LOUISIANA SCIENTIST

THE

NEWSLETTER

of the

LOUISIANA ACADEMY OF SCIENCES

Volume 1A, No. 2
(2008 Annual Meeting Abstracts)

Published by
THE LOUISIANA ACADEMY OF SCIENCES

15 June 2012

Louisiana Academy of Sciences
Abstracts of Presentations
2008 Annual Meeting

Northwestern State University
Natchitoches, Louisiana
14 March 2008

Table of Contents

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

AFPMB	Armed Forces Pest Management Board, Washington, D.C.
BCMG	Bob Campbell Museum of Geology, Clemson, SC
EBRCO	East Baton Rouge Coroner's Office
GIT	Georgia Institute of Technology
GSU	Grambling State University
KNF	Kisatchie National Forest, Calcasieu District, LA
LDFW	Louisiana Department of Fish and Wildlife
LSU-BR	Louisiana State University, Baton Rouge
LSU-E	Louisiana State University, Eunice
LSUHSC-NO	Louisiana State University Health Sciences Center, New Orleans, LA
LTU	Louisiana Tech University
McSU	McNeese State University
NASA-LRC	NASA-Langley Research Center
NCSU	North Carolina State University
NGCSU	North Georgia College and State University
NiSU	Nicholls State University
NOAA	National Oceanic and Atmospheric Administration
NSU	Northwestern State University
NSU-ARC	Northwestern State University-Aquaculture Research Center
OSU	Oklahoma State University
PEC	Punjab Engineering College, India
SLPSD	St. Landry Parish School District
SCSM	South Carolina State Museum
SLU	Southeastern Louisiana University
SU-BR	Southern University, Baton Rouge
TU	Tulane University
ULL	University of Louisiana, Lafayette
ULM	University of Louisiana, Monroe
USC	University of South Carolina
USUHS	Uniformed Services University of the Health Sciences, Bethesda, MD
VU	Vanderbilt University

Division of Agriculture, Forestry and Wildlife

Collara, P., J. Delabbio, S. Gabrey and G. Brown. NSU-ARC. **The effect of three environmental treatments on the production of red swamp crayfish (*Procambarus clarkii*) in Louisianan farm ponds**.—We investigated the effect of three environmental treatments on the production volume of red swamp crayfish (*Procambarus clarkii*). The research involved 12 quarter-acre freshwater ponds at the Aquaculture Research Center during spring 2008. Treatments were 24-hour lighting from underwater light sources, perimeter and aerial predator netting, and artificial horizontal substrate. Each treatment was applied to three ponds and there was a control group of three ponds. Crayfish were harvest twice weekly from February to May using baited pyramid crayfish traps. Per pond harvest weight (kg) and harvest proportion among six size-grades were recorded. Preliminary results will be presented. This work was supported by a NSU Undergraduate Student Research grant.

Jariel, D.M. and M.F. Vidrine. LSU-E. **Plant and soil nutrient concentrations in restored Cajun prairie**.—In prairie ecosystem, plants recycle nutrient by extracting nutrients from the soil during the active period of growth and then return the nutrients back to the soil during the period of dormancy and decomposition. Prescribed winter burning in prairies facilitates the nutrient recycling. To determine the amounts of nutrients in plant tissues and soil from spring to fall, a Cajun prairie at LSU-E was divided into three blocks. In each block, four plant species (*Baptisia sphaerocarpa*, *Eryngium yuccifolium*, *Panicum vergatum*, and *Solidago odora*) were chosen. Whole plant samples per species were clipped at ground level and soil samples were taken 2.5 cm away from the root crown of sampled species on 2004 April 14, 2004 July 28, and 2004 October 28. The soil pH, phosphorus and copper decreased from April to October. As plants matured, plant percent phosphorus, copper and potassium decreased in tissues of all species. Total phosphorus, zinc and potassium uptake by *Baptisia* were lower than the other three species. The temporary decline in pH and some nutrient levels in the soil could be attributed to the differential nutrient uptake by four plant species during the short-term period of active growth in unfertilized Cajun prairie.

Sander, P., M. Merchant and C. Burton. McSU. R. Elsey. LDFW. **Development of innate immunity in juvenile American alligators**.—Previous results in our laboratory indicated that hatchling alligators do not exhibit serum complement-mediated innate immune activity, but develop this activity during their first year. Thirty-five alligators, from seven different wild clutches, were housed in indoor tanks (30-31^{o}C) and fed ad libitum for approximately 2 months. Half of the alligators were then moved to outdoor tanks, while the other half remained indoors, such that animals from each clutch were represented in both groups. Each group of alligators was bled within 1-2 weeks of hatching, and then at various times during their first year (1, 2, 3, 4, and 6 months). The serum complement-mediated immune activity was determined using a sheep red blood cell hemolysis assay previously developed in our laboratory. Early results have indicated that alligators housed outside develop immunity much earlier than those kept indoors at optimal temperatures. In fact, most of the immunity was developed during the cold winter months when activity levels are low and nutritional intake is nonexistent. These results indicate that factors other than optimal metabolic temperature and growth rate (such as UV light exposure) may have a greater influence development of immunity. In addition, we observed clutch effects. One of the

clutches, regardless of the placement of their individuals, developed immunity earlier than the other clutches. Alligators from clutch #6 housed indoors developed immunity earlier than other alligators housed under the same conditions. Likewise, alligators in clutch #6 exhibited the highest mean innate immune activity relative to the other groups in the outdoor environment. These results indicate that captive breeding programs for other crocodilians might be able to choose immune parameters as a selectable trait.

Division of Biological Sciences

Botany Section

Banks, B.C. and A.M.D. Wiedemeier. ULM. **Crown gall due to *Agrobacterium tumefaciens*: A model system for cellular biology**.—Gall formation in plants can be used as a learning model for a cellular biology class. Cellular organization, division, and DNA expression can be compared between normal and tumorous tissue. *Agrobacterium tumefaciens* was used to generate tumors. When a plant becomes wounded and subsequently infected, a Ti plasmid is transferred from *Agrobacterium* sp. into the plant cell's genome where changes in protein production take place. In this study, we grew two dicots, tomatoes (*Solano lycopersicum*) and sunflowers (*Helianthus annuus*), for two weeks and inoculated the stems with *Agrobacterium tumefaciens*. Plants were placed into three experimental groups: wounded with a non-tumor inducing *Agrobacterium* sp., wounded with gall-forming *Agrobacterium* sp., and wounded with a toothpick or sterile inoculating needle. After another two weeks of growth, we sectioned the stems and are currently extracting the proteins to determine expression. Different ways of introducing the bacteria into the wounded stem produced distinct external tumor organization. The results confirmed that wild type bacteria induce changes in the stems. Future studies will focus on the motility of the bacteria inside the plant, neoplastic vascular organization, and the speed of aging in the neoplasm.

Burnley, P. GSU. T. Massad and L. Dyer. TU. **Correlations between plant defensive chemistry, elevation, and temperature**.—Saponins are natural carbon-based surfactants, or detergents, found in many plants to defend against herbivory. Saponins have the ability to foam because of the combination of nonpolar sapogenin and the water-soluble side chain. This project found that there is a significant relationship between the shake-foam method and HPLC method for quantification of saponin content.

Chance, L.A. NSU. M. Bodri. NGCSU. C. Griffith. KNF. **Pitcher plant bog restoration update in west-central Louisiana**.—A project to halt degradation and rapid decline of pitcher plant bogs in central-west LA was begun in 2005. The primary objective of this study was to determine if bog restoration can be achieved by erosion control, species propagation, and reintroduction of acid bog species aimed at preserving high quality bog plant habitat. Seven sites with varying topography chosen in the Kisatchie National Forest in Natchitoches Parish were impacted by recreational traffic, fire lanes, herbicide from private property, understory encroachment and past timber cutting activity. Hay from donor bogs was spread over bare ground and sandy fill dirt placed in deep ATV and skidder ruts for erosion correction. Bog species obtained from high quality donor bogs were grown in a greenhouse and then transplanted onto bare areas. Four different erosion controls were implemented on the varying terrain to test soil retention. Preliminary data collected from sedimentation traps yielded a net gain of 26.6 inches soil from treatments in erosion control areas. An average of 151 species was found present in both donor and study bogs. Elevated species numbers plus 12 state-rare species present indicate all restoration sites have high quality potential.

Environmental Sciences Section

Addo, M. SU-BR. **The acid rain problem, who is to blame?—**Acid rain refers to precipitation that is significantly more acidic than natural, unpolluted rain, which in itself is mildly acidic due to the presence of carbon dioxide dissolved in the atmospheric moisture forming carbonic acid. The phenomenon of acid rain was discovered in Great Britain in the late 1800's but was essentially forgotten until the 1960's. Acid rain or acid deposition is a problem because it negatively affects human health, damages ecosystems as well as buildings and structures. The purpose of this paper is to discuss the problem of acid rain and who is to blame for this problem. Specific issues to be discussed include the formation of acid rain; sources of pollutants which cause acid rain; the evolution of the acid rain phenomenon and areas where acid rain is a problem; the trends of acid rain and its effects in the United States; who or what is to blame for this acid rain problem. Finally, the international policies and measures to solve the acid rain problem will be discussed; and specifically, the efforts of the United States to address the problem of acid rain since the 1990 amendment of the Clean Air Act will be discussed.

