students. Participants (N = 264) included undergraduate psychology students at two southern universities who voluntarily completed a paper and pencil packet for extra credit in their course. Demographics of the sample included 48.8% males and 51.2% females. The sample consisted of 85% Caucasian Americans, 14.4% African Americans, and 6% other minorities. The measures collected were the Sleep Quality Index, Perceived Stress Scale, General Well-Being Scale, Sleep Habit Survey, Sleep Hygiene Awareness and Practices Scale, Adult Sleep Wake Scale, and items measuring emotional exhaustion.

Grelle, K. and B. Lewis. LUNO. **The effects of meditative and non-meditative exercise on memory and mindfulness.**—There is growing interest in the effects of meditation practices on psychological function. The present study is an investigation of how experience in meditative versus non-meditative exercise affects an individual's performance on three different measures of memory. Undergraduate student participants were randomly assigned to one of three condition groups: non-meditative exercise, chi meditative exercise presented without any meditative component, or chi meditative exercise presented with a meditation emphasizing an awareness of breathing and the flow of energy. After the experience, participants completed tests of symbolic memory, paired associate learning, and position memory. They also completed measures of situational and habitual mindfulness. Results suggested a trend of better memory accuracy for participants in the meditative exercise group relative to participants in the two non-meditative exercise groups. Increased mindfulness also correlated with improved memory performance.

Jeffress, M.S. NiSU. **“Finally a sport for us!”: Participant experiences in power soccer—the first competitive team sport for electric wheelchair users.**—A host of studies over the past three decades have called for increased opportunities for participation in sports because of the physical and psychosocial benefits received. This is no less true for people with physical disabilities that require the use of electric wheelchairs. This research investigates the experiences of 34 participants from across the United States in power soccer, the first competitive team sport for electric wheelchair users. The 11 female and 23 male participants ranged in age from 10 to 52

with a median age of 19. Attention is given to the meanings participants attribute to their involvement, the perceived benefits they receive from involvement, and the impact of participation on their practice of communication, self-efficacy beliefs, and the development and use of social capital.

Malaviya, A., K. Boswell, A.M. Findley, C.R. Gissendanner, A.M.D. Wiedemeier, and P.D. Wiedemeier. ULM. **A cost-benefit analysis of DNA sequencing and restriction endonuclease DNA digestion.**—DNA sequencing is the primary method used by researchers to identify the genetic make-up and relatedness of organisms. Sequencing has greatly impacted biological research particularly at the molecular level. However, the cost associated with sequencing technology is not trivial and may limit its application at small K-12 schools, colleges, and universities. Here, we present a cost-benefit analysis of using restriction endonucleases as a means to predict the genetic relatedness between a subset of Mycobacteriophages. Our research shows that the restriction endonuclease digestion of isolated DNA saves both time and money, compared to DNA sequencing. The average time for obtaining unfinished Mycobacteriophage DNA sequences from a sequencing facility is up to three months, and the cost is approximately \$1,500 per sequence. In contrast, we have determined that the digestion of isolated Mycobacteriophage DNA by 13 restriction enzymes can be accomplished in approximately 13 hours at an average cost of \$50. Researchers sequence DNA because a web-based tool, BLAST, exists that can be used to determine the genetic relatedness of sequenced organisms. We have created a prototype web based tool that predicts the genetic relationship of Mycobacteriophages that have been categorized through the use of restriction endonuclease digestion.