Baer, H., N. Hendrix, K. Kelley, C. Gissendanner and A.M. Findley. ULM. ***Caenorhabditis elegans* as a biomonitor for the presence of pollutants in the terrestrial ecosystem.—**The commercial herbicides and insecticides Round-Up®, Round-Up Plus®, Round-Up Extended Control®, Sevin®, Atrazine, and Malathion have been shown to harm non-target species in the environment. In some cases, it is thought that this toxicity is due, in part, to the surfactants and inert ingredients utilized in commercial formulations of these pesticides rather than the active ingredients themselves. The present study employs standard reproductive and behavioral assays to compare the effects that the pure active ingredients, the surfactants, and the combined commercial formulations have on the free-living nematode *Caenorhabditis elegans*. We also compare the response of the wild-type N2 strain of *C. elegans* to mutants that have been shown to be more sensitive to environmental toxins (e.g., the AE501 strain). Preliminary data suggest that while wild-type worms are largely unaffected by the pure chemicals and commercial formulations, certain surfactants have deleterious effects on worm viability. Conversely, commercial formulations of most pesticides and the presence of surfactants resulted in reduced viability and/or delayed development in the sensitive mutant worm strain. The combined data set will be useful in demonstrating the efficacy of *C. elegans* as a biomonitor in the terrestrial ecosystem.

Brandly, A. GSU. P. Derosa. LSU-BR. **DFT study of molecular toxicity**.**—**Many individuals may wonder why situations occur in life such as, what causes cancer cells to develop in the human body or why a particular compound may affect our health while others do not? Furthermore, it is of scientific relevance to find a relationship between geometrical and electronic properties of molecules and their toxicity. Such questions might motivate a quest of finding out new information that can someday help to treat a disease leading to the increase of the life span of organisms. It is known that molecular toxicity is associated with molecular reactivity and thus the study of reactivity parameters will prove relevant to the mentioned purpose. Our project focuses on the calculation of global reactivity descriptors, indicators of the molecular toxicity for a series of carbon structures that includes acenes and carbon nanotubes. In this work, ionization potential, electron affinity, chemical potential, molecular hardness, and

electrophilicity are calculated for a set of acenes, namely benzene, naphthalene, anthracene, and hexacene. This study is also relevant to nanotechnology given that the property of nanomaterials can be very different to those of the corresponding macroscopic counterpart, thus we also provide comparative results with a small section of a carbon nanotube.

Cooper, D., L. Henry, K. Morris, A. Patel, J. Delcambre and A. M. Findley. ULM. **Monitoring pollutants via the catfish olfactory response: Determining LC_{50} values and swimming behavior in the presence of pollutants of interest.—**Odorants play various roles in fish behavior including providing vital information pertaining to the presence of food sources, availability of reproductive mates, migratory cues, recognition of kin, and avoidance of predators. This highly responsive chemical monitoring system can also be assessed as a pollution detector. Basic electrophysiological studies of olfaction in fish have established a sensitive monitoring protocol to assess the presence of aquatic environmental pollutants. Fish were exposed to the active ingredients in several herbicides (e.g., atrazine and glyphosate) and insecticides (e.g., synthetic pyrethins) to assess their reception and response to the noxious stimuli. Such measurements on a small number of individuals provide an attractive alternative to the common practice of performing terminal behavior studies on large numbers of animals. In order to interpret these data, however, we have established LC_{50} values for glyphosate, glyphosate+, atrazine, and carbaryl for the fish species of interest. In addition, we have performed avoidance/preference, aberrant swimming pattern, and gill 'coughing' response behavioral studies with these same pollutants. Comparative studies were conducted with pure chemicals, surfactants, and their combined commercial formulations to assess the relative toxicity of each agent.

Hanney, M.J. and W. Dong. McSU. **Mercury content from sediments in Calcasieu Lake before and after Hurricane Rita.—**Our goal is to analyze mercury in sediments in the Calcasieu Lake area. Sediment samples from different locations were collected and then placed in Ziploc bags, which in turn were placed in an ice chest. Once the samples were taken into the laboratory, the samples were dried by an oven, and filtered to remove clumps so that the samples are a fine porous mixture. The samples were tested by cold vapor atomic fluorescence spectrometry according to the standard method from the United States Environmental Protection Agency. Our preliminary results indicated that after Hurricane Rita, mercury from the sediments were reduced slightly, which might have been caused by the disturbance from Hurricane Rita.

Mulepati S and F.X. Phillips. McSU. **Mercury analysis of water and sediment samples of Contraband Bayou, Lake Charles, LA.—**Mercury, whether naturally occurring or anthropogenic, may exist in several forms – elemental/metallic mercury, inorganic mercury (mercuric chloride), and organic mercury (methylmercury) in environmental media. Elemental Hg may be toxic to humans when ingested or inhaled. Methylmercury, a more toxic form, may be transformed in situ from other deposited mercury types by microbial action in sediment/soils. Once formed and taken up by aquatic organisms, it bioaccumulates and biomagnifies through the food web. Four locations along the upper and middle segments of Contraband Bayou were selected based on easy/safe access to sample collection sites. Mid-column water and sediments were sampled at these sites. After collection, all samples were transported in chemically clean HDPE containers and immediately preserved with nitric acid to pH<2. They were refrigerated at

4°C (±2°C) from the time of collection until digestion, and were analyzed within 20 days of collection. Samples collected before and after rain events were analyzed using cold vapor atomic absorption (AA) technique for total mercury. All water sample analyses resulted below the instrument's detection limit (0.2 ppb). A trace of mercury was detected in one of the sediment samples. All the concentrations found in the Contraband Bayou were below the Maximum Contaminant Level (MCL=2 ppb).

Sothirajah, J. SU-BR. **Mercury sources**, **effects**, **regulations and reduction methods**.**—** Mercury is a toxic pollutant that accumulates in organisms and spreads rapidly all over the earth in its natural and anthropogenic forms. Fungi, bacteria and fish produce a reaction to the heavy metal, which makes it lethal, and moves up the food chain from algae to fish and to humans. Symptoms of mercury poisoning include birth deformities, numbness in limbs, hearing and speech impairments, convulsions, paralysis and death. The adverse health effects of mercury poisoning led to government regulations to protect the air, water and food supply from mercury contamination. Some of the major mercury regulations are: Food and Drug Administration Modernization Act 1997, Mercury Containing and Rechargeable Battery Management Act 1996, Clean Air Mercury Rule, and Reduction of Toxic Air Pollutants from Mercury Chlor-Alkali Plants. Mercury disposal regulations include: Resource Conservation and Recovery Act, Comprehensive Environmental Response, Compensation and Liability Act, Emergency Planning and Community Right to Know Act, and Mercury Reduction Act. Some methods for reducing mercury emissions include voluntary cooperation, cap and trade, phytoremediation and compacted fly ash bricks. The United States is phasing out mercury use, not selling its Federal stock of surplus mercury, developing a plan to manage non-Federal mercury stocks and will ban the export of mercury by 2010. The European Commission's proposed regulation on banning mercury exports and the safe storage of metallic mercury is important because the closure of chlor-alkali plants in Europe would make almost 12,000 tonnes of mercury available for the world market.

Tangkham, W. and W. Dong. McSU. **A study of mercury in water samples after Hurricane Rita**.**—**Mercury is a naturally occurring element; however, it harms human health once it is biomagnified along the food web and consumed. This research studied the mercury content from water in southwest Louisiana, an area heavily impacted by Hurricane Rita. According to the USEPA method (using cold vapor atomic fluorescence spectrometry), we collected water samples from Calcasieu Lake in Southwest Louisiana and stored them in Teflon bottles to be shipped back to the laboratory for analysis. Our results indicated that the mercury content in the water was slightly higher than the pre-Hurricane Rita level, which might be attributed to the disturbing effect by the hurricane. However, further study is needed to draw a more definitive conclusion.

Twanabasu, B.R. and F.X. Phillips. McSU. **Distribution of aquatic invasive plants in wetlands of Calcasieu Parish**, **Louisiana**.**—**Weed invasion, a form of biological pollution, poses a serious threat to Louisiana's natural vegetation, agriculture, forestry, wetlands, transportation, recreation, and aesthetic values. Information, research, studies and surveys of the diversity and distribution of such species in the wetlands of Calcasieu Parish are scanty. This research involved field surveys, sample collection, and identification of the species during the

months of October and November 2007. The study focused on the distribution of two of the most problematic aquatic invasive plants (common salvinia (*Salvinia minima*) and water hyacinth (*Eichhornia crassipes*)) in small and private ponds rather than lakes and rivers of Calcasieu Parish. Twenty-five randomly selected sites were visited and surveyed during this study. Common salvinia occurred at four study sites, while water hyacinth occurred at two of these sites as well. The results revealed the acute invasion of common salvinia in 16% of the sites studied. The four affected sites' surfaces were completely covered by the invasive species. These study locations could serve as seed stock for subsequent spread to other adjacent wetlands by waterfowl or man.

Williams, T. and W.C. Dorsey. GSU. **A mitogenic response in AML 12 mouse hepatocytes exposed to pentachlorophenol**.**—**Pentachlorophenol (PCP) is an organochlorine fungicide that has been extensively used in the United States to protect wood products. Anthropogenic uses of agricultural, domestic, and industrial applications have caused PCP-contaminants to enter the environment and infiltrate the food chain. PCP is highly toxic to wildlife species and humans causing injury to major organs including the lung, liver, kidneys, heart, and brain. Recent investigations in our laboratory have shown that PCP exerts both cytotoxic and mitogenic effects in human liver carcinoma (HepG2) cells, and in primary culture of catfish hepatocytes. We have previously demonstrated that the cytotoxic effects of PCP caused a 48 hr-LC_{50} of 16.0 + 2.0 µg/mL in AML 12 mouse hepatocytes. In the present study, we hypothesized that low level PCP exposure will trigger a mitogenic response in AML 12 Mouse hepatocytes. To test this hypothesis, we performed the MTT assay for cell viability in PCP-treated and control cells. Data obtained from this experiment indicated a mitogenic response with respect to PCP toxicity. Upon 48 hrs of exposure, mitogenicity at lower levels of PCP was computed to be 186±0.02%, 194±0.01%, 199±0.05%, 235±0.06%, 143±0.05%, and 142±0.04% at 1.95 µg/PCP mL, 3.90 µg/PCP mL, 7.80 µg/PCP mL, 15.6 µg/PCP mL, 31.2 µg/PCP mL, and 62.5 µg/PCP mL, respectively. These results indicate that PCP toxic effects are similar across cell lines.

Microbiology Section

Cole, C.C., N. A. Eddlemon, A. L. Corbin and M. B. Kilgen. NiSU. **Validation of a post harvest treatment for *Vibrio vulnificus* in oysters using hydrostatic high pressure and cryogenic freezing**.**—***Vibrio vulnificus* is an opportunistic pathogen of main concern for immunocompromised persons who eat raw shellfish. The U.S. FDA set goals to reduce shellfish-borne *V. vulnificus* cases by 60% for 2007 and 2008. The goal of this study was to process live oysters with a post-harvest treatment (PHT) of hydrostatic high pressure (HHP) and cryogenic freezing to achieve the FDA's required level of <30 MPN/gram oyster tissue, as well as shuck the oysters. Thirty samples of 12 oysters each were processed on three different processing dates in batches of 10 samples from the same lot. Four non-treated controls per 10-sample batch of PHT samples also were analyzed. Each sample of 12 oysters was processed in separate runs in a Flow International 45 liter HHP processor for 60 seconds at 36,000 psi and 25^{o}C (75^{o}F) at Motivatit Seafoods, Inc. Each sample of 12 HHP shucked oysters was placed in sanitized half shells and cryogenically frozen at -82^{o}C (-115^{o}F). The control and PHT oysters from the 3 batches of 10 samples were processed according to the FDA's 2005 Bacteriological Analytical

Manual (BAM). An alkaline phosphatase labeled probe was used for confirmation of presumptive *V. vulnificus* colonies. This commercial PHT process was successfully validated to reduce the MPN/g of *V. vulnificus* at least 3.52 logs to the FDA requirement of <30 MPN/g.

Eddlemon, N. and R. Boopathy. NiSU. **Survey of bacteria and water quality of a semi-closed aquatic ecosystem in the upper Barataria Estuary in south Louisiana**.—The upper Barataria Estuary located in South Louisiana is a freshwater basin that no longer receives Mississippi River floodwaters due to flood protection construction. As a result, the Barataria Estuary's flood pulse has been eliminated. Today the system only floods due to heavy rainfall. The estuary consists mostly of agricultural fields and forested wetlands and it receives large amounts of nutrients such as nitrates and phosphates through agricultural runoff. Large influx of nutrients can cause hypoxia in the estuary and create water quality problems in the system. We studied the microbial ecology and water quality of the upper Barataria Estuary in five specific locations. Bimonthly water samples were taken from the Estuary and the water was analyzed for organic carbon, nitrate, phosphate, dissolved oxygen, pH, salinity, temperature, and turbidity. The bacterial counts include total aerobic heterotrophic bacteria, total coliform, fecal coliform, and obligate anaerobes. Dominant bacterial species in the system were identified using Biolog Microbial ID system. The results indicated a strong correlation between microbial population and carbon and nitrogen loading in the estuary. The specific sample sties also correlated well with their activities (such as open water, boat launch and camp sites) and the presence of fecal coliform and nitrogen and phosphate concentrations.

Greene, D., J. Cherry, M.A. Land and Z. Hatahet. NSU. C. C. Bienvenu. NiSU. **Incorporation of GFP-coding DNA into chromosomal DNA of select pathogens**.—The incorporation of the green fluorescent protein (GFP) gene into plasmids and subsequently into bacteria is routinely performed. The production of GFP protein is excellent for instant screening of samples. However, the plasmid encoding for GFP can be lost over several generations. Therefore, in addition to encoding the GFP gene, an antibiotic resistance gene is also placed into the plasmid. During culturing, antibiotics are added to the media as a lethal measure to select the cells retaining the GFP plasmid. This method presents a problem when GFP is used to track bacterial action involving an antimicrobial regime. The addition of an antibiotic as a selective pressure skews the results of the experiment. The GFP gene was encoded into the bacteria's genome by placing the GFP encoding plasmid with hyper-recombinant cells. These cells were able to incorporate the GFP portion of the plasmid into the bacterial genome. Once established as part of the host genome, the GFP trait was passed to succeeding generations during mitosis. Once this cell line was established, horizontal transfer into *E. coli* 0157 and *Salmonella enteriditis* was performed. The resulting pathogens are now easily tracked during experiments and the studies are not skewed by antibiotic pressure.

Heard, R. F. and W.H. Dees. McSU. L. Garvin, B. Mocca and A.E. Jerse. USUHS. **Investigation of the surface-accessibility of the outer membrane protein MtrE of the mtrCDE efflux pump of *Neisseria gonorrhoeae***.—*Neisseria gonorrhoeae* possesses an mtrCDE efflux pump that spans the inner and outer membranes and is responsible for increased resistance to certain antibiotics and host-derived antimicrobial peptides. MtrE forms the pore through which antimicrobial agents are expelled. We assessed the protective potential of affinity-

purified rabbit antibodies (Abs) generated against linear peptides corresponding to three regions in MtrE. Only Absreg3 bound whole gonococci as assessed by ELISA. Absreg1 and Absreg3 bound MtrE based on the recognition of denatured protein (ca. 50 kD) in wild type *N. gonorrhoeae* strain FA19, but not in an mtrE mutant by Western blot. Absreg1 and Absreg3 did not recognize native MtrE protein suggesting these antibodies are not conformationally specific. Absreg2 did not recognize MtrE, but recognized several proteins in both wild type and mtrE mutant gonococci. None of the antibodies demonstrated bactericidal activity when tested against several clinical isolates. We conclude that the use of linear peptides to generate antibodies to the regions of MtrE identified in this study was not successful in generating surface-binding, bactericidal antibodies against *N. gonorrhoeae*. Future work will focus on structure function studies and the use of cyclic peptides to better mimic conformational epitopes on the bacterial surface.

Heard, R. F. and W.H. Dees. McSU. L. Garvin and A.E. Jerse. USUHS. **Variations on a theme: Using a modified disc diffusion assay to examine the effects of exogenous divalent metals on *Neisseria gonorrhoeae*.—**Disc diffusion assays are an important tool in a researcher's arsenal. The paper discs can be inoculated with a variety of solutions including antibiotics and cationic solutions. The zones of inhibition provide qualitative measurements of the effectiveness of that solution. Recently, a high-affinity zinc uptake system was identified in *Neisseria gonorrhoeae*. This system is homologous to the znuABC transporter of *Escherichia coli* and is responsible for the transport of zinc both into and out of the gonococcus. Using a modified disc diffusion assay, we compared inhibitory concentrations of various divalent cations (Zn^{2+}, Ca^{2+}, Cu^{2+}, Ni^{2+}, Mg^{2+}, and Mn^{2+}) against a collection of gonococcal isolates. Several strains of wild-type gonorrhea, including a mutant (MntC) that lacks the periplasmic binding protein, were tested. For this study, a preliminary investigation was performed to determine the extent of sensitivity in certain strains.

Jones, J.M. and W.H. Dees. McSU. J.L. Giddings and A.E. Jerse. USUHS. **Determining *Neisseria gonorrhoeae* survival after phagocytosis: A preliminary investigation**.—*Neisseria gonorrhoeae* adheres to and invades epithelial cells of mucosal surfaces. This invasion of host cells results in an influx of polymorphonuclear (PMN) cells, which aid in the killing and clearance of the gonococcal infection. Some studies have indicated that *N. gonorrhoeae* can evade destruction by PMNs. We designed an experiment to observe the phagocytosis and survival of bacteria using vaginal cells isolated from mice that were experimentally infected with *N. gonorrhoeae* (strain FA1090). Although we observed gonococci associated with host cells, fluorescent microscopy alone could not demonstrate phagocytosis. Further studies using confocal microscopy are required to confirm ingestion of the bacteria during infection.

Joubert, K. and J. Al-Dujaili. LSU-E. **Advantage provided by iron for *Escherichia coli* growth and cultivability in drinking water**.—Several hypotheses have been proposed to explain why corroded environments are favorable for *Escherichia coli* survival. Among them, iron was identified as a booster for the survival in drinking water. This study examines the survival of *E. coli* strains in drinking water in southwestern Louisiana communities, the role of iron as a key parameter involved in coliform persistence in drinking water, and the effect of iron as a nutrient under aerobic conditions on the growth and cultivability of *E. coli* in drinking water.

Drinking water samples collected from residential homes in southwest Louisiana were tested for the presence of *E. coli* by exposing cultured coliform bacteria to long wave UV light with the amount of iron in these samples measured using atomic absorption spectrophotometry. The effect of iron at varying concentrations on the growth of *E. coli* was examined using the plate count technique and epifluorescence microscopy. We found that the water samples collected did have *E. coli* present, and as the amount of iron increased, so did the amount of *E. coli* present. The results lend support to the hypothesis that iron influences the growth of *E. coli*. Understanding the effect of iron as a parameter for *E. coli* survival can lead to better purification techniques and an increased prevention of water contamination.