Newman, D.N., K.L. Nelson, and J.R. McDaniel. LTU. **Examining gender bias amongst engineering students.**—The Committee on Equal Opportunities in Science and Engineering recognizes the importance and need to attract, retain, and increase diverse student populations, including women and minorities, in engineering, technological, mathematical, and scientific (STEM) fields. Math and science have been historically viewed as the territory of males, making these fields particularly susceptible to influence by sex role expectations. False beliefs that women lack abilities in math and science have perpetuated the idea that women should not pursue careers utilizing skills in math, science, and engineering. A recent study by Moss-Racusin, Dovidio, Brescoll, Graham, and Handelsman (2012) found that faculty exhibit gender bias toward females in the sciences field and suggests this may contribute to gender disparities within sciences. The current study analyzed whether students also exhibit gender bias towards potential applicants for their own program of study. Undergraduate engineering students were given a hypothetical application with either a male or female name and asked to rate the applicant's potential. Results showed no significant differences, suggesting that a gender bias toward females may be diminishing, at least at the student level.

Yehya, R. SU-BR. **Challenges facing higher education.**—This paper examines the major challenges facing the institutions of higher education in the United States. These challenges include: increasing public demands for stricter accountability and assessment, meeting high public expectations, decreasing public financial support, maintaining academic quality in teaching and research, addressing the opportunities and challenges of globalization and online education, responding to increasing competition and remaining relevant and ahead of the curve,

and predicting educational trends and having proper adaptation. In addressing these challenges, special attention is paid to the resources available to the institutions of higher education.

Division of Social Sciences

Arnold, D.H. and L.M. Anderson. **Predicting disruptive innovation development: Do characteristics of the firm predict innovations?**—Disruptive innovations are changes in technology that drive changes in consumer behavior regarding both new-to-market products and innovations in business models. Current research aims to link the unique resources of the firm and the firm's ability to initiate product-level and business-model innovations. Resources include human resources, organizational culture, resource allocation, and organizational structure. Examples of disruptive innovation include Amazon's decision to sell media online and the unique pricing strategy used by Southwest Airlines. This paper describes a research plan for increasing the understanding of disruptive innovation and its link to organizational strategy. Utilizing an existing theoretical framework, the research seeks to further distinguish between two types of disruptive innovation, find a relationship between strategic capabilities and innovation, and increase the predictive qualities of the theory. Using a sample of workers from firms regarded as innovators, we hypothesize the types of disruptive innovations will be distinguishable by the firms' workers, further clarifying the theoretical structure of the concepts. We also hypothesize that a firm's unique resources have a direct relationship with the innovative history of the firm and these resource strengths differ among product-related and business-model innovations.

Belwalkar, B., W. Scanu, and R. Chambers II. LTU. **Team selection using behavioral game theory.**—Evers, Anderson, and Voskuil (2005) identified employee selection as a complex process. Complexity in the selection process escalates when an employee is selected as part of a team. Some people have greater preference and efficacy for teamwork than others (Driskell & Sala, 1992; Tasa et al., 2007). Therefore, selecting such individuals via appropriate methods is an important step in maximizing team efficiency (Jones et al., 2000; Stevens & Campion, 1999). Traditionally, self-report measures have been used for team selection, such as biographical data and personality assessments (Spector, 2012). The present paper researches a multi-disciplinary approach to team selection using behavioral game theory. Behavioral game theory is defined as a study of individual's behavior in a strategic and interactive decision making process to accomplish a certain goal, usually expressed in a mathematical expression (Camerer, 2003). In other words, game theory analytically answers questions about what individuals with various degrees of rationality will do. The purpose of the present paper was to explore whether behavioral game theory might contribute to better team selection compared to the traditional selection practices. This research may provide organizations, which rely on self-managing work teams, with a cost-effective and efficient method of team selection.

Buckner, J.E.V, R.A. Buckner, and C.M. Castille. LTU. **UF-NO! UFOs and cognitive dissonance.**—Some people hold firm to their beliefs, even when faced with undeniable evidence those beliefs are false. The theory of cognitive dissonance explains how people react when confronted with disconfirming evidence of their beliefs. According to the theory, people experience cognitive dissonance, a state of psychological discomfort, when they hold a strong belief and are presented with irrefutable evidence that their belief is false. When individuals experience cognitive dissonance they are motivated to alleviate this uncomfortable feeling. Ultimately, individuals come to a crossroad where they must decide to either continue in their belief or abandon it. This study examines the UFO community as an example of how cognitive

dissonance influences belief. Proponents maintain that UFOs are alien craft and that aliens have crashed on Earth, in spite of an overwhelming lack of physical evidence. To demonstrate the vast difference between proponents' beliefs and existing evidence, we compiled a list of alleged UFO crashes using various internet sources. In addition to reviewing the discrepancy between proponents' beliefs and the evidence, we discuss factors that enable UFO proponents to persist in their belief, common contentions believers make to help them reconcile their beliefs with the evidence, and ways skeptics weigh evidence.

De Leon, J.A., C. Huynh, and T. Sheets. LTU. **Top executive succession and issues leading to performance.**—Although research on the direct link between top executive performance and organizational performance has produced mixed results, the shared belief among scholars is that top executives are vital for organizations. This research focused on executive succession. Changes at the top executive level usually have long lasting consequences that are felt throughout all levels of the organization. Therefore, it is in the best interest of the organization to have a clear succession plan in place to ensure a smooth transition. Using a sample of general managers from professional sports, this research explored the important issues related to executive succession and the influence these issues may have on an organization's present plans and future performance. The presentation examined the pros and cons of replacing top executives with executives from inside or outside of the organization. Overall, the presentation was designed to show how organizations can survive drastic changes in leadership through clear and well thought-out succession planning.

De Leon, J.A., E. Theys, B. Dennis, and C. Huynh. LTU. **Choosing the right candidate: A look into performance in major league baseball.**—Managers are usually tasked with making important personnel decisions. While there are multiple criteria for selecting job candidates, the performance literature has demonstrated that the description and prediction of performance play one of, if not the most important aspects in the selection and hiring of future employees. When selecting the best applicant for a job, most managers usually tend to identify typical performance (i.e., what an employee will do on a regular basis) as the determining factor for employment. Other managers, however, rely on maximal performance (i.e., an employee's peak performance) to make employment decisions. Using archival data from the 2012 season of Major League Baseball, this presentation will explore the pros and cons of utilizing each aspect of performance as a selection criterion. The presentation also will examine other factors that managers should take into consideration when selecting employees, such as the variability of performance over a period of time and the effects of employee compensation on employee behavior. Overall, the presentation is designed to show that some organizations tend to make financial investments in the selection of new personnel without knowing which of the two aspects of performance could best serve the organization.

Duck, T.K., R. Niles, and J. Middleton. LTU. **Parenting style and its relationship to hope, anxiety, and depression in college students.**—An investigation was conducted into the correlations between the three parenting styles of authoritarian, authoritative, and permissive, and the variables of hope, depression, and anxiety. The authoritative style is commonly seen as the most beneficial parenting style, as it consists of a balance between a demanding attitude and firm control with high levels of nurturing, warmth, and clear communication. Hope consists of agency (the capacity to reach a goal) and pathways (the ability to generate routes to that goal).

Students in this study completed an online questionnaire consisting of the Hope Scale, the Parental Authority Questionnaire (PAQ), the Center for Epidemiologic Studies – Depression Scale (CES-D), and the Zung Self-Report Anxiety Scale. Authoritative parenting was hypothesized to be positively correlated with the students' levels of hope and negatively correlated with levels of depression and anxiety, and authoritarian and permissive parenting were hypothesized to be negatively correlated with the level of hope and positively correlated with levels of depression and anxiety. Correlational analyses were conducted to test these hypotheses and to determine significant correlations between the variables and gender and ethnicity.