Land, M.A., S. Wise, J. Fung, D. Ownes and A. Coombs. NSU. **Survey of coliform and pathogen leakage of peritoneal cavity of game taken with shotgun and microbial reduction strategies**.**—**Hunting is still an integral part of rural life even in today's culture. Game ranging from deer to ducks is universally taken with a shotgun. Shotguns project multiple lead or steel pellets at a velocity of approximately 1,300 ft/sec and their pattern coverage will depend on a variety of factors. The kinetic energy of the pellets entering the target causes massive trauma to the animal. The resulting trauma can affect any of the body's organ systems but damage to the digestive system poses particular risks. If the digestive system is perforated, gut bacteria can leak into the peritoneal cavity. The entry or exit wounds and associated tissues can spoil and potentially cause food poisonings. A variety of game was harvested by shotgun and bacterial swabs were taken from the wound entry points, the surrounding skin and the peritoneum. The swabs were cultured and a pathogen survey was conducted. Additionally, aerobic plate counts were conducted after traditional processing methods and then compared to those incorporating an organic acid treatment, and the resultant shelf life extensions were evaluated.

Mangrum, M. and M.A. Land. NSU. C. Lyles. OSU. **Evaluation of copper salts on *Salmonella* under varying conditions**.**—**Copper is a dietary supplement used in the poultry industry to aid the digestive lining of chickens. Copper sulfate is the industry standard, but an alternative form of copper is available as a copper chloride complex. When the copper complex was used as a feed additive, *Salmonella* loads were observed to decrease during processing. A comparison of copper sulfate and the copper complex on *Salmonella enteriditis* were evaluated under a variety of conditions. The conditions include planktonic growth, simulated gizzard digestion, and in vivo. In each of these conditions the copper complex performed favorably.

Owens, D., D. Coombs and M. Land. NSU. **Survey of *Salmonella* spp. in *Anolis carolinesis* and methods of pathogen reduction**.**—**The common green anole (*Anolis carolinesis*), or porch lizard, is the only anole that is native to the United States. There are six other *Anolis* species that are native to the Caribbean islands. As a result of released or escaped pets, there are now over thirty six species of non-native anoles breeding in the southeastern United States. Their diet consists of mainly insects. They are diurnal and their habitats range from terrestrial to aboral. These lizards are easily caught and are also sold commercially. Reptiles in general have been found to be reservoirs of *Salmonella* spp. and implicated in salmonellosis sickness. Green anoles were collected from different areas of Louisiana and tested to see if *Salmonella* spp. were present in the alimentary tract. Methods to eliminate *Salmonella* were also investigated.

Rachal, T., K. Ghislain, A. Corbin and R. Nathaniel. NiSU. **Prevalence of methicillin resistant *Staphylococcus aureus* and *Staphylococcus intermedius* in domesticated pets from southern Louisiana**.—Methicillin resistant *Staphylococcus aureus* (MRSA) and methicillin resistant *Staphylococcus intermedius* (MRSI) are both major causes of skin and wound infections in humans and domesticated animals. Both of these *Staphylococcal* species are gram positive and coagulase positive, and highly resistant to most antibiotics. Species identification is difficult since there are very few biochemical differences between these two organisms. Nose and mouth swabs were taken from 115 animals from regional animal hospitals. The samples were cultured for staphylococcus on mannitol salt agar. Catalase and coagulase positive strains were tested for resistance to oxacillin. MRS was then tested for resistance to polymixin B, presence of L-pyrroglutamyl-aminopeptidase and the ability to produce acetoin to differentiate between *S. aureus* and *S. intermedius*. Our results show a 70% (81/115) rate of colonization of pets by coagulase positive *Staphylococcus* species of which 39.5% (32/81) were also resistant to oxacillin. Additionally, 62.5% (20/32) of MRS were identified as *S. aureus* and 37.5% (12/32) were identified as *S. intermedius*. Overall, 46% (53/115) of animals tested carried *S. aureus*, while 24% (28/115) harbored *S. intermedius*. These results indicate that pets could serve as reservoirs for MRSA and MRSI, having public health implications.

Thomas, R.L. and D. W. Jackson. ULM. **Species diversity among aquatic microbial biofilms in northeast Louisiana**.—In the natural environment, bacteria often exist as matrix enclosed micro-colonies called biofilms. Microbial biofilms may have a large impact on aquatic ecosystems due to their role in nutrient cycling and as a food source for small invertebrates, therefore affecting larger vertebrates. The goal of this project is to compare for one year the microbial population of Black Bayou Lake with Bayou DeSiard using water analysis and species diversity as markers for change. Dialysis tubing containing filter-sterilized bayou water was placed at two study sites, Black Bayou Lake and Bayou DeSiard. Black Bayou is part of a nature reserve and had a low diversity of bacteria. Bayou DeSiard was colonized by a low diversity of bacteria; however, in Bayou DeSiard, there were some potentially novel bacteria present. Increased changes over the last two months in dissolved oxygen, silica, and calcium content were seen in the water analysis of Bayou DeSiard suggesting that these factors as well as human use may influence microbial population composition. By looking at change in microbial diversity in relation to seasonal changes, nutrient availability, and water use, there is a potential to use bacterial biofilms as a biosensor for environmental changes due to pollution.

Walker, N. and R. Boopathy. NiSU. **Presence of pathogenic and non-pathogenic bacteria in U.S. dollar bills in circulation in Thibodaux, LA**.—United States currency is handled and passed around by millions of people every day. The average age of paper bills from one to twenty dollars in value ranges from about eighteen months to four years, which means that these bills can be carriers of bacterial species from every person they have come into contact with in their life span. Bills are only taken out of circulation if they have been badly mutilated, and many heavily soiled bills remain in circulation. Because paper currency is passed around so frequently from person to person, a large number of antibiotic resistant bacteria found on it would be cause for concern. The purpose of this experiment was to identify examples of bacterial species found on old, new, and moderately new samples of US currency and to find their antibiotic resistance capabilities. Samples were taken from ten old, ten new, and ten moderately new bills ranging

from one to twenty dollars in value. Quadrant streak plates were made using tryptic soy agar with all thirty samples to obtain isolated colonies. The isolated colonies were identified using BIOLOG method. Many pathogenic and non-pathogenic bacteria were found on the paper currency. Among the pathogenic bacteria identified were *Cellulosimicrobium cellulans*, a bacteria associated with short bowel syndrome in the immunocompromised, *Actinomyces canis*, a bacteria that causes actinomycosis, a disease characterized by abscesses on the mouth, lungs, and GI tract, and many species of *Staphylococcus* and *Streptococcus*. Among the non-pathogenic bacteria identified were *Micrococcus luteus*, bacterial species normally associated with the flora of normal mammalian skin, and *Alloiococcus ottitis*, an organism found in the fluid of the middle ear. Antibiotic disc assay was performed in all isolates to find out the antibiotic resistance of the bacteria.

Wise, S. and M.A. Land. NSU. ***E. coli* O157:H7 survival in a soil column of varying organic matter concentrations**.—*Escherichia coli* O157:H7 shed in bovine feces and subsequent survival in soil systems is dependent on many factors. *E. coli* O157:H7 being a Gram negative bacteria should not survive for extended periods of time external to a host animal. However, *E. coli* O157:H7 has been shown to persist in the environment and remains a possible threat to the food supply. While temperature of *E. coli* O157:H7 survival has been investigated in pure bovine fecal slurries, the varying concentrations of organic matter and its ability to compete with natural soil flora have not been investigated. With the increasing interest in using compost as a substitute for synthetic fertilizers, the persistence of this pathogen in soil systems was investigated.

Molecular and Biomedical Biology Section

Bray, J., J. Cheng, M. McCain and Z. Hatahet. NSU. **Role of DNA polymerase η in resistance to chemotherapeutic drugs**.—Human DNA polymerase η (pol η) is capable of replicating across UV induced pyrimidine dimers, and defects in the gene encoding pol η result in a syndrome called Xeroderma Pigmentosum Variant (XP-V). XP-V patients are prone to the development of cancer in sun exposed areas; cells derived from XP-V patients are slightly more sensitive to UV radiation and exhibit a higher mutation rate than wild type cells. Pol η can also replicate across a wide spectrum of DNA lesions introduced by environmental or chemotherapeutic agents or during nucleotide starvation, suggesting pol η plays wider roles in cellular functions. The molecular mechanisms that regulate pol η activity in cells, however, are still not clear. We are using site directed mutagenesis to pinpoint amino acid residues that are important in regulating the cellular function of pol η. In particular, we are interested in the signal transduction mechanism responsible for recruitment of the pol η to sites of replication forks stalled by DNA damage.

Dietz, K.N., A.D. Hollenbach. LSUHSC-NO. **The myogenic transcription factor Pax3 is phosphorylated by casein kinase II in vitro**.—Pax3, a member of the paired-box family of transcription factors, plays a role in early myogenesis and is associated with alveolar rhabdomyosarcoma (ARMS), a solid muscle tumor. ARMS, which occurs in the trunk and extremities of older adolescents, is characterized by a t(2:13)(q35;q14) chromosomal translocation which fuses the gene for Pax3 to the gene for FKHR (FOXO1a) to form the

oncogenic fusion protein Pax3-FKHR. Pax3-FKHR contributes to the deregulation of muscle development and the formation of ARMS. FKHR is known to be regulated by phosphorylation. However, although a majority of the sites of FKHR phosphorylation are present on Pax3-FKHR, phosphorylations of these sites do not regulate Pax3-FKHR. Therefore, it is possible that phosphorylation of the Pax3 region of Pax3-FKHR may play a role in the regulation of Pax3-FKHR. Previously, we identified Ser201, 205, and 209 as the sites of phosphorylation on Pax3. Therefore, the goal of this present study is to identify the kinase(s) involved in order to better understand the possible regulatory mechanism of Pax3 and Pax3-FKHR. By using in vitro kinase assays, we demonstrate that Pax3 is phosphorylated by CKII. Further, CKII phosphorylation of Ser205 is required for efficient phosphorylation of Ser201 and Ser209.