Fontana, L.E. and E.L. Zucker. LUNO. **College students' attitudes towards the use of animals and other resources: Cultural influences and differences.**—Humans have evolved with a multitude of other species, not only relying on other species in mutually beneficial ways, but also exploiting other species to benefit themselves. In this study, the attitudes of undergraduate participants regarding the use of other animal species in a variety of contexts were investigated, as were participants' considerations of consequences of using available natural resources. One hundred undergraduate participants completed an investigator-designed survey indicating whether they deemed eight different uses of animals appropriate or inappropriate (e.g., for food, clothing, companionship, sport, etc.) for 23 different animals or animal groups (e.g., rodents, cats/dogs, cattle, waterfowl, monkeys, etc.). The Consideration of Future Consequences Scale (CFC; Strathman et al, 1994) was also completed by participants. The number of appropriate and inappropriate uses indicated was correlated with scores on the CFC, with an inverse correlation expected between the number of acceptable uses and scores on the CFC. Results were examined as a function of participants' cultural backgrounds and whether they lived in primarily urban or rural settings. Differences in appropriate/inappropriate uses of animals were expected as a function of these differing backgrounds.

Hindman, M.L. LSU-BR. M.M. Livingston and J.J. Tobacyk. LTU. **Performing research involving human participants: Legal, ethical and pragmatic issues.**—This presentation is a series that addresses the Office for Human Research Protections (OHRP) Federal regulations as well as ethical and pragmatic considerations in research with human participants. The first section of the presentation addresses what students need to know about serving as research participants and as a researcher using human participants. The rights of research participants will be a focus as well as appropriate participation and methods of appeal if violations occur. Pragmatic and ethical issues involved when students conduct research is addressed. The second section of the presentation discusses the common problems with and misconceptions about the OHRP regulations and processes and ways for researchers to streamline obtaining IRB approval. The third section provides a discussion on the use of human participants from the perspective of a longtime active researcher. It includes the researcher's ethical and legal obligations, retention of participants, optimizing results, cross cultural research issues and other pragmatic considerations.

Huynh, C.H. and A.M. Rabalais. LTU. **Revising the core self-evaluations scale: A study examining academic performance.**—The construct of core self-evaluations (CSE) can be defined as a broad, latent trait consisting of fundamental conclusions or evaluations that an individual holds about him- or herself. CSE, composed of four dimensions: self-esteem, generalized self-efficacy, neuroticism, and locus of control (Judge et al., 1997), has been tied to

job stress (Brunborg, 2008), job satisfaction, life satisfaction (Judge et al., 2005), goal setting, motivation, performance (Erez & Judge, 2001), and academic achievement (Rosopa & Schroeder, 2009). Researchers have speculated that the locus of control factor of CSE may not be a strong enough factor to be included in a measure of CSE (Judge, 2009; Judge et al., 2003; Bono & Judge, 2003). Locus of control has had a low impact on the incremental validity of the CSE scale; it does not seem to add anything beyond the other three factors (Judge, 2009). In response to this concern, the study examined whether a measure that excludes locus of control would be a more valid measure of CSE. It also assessed the relationship between CSE and academic performance as well as the moderating role that cognitive ability plays in the CSE-academic achievement relationship.

Igou, F.P. LTU. **Age discrimination in hiring: A hidden form of discrimination.**—Although older workers have some legal protection under the 1967 Age Discrimination in Employment Act (ADEA), age discrimination may be a pervasive, hidden form of discrimination affecting many hiring processes. This paper will present the findings of a study which examined the effects of applicants' perceived age on research participants' assigned ratings of job application materials. Participants were asked to rate simulated job applicants application form, cover letter and resume on five different job qualification dimensions. Two age conditions, 25 and 55 years of age were used. It was found that 25-year-old job applicants were rated significantly higher on most job qualification dimensions than 55-year-old applicants despite the application materials being identical.