Halton, M.K. and J.P. Doucet. NiSU. **A genomic element common to promoters of multiple Usher syndrome genes**.—The Usher syndromes are autosomal recessive diseases characterized by congenital deafness and retinitis pigmentosa. Although rare (4.4/100,000), these diseases are the most common form of deaf-blindness. Type I Usher syndrome, characterized by severe deafness with vestibular dysfunction and onset of blindness in the second decade, is caused by specific mutations in any of five different genes (ush1a-ush1e). Normal protein products of these genes function in a complex to maintain surface integrity of retinal and inner ear epithelial cells. Because these proteins function together, we sought to determine if their expression is coordinately regulated. Sequences of 2000 nucleotides from the upstream promoter regions of each of the five ush1 genes were subjected to sequential one-to-one comparisons using the mVISTA genomic alignment software. With this strategy, a 300-bp region of 77.3% sequence identity was discovered between the ush1c and ush1d promoter regions. Although the function of this region is unknown, its presence suggests coordinated expression of at least part of the protein complex that when altered causes Usher syndrome. This region now serves as a tool to identify other genomic regions that may function in sensorineural health.

Hotard, S. and E. Zou. NiSU. **The activity of glutathione S-transferase in the hepatopancreas is not influenced by the molting cycle in the fiddler crab, *Uca pugilator***.— Glutathione-S-transferase (GST) in the hepatopancreas of crustaceans is a metabolically important phase II enzyme that has been suggested as a biomarker for organic pollution. It conjugates potentially harmful electrophilic substances with endogenous reduced glutathione (GSH) to protect other nucleophilic molecules such as proteins and nucleic acids. However, much of crustacean physiology is known to exhibit a cyclic characteristic due to the periodic shedding of the confining exoskeleton. The goal of this study was to determine whether hepatopancreatic GST activity varies during the molting cycle using the fiddler crab, *Uca pugilator*, as the model. The variation of hepatopancreatic GST activity during the molting cycle and the induction of enzymatic activity by the molting hormone 20-hydroxyecdysone were studied. Neither the molting cycle nor 20-hydroxyecdysone injection had a significant effect on hepatopancreatic GST activity, suggesting GST activity is not under control of the molting hormone in *Uca pugilator*. Therefore, there is no need to distinguish different molt stages when utilizing GST activity in the hepatopancreas of crustaceans as a biomarker for organic pollution. Additionally, these results suggest glutathione conjugation is not part of the mechanism for ecdysteroid elimination in *Uca pugilator*.

Lemoine, F.J, J. Craig, E. Johnson, B. Morgan and J. Quiros. NSU. **Identification of characterization of chromosome fragile sites in yeast**.—For proper growth and division, cells must maintain intact, or unbroken, chromosomes. Fragile sites are special chromosomal regions that are prone to break in response to certain types of stress. Such breaks are associated with chromosome loss and translocation, genomic alterations that are frequently observed in many cancers. Therefore, a greater understanding of how and why chromosome fragile site breaks occur has important implications in cancer biology. Studies of chromosome fragile sites in mammals are limited by the genetic and biochemical experiments that can be practically conducted in such complex organisms. We have previously identified two chromosome fragile sites in the budding yeast *Saccharomyces cerevisiae*. This discovery demonstrates the potential use of budding yeast as a model system for studying the structure and regulation of chromosome fragile sites. However, additional studies are needed to validate the usefulness of this model system. Therefore, we are currently developing new techniques that will aid in the identification and characterization of additional yeast chromosome fragile sites in hopes of revealing commonalities in structure and function. Results from these studies will provide insight into the molecular mechanisms controlling chromosome fragile site stability in yeast and mammals.

Macchu, V., M. Merchant and P. Sanders. McSU. **Effects of alligator leukocytic peptides on antibiotic-resistant human bacterial pathogens**.—Treatment of clinical isolates of human pathogenic bacteria, which were known to be resistant to multiple antibiotics, with refined leukocyte extracts from the American alligator (*Alligator mississippiensis*) resulted in a concentration-dependent reduction in growth. The alligator leukocyte extract exhibited the strongest antibacterial effect on *Klebsiella pneumoniae* and *Acinetobacter baumannii,* followed by *Enterococcus faecium,* and then *Pseudomonas aeruginosa*. The antibacterial activities were heat stable at 70^{o}C for up to 30 minutes, stable in the presence of 50 mM EDTA, and sensitive to protease treatment. Collectively, these data strongly suggest that the molecule(s) responsible for the observed antibacterial activities are small, cationic peptides. These peptides may prove to be useful as a new class of antibiotics for human use.

Mbaka, M., J. Bray and Z. Hatahet. NSU. **Base excision repair genes in *E. coli* are regulated by the ArcAB two component signal transduction system**.—Repair of DNA damage is a key cellular function responsible for the maintenance of genomic integrity. Oxidative damage is of particular interest since it is largely a byproduct of metabolism. In all known organisms, several enzymes work together to remove oxidative lesions through the process of base excision repair (BER). Transcription regulation of BER genes in bacteria is still poorly understood. We have recently discovered that expression of the BER genes nth, nei, fpg and mutY is controlled by ArcAB signal transduction pathway, a premiere regulator of the redox state in *E. coli*. We have constructed single and double deletion mutants of BER genes and either arcA or arcB and analyzed their mutation frequency. We report significant effects of deleting either the sensor kinase gene (arcB) or the transcription factor (arcA) on all four BER genes.

Meng, Y. and E. Zou. NiSU. **Induction of N-acetyl-β-glucosaminidase mRNA in the epidermis of the fiddler crab, *Uca pugilator*, by 20-hydroxyecdysone**.—N-acetyl-b-glucos-aminidase (NAG) is an exoskeleton-degrading enzyme that exists in the epidermis of crustaceans. We report herein the induction of NAG mRNA in the epidermis of the fiddler crab,

Uca pugilator, by 20-hydroxyecdysone (20-HE). Using a primer pair designed on the basis of the consensus regions of NAG cDNAs of other arthropods, a partial sequence, 749 bps in length, of NAG cDNA from epidermal tissues of *Uca pugilator*, was characterized. The induction of NAG mRNA in the epidermis by 20-HE was subsequently investigated using semi-quantitative reverse transcription PCR with 18S rRNA used as internal control. Time-response results show that at a 20-HE dose of 1 μg/g wet weight, NAG mRNA was inducible at 1.5 h after 20-HE treatment. Injection with 20-HE at 0.25 and 1 μg/g wet weight induced NAG mRNA at the 1.5 h mark. The inducibility of epidermal NAG mRNA by 20-HE is further evidence that NAG gene expression in crustacean epidermis is regulated by the molting hormone. Discussion on the utility of NAG gene expression as a more sensitive biomarker for disruption of crustacean molting by environmental agents also is presented.

Quiros, J., L. Lemon, S. Montgomery, G. Rhodes, G. Walker and F.J. Lemoine. NSU. **Characterization of yeast chromosome fragile sites**.—A cell's ability to maintain intact chromosomes is essential for normal cellular growth and viability. However, certain chromosomal regions, known as chromosome fragile sites, are prone to breakage when cells are exposed to replication stresses. Once broken, these sites often are involved in translocations and other genome rearrangements that are characteristic of certain types of cancers. We have recently identified a chromosome fragile site in *Saccharomyces cerevisiae* and are using this information to develop a simple, tractable eukaryotic model of mammalian chromosome fragile sites. Currently, we are working to identify the physical and genetic regulators of double strand break formation at yeast chromosome fragile sites. The establishment of a yeast chromosome fragile site model system will allow for the advancement of genome stability regulation studies that are critical to the understanding of cellular transformation and cancer development.

Zoology Section

Boverie, T. and M. Merchant. McSU. **Lack of acute phase response to infection in the American alligator (*Alligator mississippiensis*).—**Five juvenile alligators (6.4-8.1 kg) were injected intraperitoneally with a mixture of bacterial lipopolysaccharides (LPS) derived from *Escherichia coli*, *Pseudomonas aeruginosa*, and *Klebsiella pneumoniae*. Blood was collected prior to treatment, and 1, 2, 3, 4, 5, 7, 9, and 11 days post-injection. The serum was subjected to clinical agarose gel electrophoresis to determine the changes, relative to pretreatment condition, of protein expression in the serum. Surprisingly, unlike the drastic changes in protein expression observed in mammalian and avian systems upon infection, no changes in protein expression were detected after LPS-treatment. Injection of LPS intramuscularly and in the hind foot pad revealed the same lack of acute phase response. Injection of other substances, such as phytohemagglutinin (an immune system stimulator) and heat-killed bacteria also yielded negative results. Several attempts to isolate C-reactive protein and serum amyloid A, acute phase proteins that are expressed at low levels, but increase up to 100-fold in mammals upon infection, yielded no results. These data lead us to believe that the American alligator, and perhaps other crocodilians, do not exhibit the typical acute phase response, characterized by large changes in serum protein expression, observed in more modern vertebrates.