Khoshini, S. and K.J. Eskine. LUNO. **Enclothed cognition: Effects of clothing style on creativity and sexual attitudes.**—While people can generally control the clothes they wear, relatively little is known about how those outfits can affect their cognition. Theories of Enclothed Cognition argue that the co-occurrence of the symbolic meaning of clothes and the experience of wearing them significantly influences the wearer's cognition. Participants were randomly assigned to one of three conditions, wearing a headscarf, wearing a full-body cape, or viewing a headscarf, prior to completing the Remote Associates Test (RAT) for creativity and the Sexual Liberalism-Conservatism Questionnaire (SLCQ). Enclothment manipulations resulted in a significant difference between the scarf-wearing condition and cape-wearing condition within the homosexuality subscale of the SLCQ, with cape-wearing participants answering more conservatively compared to scarf-wearing participants. Participants' self-reports on their everyday enclothment significantly predicted their creativity scores, which paralleled our hypothesis that enclothment constrains creativity. These results suggest a possible link between enclothment, cognition, and sexual attitudes.

Lambert, C. and K.J. Eskine. LUNO. **Effects of expertise and emotions on aesthetic judgments.**—Aesthetic judgments are made daily, but what processes undergird our appraisals of art? Recent research in the cognitive sciences has revealed the influential role of emotions in aesthetic processing, yet it remains unclear whether individual expertise affects the extent to which people rely on their emotions. The present study tested the effects of emotions and expertise on aesthetic judgments across four different mediums of art. Emotions are critical components of our experience, and they arise at a place where mind and body meet. However, an important part of artistic training involves the deliberate suppression of emotions to assess various aspects about an art work in a critical, objective manner. To determine the effects of

emotions and art experience on aesthetic judgments, participants were randomly assigned to a mood induction condition (happy vs. control) via short video clip. All participants indicated their experience/expertise with art, which will result in a 2 (emotion: happy, control) x 2 (experience: expert, novice) between-subjects quasi-experimental design. Following the emotion induction, participants rated all same art works on a validated art rating scale. It was hypothesized that novice participants will judge the art to be better when primed with happiness compared to control novices; however, the emotion induction is predicted to have no effect on experts' judgments.

Livingston, M.M. and F.P. Igou. LTU. **Development of scale to measure the need to persuade or proselytize.**—Individuals differ in their need to persuade or proselytize others, to convert someone from one belief to another. This need may manifest itself from the simple need to inform others, to the need to control others' attitudes or behaviors. Currently, there is no scale to measure this need. Such a scale would prove useful in the selection of sales people where it would be an asset or in selection of counselors where prose might be a potential deficit. This paper will present the steps taken to develop and validate this scale. Preliminary results will be presented.

Maier, M.I. and K.J. Eskine. LUNO. **The effects of perceived group membership and incidental emotion on forgiveness.**—While a vast amount of research has been done on dehumanization, little research has examined the effects of group membership and emotion on forgiveness. The purpose of this study was to investigate various aspects of group identification and emotion, specifically guilt and pride, on forgiveness. Seventy Loyola University undergraduate students identified with a particular group were primed for either guilt or pride following the recollection of a life memory. The Rosenberg Self-Esteem Scale and the Belief in a Just World Scale were administered and questions pertaining to forgiveness and pro-social behavior were asked. When primed for guilt or pride, it was hypothesized that in-group members will judge each other similarly, regardless of emotion. In contrast, it was hypothesized that out-group members would be judged more harshly when in-group members are feeling proud, but will be judged more kindly when in-group members are feeling guilty.

Merritt, D.L., J.M. Tracy, J. Middleton, R. Granda, T. Duck, W. Buboltz, and T. Young. LTU. **The relationship between paternal parenting style and ego state development.**—A central component of mental health is ego development (Richards et al., 1991). Ego state is implicated in the intrapersonal and interpersonal functioning of individuals (Richards et al., 1991). Paternal parenting style and supporting behaviors have been correlated with the development of personal identity, autonomy, and relatedness to others (Allen et al., 1994). The purpose of this study was to determine the relationship between paternal parenting style and ego development. Undergraduate college students (n = 241) were recruited to participate in a survey which consisted of the Ego State Questionnaire, the Differentiation of Self Inventory, and the Parenting Styles Questionnaire. Linear regressions were conducted to determine the predictive nature of paternal parenting style on ego state. The results suggest that the ego states of males are more closely related to their fathers' parenting style than the ego states of females. Fathers who primarily exhibit an authoritarian style may evoke feelings and behaviors that resemble criticizing and fault finding. Those that are more permissive could instill attitudes that reflect

nurturing and promote growth. The authoritative parenting style in fathers may encourage spontaneity and joy in experience.

Middleton, J. and W. Buboltz. LTU. **The relationship between social desirable responding and emotional intelligence.**—Socially desirable responding is when study participants answer questions in a manner that does not actually reflect their feelings, but rather to manipulate their impression to others (Paulhus, 1984). While this is a subject that has garnered much attention, little research has been conducted on what underlying traits support the tendency to answer in a socially desirable manner. This study explored the relationship between trait emotional intelligence (EI) and social desirability. After collecting data from 295 (54% men) undergraduate students, regression analysis was conducted. Results indicated that higher EI scores were a predictor of socially desirable responding. However, women and men differed in the EI subscales that were significant. For women, higher level of emotional control predicted socially desirable responding. For men, the EI subscales of emotionality and sociability were the only significant predictors.

Moore, R.J. and L.B. Lewis. LUNO. **How learning another language affects words and their meaning.**—It has been a debate for years whether the languages of a bilingual person share one system of semantic representation (defined as how word meaning is represented through language) or if those languages are accessed and understood differently in separate systems of semantic representation; essentially, if the understanding of words and their associations in one language is carried over to another language. This study attempts to answer this question by investigating how bilinguals, compared to monolinguals, process and make connections in English to observe if other learned languages have an effect without direct interference. Tests were administered in written English to observe the number of similar or dissimilar responses to semantically ambiguous words through free association and rating scales. A questionnaire and verbal fluency test obtained individual backgrounds and proficiency in any language other than English; participants were grouped based on second-language proficiency. A sorting test was administered to control for individual cognitive differences in level of abstraction. It was predicted that a high number of repeated responses would be found within the monolingual group, while there would be more response variations in the bilingual groups due to their experience with other languages and word meanings.

Murphy, S.M., and R. Chambers. LTU. **Does test content matter? The pros and cons of content validity.**—The Uniform Guidelines on Employee Selection Procedures (1978) discuss three primary types of validity for establishing a selection test is relevant to job performance and meets both professional and legal standards. This includes construct, criterion, and content validity. Criterion validity establishes job-relevance by relating test scores to job performance. Construct validity establishes job-relevance by relating test scores with variables that theoretically relate to the job-related construct the test supposedly reflects. Content validity establishes job-relevance by relating the content of the test to job content. Some suggest because content validity does not involve test scores, it is not true validity (Messick, 1975). It is what test scores predict that is job-relevant (e.g., cognitive ability predicts performance) and not the relationship between the test and job content (e.g. ratings of test items relevance to job tasks; Murphy, 2009). Proponents maintain however that content validity is the only recognized validation evidence that can be achieved without having to administer the test, which can be time

consuming and often not feasible (Tan, 2009; Crocker, 2003). This paper will present an explanation of how the content validity of a test may be established and the pros and cons of using this form of validity.

Niles, R.M., D. Thomas, J. Middleton, and T. Duck. LTU. **Emotional connectedness to Facebook: Does proximity matter?**—Since its creation in 2004, Facebook usage has grown exponentially with approximately 950 million registered users worldwide in June 2012 (Facebook, 2012). In turn, Facebook has fundamentally changed the ways in which people form, interact, and maintain social relationships. Research has indicated that social networking websites are used as a means of staying in touch with family, friends, peers, and checking photos (Miller et al., 2010). It is unclear whether a relationship exists among geographic proximity and the use of Facebook. The purpose of this study was to examine the relationships among demographic characteristics and one's emotional connection to Facebook. It is hypothesized that those respondents who are currently living outside of their home state will report a greater emotional connection to Facebook than those respondents who live in their home state. It was also hypothesized that those respondents who live off-of campus will report a greater emotional connection to Facebook than those respondents who live on campus in student housing. Two-hundred and one college students at a southern university completed a survey packet that included demographic questions and the Facebook Intensity Scale (Ellison et al., 2007).