Canning, L., J. Land, H. Meyer, C. Chapman, M. Wagle and W. Dees. McSU. **Vertical distribution of mosquitoes in a southwest Louisiana marsh**.—A vertical distribution study of mosquitoes in the Sabine National Wildlife Refuge in southwestern Louisiana was conducted in fall 2006 and spring 2007. This study provides information on nuisance mosquitoes and disease vector ecology. This is the first study of vertical distribution of mosquitoes in flight in Louisiana marshes. Mosquitoes were collected using Centers for Disease Control mosquito light traps placed overnight at 1.5m, 3.5m and 5.5m above ground. Traps were placed in areas with little to no competing light and where no pesticide applications are conducted. Meteorological conditions were recorded. During both fall and spring, *Anopheles crucians* was the most common species at 1.5m and *Culex salinarius* was the most common species at 5.5m. At a height of 3.5m, *An. crucians* was more prevalent during the fall.

Canning, L., J. Land, H. Meyer, C. Chapman, T. Sylvester and W. Dees. McSU. **Nocturnal periodicity of mosquitoes in a southwest Louisiana marsh**.—A nocturnal periodicity study of mosquitoes during new moon phases in the Sabine National Wildlife Refuge in southwestern Louisiana is underway. This study provides information on nuisance mosquitoes and disease vector ecology. Mosquitoes are collected before, during and after sunset and sunrise, and at other intervals throughout the night using a modified Center for Disease Control mosquito light trap with a rotating collector placed 1.5m above ground. This trap is placed in an area with little to no competing light and where no pesticide applications are conducted. Studies were initiated in July 2006. To date, *Aedes sollicitans*, *Anopheles crucians* and *Culex salinarius* have been the most commonly collected species. *Culex salinarius* was collected more commonly during the cooler months, whereas *An. crucians* was collected in the warmer months. *Culex salinarius* was the most prevalent mosquito at dusk, during the night and at dawn. Notably, many *An. crucians* were collected during the night and at dawn.

Dees, W.H. and B.M. Clark. McSU. G.W. Schultz, R.G. Robbins and D.W. Hill. AFPMB. **Computer-based tutorial on larval mosquito identification**.—A computer-based program on larval mosquito morphology and identification has been developed to complement laboratory education and training in medical entomology, pest management and public health. This program addresses identification of larval mosquitoes to the species level. There are five major sections in the program: (1) tutorial in larval morphology, (2) student identification practice, (3) glossary of larval morphology, (4) chaetotaxy diagrams, and (5) a program map to aid users in moving about the tutorial. Twenty-nine mosquito genera including over 800 chaetotaxy diagrams in PDF format are presented. Commonly known mosquito genera include (with number of chaetotaxy diagrams): *Aedes* (254), *Anopheles* (97), *Coquillettidia* (4), *Culex* (195), *Culiseta* (5), *Haemagogus* (23), *Mansonia* (2), *Psorophora* (7), *Toxorhynchites* (9), *Uranotaenia* (48), and *Wyeomyia* (13). A calculator and plastic ruler are recommended when using this program. A soundcard and Adobe Acrobat™ are required to operate this program.

Dulplechin, A.C., J.G. Hinton and H.A. Meyer. McSU. **Big Thicket Tardigrade ATBI: An Update**.—An All Taxa Biological Inventory is currently assessing the biological diversity of the Big Thicket National Preserve (BTNP) in east Texas. As part of this ATBI, a multihabitat inventory of freshwater and terrestrial tardigrades in all 14 units is being performed. Sampling of moss, lichens, leaf litter/soil, periphyton, and sediment are being collected and processed.

Currently 204 terrestrial and freshwater species have been reported in the Nearctic realm, of which 19 have been found in Texas. An ATBI for the Great Smoky Mountains National Park (GSMNP) found 73 species and estimated a total species richness of about 100. Our sampling methods and intensity are consistent with the GSMNP survey. Species found thus far include *Macrobiotus areolatus/tonollii*, *Macrobiotus* cf. *liviae*, *Milnesium tardigradum*, *Echiniscus quadrispinosus* and *E. virginicus*. No tardigrades have been found as yet in aquatic samples from the Big Thicket. No members of the widespread family Hypsibiidae have been found. Overall, the diversity of species and higher taxa found is much lower than that reported from the GSMNP. This is consistent with other surveys of tardigrades in the Gulf Coast region of the Deep South.

Falconi, R., P. Sanders, M.D. Vu, J. Gremillion, F. Hussain, R. Spencer, R. Hardy and M. Merchant. McSU. **Effects of alligator serum on antibiotic-resistant human bacterial pathogens**.—Treatment of clinical isolates of human pathogenic bacterial strains, which were known to be resistant to multiple antibiotics, with serum from the American alligator (*Alligator mississippiensis*) resulted in a concentration-dependent reduction in growth. The bacteria were grown in the absence, or in the presence of 10%, 25%, 50%, 75%, and 100% alligator serum. The alligator serum had the strongest growth inhibitory effect on *Klebsiella pneumoniae*, followed by *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterococcus faecium*. The antibacterial properties were completely inhibited by heat treatment of the serum at 56^{o}C for 30 minutes, addition of 10 units/mL protease, or by the addition of 50 mM ethylenediaminetetra-acetate, indicating that the activity was due to serum complement protein activity.

Kersten, C.A. McSU. **Gonad regeneration in *Carassius auratus*: A four year study**.—Gonad regeneration in fishes is a new model to study tissue regeneration. Regeneration of fish gonads has been documented but not characterized until now. Here, I present results of four experiments with the purpose of initial characterization of the process. In general, fish were surgically gonadectomized, exposed to experimental conditions and then gonadosomatic indices measured at sacrifice. Experiment one hypothesized that regeneration involved remaining cells returning to an embryonic state rather than mitotic replacement. Experiment two determined whether there are differences in gender and if a remnant is necessary. In experiment three, we hypothesized that pheromones have an effect on gonad regeneration. Experiment four determined if spawning conditions affected regeneration. Embryonic cells were seen in the newly regenerating gonad, there was no difference between males and females, and a gonadal remnant was necessary. There was a trend suggesting that pheromones have an effect and spawning conditions significantly promoted regeneration.

Kinney, C. and M. Merchant. McSU. **Differential protein expression of alligator leukocytes upon infection**.—Blood was collected from juvenile American alligators prior to and 24 hours after intraperitoneal injection of bacterial lipopolysaccharide (LPS). The leukocytes were isolated from each sample, and the protein was extracted. The samples were analyzed by Two Dimensional Difference In-Gel Electrophoresis (2D-DIGE) to determine changes in protein expression upon LPS injection. The results indicated that the expression of several proteins was increased upon LPS treatment, while the expression of several others decreased. The quantitative increases and decreases were determined by digital densitometry. Fourteen proteins of interest

were picked from the two dimensional gel and subjected to LS-MS/MS to acquire partial peptide sequence data. These peptide sequences were compared to those within the Entrez National Institutes of Health website protein sequence database to determine the identity of each protein. The identity and function of these alligator leukocyte proteins will be discussed.

Klucznik, D.J., J.B. Richey and J. Akin. NSU. **Polymorphic egg jellies and algal symbiosis in *Ambystoma maculatum*.—**The spotted salamander *Ambystoma maculatum* produces three distinctive types of egg jellies, ranging from clear, to milky, to opaque white. Hatching rates differed for jellies. In addition, algal colonization of eggs differed among jelly types. Algal presence also affected larval growth rate.

Meyer, H.A., T.L. Sylvester, B. Clark and W.H. Dees. McSU. **Seasonal small-scale distribution of chiggers in Sam Houston Jones State Park: Research plan and preliminary results.—**Mites (Order Acari) include many parasitic species, some of which attack humans. In mites of the family *Trombiculidae*, adults are free-living, but their larvae, known as chiggers or red bugs, are ectoparasites that feed on vertebrate hosts. These chiggers can cause severe dermatitis on humans. Despite their nuisance behavior, trombiculid mites are not known to vector any serious disease pathogens in North America. Studies in Nebraska and Germany show chiggers to be highly seasonal, distributed in "mite islands" that persist for months or years. Currently, we are studying small-scale chigger distribution and seasonality at three $5m^2$ plots in Sam Houston Jones State Park in Calcasieu Parish, Louisiana, in an area known to harbor chiggers of the species *Eutrombicula alfreddugesi*. We are particularly interested in determining the size, distribution, and persistence of mite islands. In each plot, chiggers are sampled monthly using 50 black ceramic plates. Some authorities claim that chiggers in the Deep South are not seasonal, but breed continuously and are active year round. However, our first two months of sampling (Jan and Feb 08) have yielded very few chiggers. Sampling will continue through 2008 and into 2009.

Moore, A. and J. Akin. NSU. **Using JWatcher to quantify behavior in the ground skink.—** Behavioral investigators catalog the suite of an animal's behaviors in an ethogram. While the definition of a behavior is important, noting also the sequence of events both leading to and following a behavior may be especially meaningful. Direct observation of a behavior sequence may be difficult due to the challenge of recording multiple events in real time. Video acquisition of data and later review provides an opportunity to quantify behavior more accurately.

Morgan, M. and J. Akin. NSU. **Effects of predation on larval recruitment in *Ambystoma*.—** Many amphibian species utilize vernal pools for reproduction as these habitats are typically predator-free. In ambystomatid salamanders, eggs masses are deposited in ponds where larvae develop prior to metamorphosis. In a Louisiana bottomland hardwood forest community, we examined the effects of predator presence on larval development and survival. In ponds containing significant predator presence, larvae metamorphosed at smaller sizes than in ponds absent of predation.