Outland, N. and C. Corprew. LUNO. **Racial identity as a mediator or moderator on the correlation between race-related stress and the endorsement of hypermasculine attitudes.**—Utilizing the centrality and regard components of racial identity outlined by Sellers et al. (1997), this study seeks to understand how racial identity moderates/mediates the relationship between the perception of race-related stress and the endorsement of hypermasculine attitudes in African-American college males. Males were recruited from student organizations geared towards African-American males from several universities, through a psychology subject pool, social media outlets, and the snowball method. Participants completed a Hypermasculinity index, a Racial Identity index, and a Race-related Stress index administered by a male researcher. Spencer's PVEST model (Spencer, 2006) provided the study's theoretical framework. The first hypothesis anticipated that as perception of race-related stress increases, those participants who were low in racial centrality would report higher endorsements of hypermasculine attitudes. The second hypothesis was that as the perception of race-related stress increased, participants low in private regard would report higher levels of hypermasculine attitudes. The study used hierarchical linear regression analysis to assess the hypotheses. Results provided understanding of factors associated with the endorsement and expression of hypermasculine traits.

Patton, C.B. LTU. **Creativity and conscientiousness in the workplace.**—Many organizations devote considerable time and resources attempting to develop novel and useful products and services. Not surprisingly, workplace creativity is now one of the more salient, instrumental components behind the modern American economy (Florida, 2004). Creativity and workplace creativity are not necessarily the same thing. While creativity may include either novelty or usefulness and sometimes both, workplace creativity requires both novelty and usefulness (Amabile, 1996). Workplace creativity is a dynamic process that can be influenced by an individual's psychological processes (i.e., motivational, cognitive, and affective; Zhou &

Shalley, 2011). Studies have shown that conscientiousness, a factor in the five-factor personality model, predicts performance across jobs (Behling, 1998). However, George and Zeng (2001) state that people who are high in conscientiousness often have low levels of workplace creativity in certain contexts (e.g., closely monitored by supervisors or coworkers who are unsupportive of creative work). The purpose of this paper was to discuss the relationship between conscientiousness and creativity in different occupations (e.g., an engineering job versus a non-engineering job) and creative self-efficacy and its relationship with both creativity and conscientiousness.

Paul, S.L., C.M. Whitehead, and D. Merritt. LTU. **Energy drinks, perfectionism, and self-efficacy.**—This study compared the relationships between energy drink usage, perfectionism, and self-efficacy. The study sample included 304 undergraduate students enrolled in psychology courses who were given extra credit for completing the study survey. Of the participants, 54.4% were female and 45.6% were male. Student participants completed a battery of questions regarding sleep quality, self-efficacy, perfectionism, and self-monitoring. The instruments used were the Sleep Quality Index, the Multidimensional Scales of Perceived Self-Efficacy (Bandura), the Frost Multidimensional Perfectionism Scale (Stober, 1998), and the Self-Monitoring Scale (Snyder, 1974). It was hypothesized that the students who have higher levels of self-efficacy and perfectionism would get less sleep and that students with lower levels of self-efficacy and perfectionism would have lower quality of sleep.

Plaisance, B., J. De Leon, J. Tornabene, and M. Desselles. LTU. **Online social media as distraction: An exploration of individual differences.**—With the use of online media and smartphones skyrocketing, modern workers generally believe they can effectively multi-task. Such assumptions run counter to empirical evidence. Attempting more than one task at a time may lead to higher cognitive loads, greater distraction, and impaired performance (Salvucci, 2002). Individual difference variables such as gender and conscientiousness have been linked to distractibility (Barrick & Mount, 1991; Rust, 1999). Xu (2010) found that male students were more easily distracted than female students. Kay and Lauricella (2011) reported males were more likely to use electronic media devices while doing other activities. Research has examined distraction using multiple repetitive activities (e.g., data entry), texting while driving, and easy and complex homework assignments (Sanders & Baron, 1975; Strayer et al., 2003). The paper expands upon previous work by examining online social media as a distraction while working on a clerical online task. In addition to gender differences, a physiological measure of testosterone was investigated. Testosterone has been linked to some, but not all, measures of attention (Rasile et al., 1995). Males and individuals with lower conscientiousness and higher testosterone were hypothesized to be more distracted by social media than their counterparts.

Rabalais, A. and M. Desselles. LTU. **The effect of executives' characteristics on strategic emphasis.**—The present paper explored the relationship between executive characteristics and strategic decisions. According to Hambrick and Mason's (1984) upper echelons theory, an organization's strategies as well as effectiveness are reflections of the values and cognitive bases of the organization's influential members. Characteristics of upper echelon managers have been found to influence their strategic choices (Barker & Mueller, 2002). Long-tenured CEOs tend to emphasize stability and short-tenured CEOs tend to emphasize innovation. Those with high levels of education are more likely to focus on innovation compared to those with low levels of

education (Hambrick & Mason, 1984). The current study extends upper echelons theory through the addition of macro-organizational variables such as managerial discretion that is hypothesized to moderate the relationship between executive characteristics and strategic decisions. In some industries, executives have relatively more control over decisions and the strategy pursued by their organization (Finkelstein & Hambrick, 1990). For those organizations in which management has high control, management characteristics should be strongly related to the strategy. This presentation incorporated these theories and proposed a model and research design in attempt to clarify the relationship between executives' characteristics and strategic decisions.

Theys, E.R. and M. Desselles. LTU. **Metamotivational state and group cohesion: Reversal theory in teams.**—The purpose of this study was to connect reversal theory to group cohesion through the examination of the effect of metamotivational state on group cohesion. Reversal theory's theoretical base is built upon assumptions which, for the most part, have gone untested. This study tested the assumption of felt identification and the relationship this factor has with the orientation domain. Furthermore, Apter (2001) and Carron (1982) identify a need for individual level analyses in both reversal theory and cohesion research. This study addressed this deficiency by using momentary and individual level data for metamotivational state as well as cohesion. Data were collected from collegiate athletes using a repeated measures design. Momentary metamotivational state as well as individual level cohesion data were collected twelve times over the course of three weeks before and after team practices. Group level data, motivational profile and group cohesion were collected once and will serve as the level two variables in the hierarchical linear modeling analyses.

Wynes, D.D., J.G. Gotee, and J.R. McDaniel. LTU. **Promoting domestic violence prevention, intervention and community education.**—Domestic violence (DV) is defined as any physical, sexual, or emotional abusive behavior used by one person in a relationship to intimidate, coerce, punish or control their partner. In 2003, approximately 8 billion dollars were spent covering DV related costs. In 2009, approximately 550,000 females 12 years and older and 100,000 males experienced some form of nonfatal intimate violence. Some victims of DV may experience low self-esteem, depression, anxiety, posttraumatic stress disorder, or suicide ideology. The importance of DV prevention and intervention has long been recognized in research and advocated in community initiatives. Different methods are currently being used to distribute information regarding DV such as community workshops and media campaigns. However, as important as getting information out to the public, it is equally important to consider how the information is delivered, received and processed by communities. The purpose of this study was to explore the effectiveness of different visual aids used to present DV statistics, prevention, and intervention information to college students and examine how the presentation may influence their attitudes and behavior towards DV prevention. The study also identified an effective and efficient method to provide DV information to different audiences in the community.

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