Popik, W. and R. Osborn. NSU. **Oviposition preferences of mosquitoes.—**Laboratory experiments were completed in which lab-reared mosquitoes were provided with a choice of

oviposition sites. Not much research has been completed on what cues adult mosquitoes use to lay their eggs. Larval mosquitoes were collected and placed in a beaker in the mesh-covered experimental container. Four smaller containers containing distilled water and different treatments were placed in the experimental container. Adult mosquitoes did oviposit only in certain containers and ignored others. Both visual and chemical cues may be involved in how mosquitoes select oviposition sites. Further experiments will be completed comparing the influence of water containing hay versus pine straw.

Smith, O.A., A.M. Ferrara, Q.C. Fontenot and G.J. LaFleur, Jr. NiSU. **Preliminary assessment of reproductive potential of spotted gar *Lepisosteus oculatus* in the upper Barataria Estuary, Louisiana**.—The goal of this study was to characterize the reproductive potential of a spotted gar *Lepisosteus oculatus* population from southeastern Louisiana using standard histological techniques. Classification of reproductive stage by gonad histology may be used to more accurately determine reproductive potentials of populations. This study also examined sex-specific seasonal changes in gonadosomatic index (GSI), total fecundity, and sexually dimorphic snout features. From October 2006 to September 2007, spotted gar (N=468) were collected from the upper Barataria Estuary, Louisiana. Histological analyses revealed that males (N=94) and most females (N=123) are capable of spawning year round. According to macroscopic examination and histological assessment of ovaries, over 25% of mature females spawned from March to July, and approximately 73% of spawned females retained and reabsorbed eggs after spawning. GSI was highest in March for males (N=215) and in April for females (N=253). Mean fecundity was 6,493±4,225 eggs per fish (N=192; mean TL=579±44 mm). Snout morphology was sexually dimorphic where females had longer and narrower snouts than did males. Our results will be used to determine reproductive potential in the gars using rate of incomplete spawning and the retention and atresia of eggs.

Thibodeaux, C.A. and C.A. Kersten. McSU. **Effect of temperature on gonad regeneration in male goldfish (*Carassius auratus*)**.—Tissue regeneration has been a large arena of research throughout much of history. There have been advancements in this area; however, new models for certain species of animals have not been discovered. Fish serve has excellent models due to the fact they can regenerate many structures. Gonad regeneration in fish has been documented but not carefully characterized. To advance toward this goal, six fish tanks housed goldfish, three "spawning" tanks set to 68°F and three "non-spawning tanks" set to 72°F. Gonadectomies were performed with a remnant of tissue left for regeneration to occur. Six months later, gonadosomatic indices (GSI) were recorded. Fish kept at 68°F had significantly higher GSI. This suggests that spawning temperature has an effect on gonad regeneration in male fishes.

Treusch, N. and R. Osborn. NSU. **Protein content in *Tenebrio* beetles**.—The aim was to complete a pilot study comparing protein content in different stages of development of *Tenebrio molitor* beetles. Beetles were reared using commercial wheat, supplemented daily with frozen green peas. Two individuals of each stage: larva, pupa and adult beetle were removed from the culture and placed in 10ml of 70% ETOH. Size was measured by volumetric displacement. Each individual was ground up in a mortar and pestle. Biuret's reagent was used as a qualitative test for the presence of protein in each sample. Albumin was used as a control for protein. Macerated tissue was then filtered. A spectrophotometer was used to read absorbancies. Insects without the

reagent were used as controls along with ETOH, distilled water, Biuret's reagent and albumin. There were differing amounts of protein in the different stages of the beetle during metamorphosis. Dramatic changes occur in insects such as beetles, which have holometabolous development in which there is a pupal stage. Further research will be completed on this problem.

Twanabasu, B. R and W. Dong. McSU. **Is mercury in shrimp a concern to our health?—**The presence of mercury in fish is a major health concern. According to EPA criterion, fish with mercury concentrations of 0.3 mg/kg could be harmful to the nervous system of our body. As a result, Louisiana Department of Environmental Quality issued an advisory on fish consumption. However, at a lower level of the food chain (e.g., shrimp), the study on mercury content is very limited, although many people eat more shrimp than fish. In this study, we analyzed shrimp tissue for mercury content, which was collected from the water of southwest Louisiana. Both the manual cold vapor technique (EPA method 245.6) and thermal decomposition method (EPA 7473) were used. Our results contributed to the understanding of the mercury issue from biological tissues.

Vidrine, M.F., J.E. Cordes, J.A. Hamlin, M. Bastian-Stanford and S. R. Hazelton-Robichaux. LSU-E. **Evaluation of supraspecific taxa (genera and subgenera) of Unionicolidae (Acari: Hydrachnidia).—**The family Unionicolidae has 4 subfamilies: Encentridophorinae, Pionatacinae, Pollicipalpinae and Unionicolinae. Our emphasis is on the Unionicolinae, which currently contains a single genus *Unionicola* and 56 subgenera with 235 species. Supraspecific taxa (genera and subgenera) are continuously redefined. Significant changes occur when information is presented, e.g.: 1) new species; 2) new geographic records; 3) new adult/nymph host records; 4) new larval host records; 5) previously-described species are revised with descriptions of unknown forms; 6) new characters (morphological, behavioral, or molecular); 7) new techniques of analysis (chemical, statistical, etc.); and 8) any combination of the above. These taxa are supported by evidence and used to designate evolutionary units. The continuous re-evaluation of each taxa is a major task (systematics) of considerable importance. All other forms of biological inquiry, including physiology, ecology, genetics, and evolution, hinge upon systematic evaluation and designation of taxonomic position. Each taxon represents a testable hypothesis based upon specified evidence and includes units known as species, the biological equivalence of a fact.

Williams, A.A. LSU-E. M. Simoneaux and A. Coreil. LSU-BR. **The effects of mosquito adulticide on two non-target lizard species**.—To investigate the effects of mosquito adulticide on non-target vertebrate species, two lizards, the green anole (*Anolis carolinensis*) and the Mediterranean house gecko (*Hemidactylus turcicus*) were analyzed from environments sprayed with malathion and compared to the same species in spray-free sites to serve as a control. Body measurements included body mass, snout-vent length (SVL), and gonadosomatic index. Histological analysis of the gonadal tissues also was performed to detect possible abnormalities. Results from body measurements revealed only individuals from the test sites treated with malathion had significantly greater mean values in body mass (female *A. carolinensis*, male and female *H. turcicus*), and SVL (male and female *H. turcicus*). There were no significant difference between control and test gonadosomatic indices, nor were there differences observed in the histological studies. Reasons for the larger individuals in the areas treated with malathion

are speculative; although, it would seem that these individuals are benefiting, at least in short term, from the environments treated with mosquito adulticide.

Young, S.R., S.M. Rider, D. K. Reed, M.A. Venable, J.A. Hamlin and S.R. Hazelton-Robichaux. LSU-E. J.H. Spring. ULL. **Segmental distribution of a *Drosophila* DRIP-like aquaporin in the Malpighian tubules of the house cricket, *Acheta domesticus*: Control vs. stimulated**.**—** Malpighian tubules (Mts) are the chief excretory and osmoregulatory organs of terrestrial insects like the house cricket *Acheta domesticus*. Morphologically, the Mts are a monolayer epithelium segmented into three distinct regions (proximal, mid and distal). Each region appears to consist of a uniform cell type. Both the mid and distal segments are involved in rapid fluid transport and respond both to corticotropin releasing factor-like diuretic peptides (CRF-DPs) and myokinins. Ultrastructually, the cells of the mid tubule show the typical elaborations of a transporting epithelium, i.e. elaborate brush border and basolateral infoldings. Interestingly, the cells of the distal segment lack these modifications yet transport fluid at a rate three times that of the mid tubule. Although the response of the segments to hormonal stimulation is well documented, the actual mechanism for rapid fluid movement remains unclear. In previous studies using immunocytochemistry, we demonstrated the presence of a *Drosophila* DRIP-like aquaporin (water channel) in the Mts of *A. domesticus* and demonstrated that its segmental distribution was hormonally regulated. The objective of this follow-up investigation was to isolate differentially the DRIP-like aquaporin proteins in the mid and distal segments of unstimulated and stimulated Mts using Western blot analysis.

Division of Physical Sciences

Chemistry Section

Battle, C.H., C. Laborde, R.S. Srivastava and A.A. Gallo. ULL. **Studies in the Cu(I) catalyzed amination reactions of alkenes**.—The use of achiral and chiral ligands on the course of an allylic amination reaction in the presence of a copper(I) catalyst is the focus of this study. Achiral ligands such as triphenyl phosphine and triethyl phosphite and the chiral ligand, R-BINAP, with Cu(I) salts were used in the amination of alpha-methyl styrene and 2-methyl-2-pentene. Phenylhydroxylamine was the nitrogen transfer reagent in these reactions. The general reaction conditions of mole %catalyst, time and temperature were monitored. Of particular interest was whether the enantioselective amination of 2-methyl-2-pentene with R-BINAP would occur. Initial results suggest that two isomers are formed in this reaction, with one of the products occurring as stereoisomers. Spectroscopic analysis of the reaction mixture will be presented.

Delaney, M.S., C. Rodriquez and C. Vallee. McSU. **Thermochemical and computational studies of the olation process of lithium hydroxide monohydrate**.—Thermochemical studies (differential scanning calorimetry and thermogravimetric analysis) and computation studies of the olation process of lithium hydroxide monohydrate were carried out to try to explain the apparent deviation in behavior from the accepted mechanism of olation.

Dinser, J.A., M. Lanier, D.D. Dolliver, A.S. McKim, R. Rucker, R. Weber and T. Sommerfeld. SLU. **Synthesis of O-methylbenzohydroximoyl azides and their reactions in acidic/ electrophilic media**.—The first general synthesis of N-methoxybenzohydroximoyl azides will be discussed. These compounds have demonstrated a remarkable thermal stability and sluggishness to traditional reactions of azides such as copper-catalyzed cycloaddition reactions. It has been demonstrated that these compounds undergo a Schmidt-type rearrangement in acidic media. The role of a substituent on the aromatic ring in these rearrangement reactions will be discussed, and the results will be correlated with computational analysis. An alternate reaction in an acidic/electrophilic medium to form a tetrazole will be discussed.

Garrido, P., A.A. Gallo and R.S. Srivastava. ULL. F.R. Fronczek. LSU-BR. **Catalytic group transfer reactions**.—The group transfer reactions are a key step in the chemical transformations that are used in academia and in industry. The most common group transfer reactions include an oxide ion or an oxygen atom, imide (NR), nitroso (RNO), or carbene (CR2). The alkenes are the most important because their products are epoxides (E = O), aziridines (E = NR), amines (E = NHR) and cyclopropanes (E = CR2), each of which has a high-energy ring that may be opened in a subsequent step to yield important organic functional derivatives. Accordingly, enormous attention has been paid to studies on catalytic epoxidation (E = O), aziridination (E = NR), amination (E = NHR) and cyclopropanation (E = CR2) reactions, due to easy C-C and C-N bond formations from ring cleavage. We will present our new results of amide transfer reactions.

Gonzales, C., Q. Le, G. Checkan, X. Wu and R.S. Srivastava. ULL. F.R. Franczek LSU-BR. **Design and development of ruthenium(III) complexes in search of new anticancer agents**.—

The discovery of new metal-based antitumour drugs, whether cisplatin derivatives or those based on other metals, has been largely based on cell viability assays (IC_{50} values) and compounds that bind to DNA. The Pt(II) compounds are currently the most widely used anticancer drugs. Today, there is hardly any clinical regimen or combination of chemotherapy that does not contain either cisplatin or carboplatin. Cisplatin is one of the three most widely utilized anticancer drugs in the world and has annual sales of approximately $500 million. Despite the resounding success of cisplatin, the drug exhibits several side effects. This has led researchers to develop anticancer drugs utilizing other metals. Many ruthenium complexes including NAMI-A, which is in clinical trial, phase II, have been evaluated for the treatment of cancer. We have recently synthesized several Ru (III) complexes and evaluated their in vitro anticancer properties on NIH 3T3, a continuous mouse embryonic fibroblast cell line, and human breast adenocarcinoma cell line HTB-22. We found promising results of some of the complexes. The synthesis and biological assay will be discussed.

Gurijalat, P. and J. Sneddon. McSU. **Determination of polyaromatic hydrocarbons in soils in southwest Louisiana by gas chromatography-mass spectrometry**.—A method will be described for the determination of selected polyaromatic hydrocarbons in soils for subsequent determination by gas chromatography-mass spectrometry. The method involves the soxhlet extraction with dichloroethane for subsequent determination by GC-MS. The overall performance and detection limit as well as some results from a preliminary field study in Southwest Louisiana will be presented. Supported, in part, by Environmental Protection Agency, EPA-R-82958401-1.

Kiran, B. McSU. **Electron counting rules and the stability of clusters**.—Magic clusters, characterized by large energy gaps between their highest occupied molecular orbital (HOMO) and lowest unoccupied molecular orbital (LUMO) exhibit unusual stability and may serve as building blocks for a novel class of cluster assembled materials. Recently, we proposed a new electron counting rule that enables us to predict both the composition and structure of many magic clusters consisting of hydrogen and aluminum atoms. This rule has been found to be applicable to a wide variety of systems. Some recent success in predicting stable AlHLi and Al-Au system will be presented.

Kumar, A.L. and J. Sneddon. McSU. **Determination of chlorohydrocarbons in different proportions of clay and sand by gas chromatography-mass spectrometry**.—The results of a study involving the retention and subsequent determination of selected chlorohydrocarbons of various combinations of soils and clay by gas chromatography-mass spectrometry will be presented. Sample preparation for introduction to the GC-MS involved soxhlet extraction with dichlorethane.

Mosby, B. GSU. J. Martin and R. Wilcox. NCSU. **Polymerizations of nitro-aromatics.—**Metal halides have shown the ability to effectively sorb gases and small molecules. This sorption ability has led to commercial uses of metal halides in gas separation and purification processes. While exploring the reactivity of nitro-containing molecules with metal halides it was discovered that a reaction with $AlCl_3$ leads to polymeric materials with interesting optical properties. The broad visible and infrared emissions as well as the vivid colors of these polymers make them

useful as OLEDs and dyes. Size exclusion chromatography and freezing point depression will be used to determine the molecular weight of the compound. We will also oxidize and reduce the compound to gain more information about its reactivity.

Pilla, D. and J. Sneddon. McSU. **Determination of chlorocarbons in soils from southwest Louisiana by gas chromatography-mass spectrometry**.—Results of a method developed for the determination of chlorocarbons in soils from Southwest Louisiana will be presented. Approximately 50 g was extracted using dichloromethane by soxhlet extraction for subsequent determination by gas-chromatography-mass spectrometry. Detection limits as well as preliminary results of a field study will be presented. We also acknowledge the partial support of Environmental Protection Agency, EPA-R-82968401-1.

Ramelow, U., S. Pingili and S. Branganza. McSU. **Conductivity of polymers and copolymers obtained by UV irradiation**.—New polymerization methods were investigated by UV radiation as a photochemical initiator. The effect of dopants on conductivity of their polymers and copolymers was studied. The conductivity change at various temperatures was traced during the reaction with dopants, activation energy and ΔH values were calculated. Ethylene-glycol-dimethacrylate/methylmethacrylate copolymers were prepared. IR spectroscopy was used to calculate reactivity ratios and to identify the type of copolymerization,. The effect of dopants on copolymer conductivity was studied.

Ramelow, G. and S.R.C. Nekkalapu. McSU. **Determination of chemical form and bio-availability of trapped metals in sediment cores from Bayou d'Inde, Louisiana**.—Sediment cores were collected from ten stations on Bayou d'Inde in southwest Louisiana. The stations are located from the mouth of the bayou to Cities Service Highway Bridge. Cores were collected by driving a 1-inch diameter PVC pipe into the bottom sediment, capping the tube, and then withdrawing the tube from the bottom. Upon reaching the laboratory, each sediment core was sectioned into 3-inch segments. The sediments were cut in half; one-half was saved for future mercury analysis; the other one-half was dried in an oven for two days and then pulverized to a fine powder for subsequent trace metal analysis. Each dried and powdered sediment sample was subjected to a three-part BCR extraction scheme to determine the bioavailability of each metal studied and the chemical form of the metal in the sediment. All extracts were analyzed by inductively coupled plasma emission spectrometry.

Sullivan, R., M. Wilkerson, L. Nunez and M. Morgan. NSU. **Chemical guilty of swimsuit murder-victim left in pieces**.—Chemvention is annually sponsored by the American Chemical Society (ACS) as part of the National Chemistry Week (NCW) celebration. It is this invention contest, using chemical principles, that propelled the formation of a working team (Melissa, Rebecca, Lauren and Matt) and their corresponding entry and runners-up status in Chemvention. They had to develop a hands-on activity geared towards elementary school children (between 4th and 6th grades) for NCW. The theme for 2008 is "Having a Ball with Chemistry" (chemistry and sports). They had to depict how/where chemistry is connected to sports materials (shoes, equipment, clothing, etc.) and/or performance (metabolism, nutrition, physiological) and they had to do it all for under $50 (all materials and use of instrumentation). This presentation will discuss the background and results of this chemical education research.

Talbert, C. GSU. A. St. John and A. Lyon. GIT. **Structures of microgel/silica particles**.—This research is based on using the behavior of colloidal microgel crystals to create new variations of colloids. Colloids of different shapes can help develop photonic materials based on the periodic assembly of particles. N-isopropylacrylamide (NIPAm) is the polymer being used; NIPAm at 31^{o}C is highly soluble in water, which makes it mechanically soft. Though, the NIPAm is only the polymer, N,N'-methylene bis-acrylamide (BIS) is the particle that holds the polymer together. Using ammonium persulfate as an initiator, the reaction compresses the polymer between the BIS and creates the microgel. The silica beads were adjusted and functionalized with a high silane concentration to put a carboxylic acid group onto the silica bead; then reacted with a photo cross-linker, benzophenone, through carbodiimide coupling. A small amount of the silica was placed with the microgel and put under U.V. light to cross-link the two. These adjustments proved to be rewarding. There is no evidence to tell whether the silanization or length of U.V. radiation is the cause for the change in results. As expected, clumps were formed but spherical shapes also formed.

Thibodeaux, C. and J. Sneddon. McSU. **Determination of heavy metals in oysters by flame atomic absorption spectrometry**.—A study of concentrations of selected heavy metals in oysters collected from southwest Louisiana will be presented. The method developed involved the drying, weighing a known mass and digestion involving microwaving the oyster into solution. The samples were then determined by flame atomic absorption spectrometry. Results of the study will be presented including accuracy studies using a NIST-SRM 1566b reference oyster. Support in part by an award from Merck Undergraduate Program for 2005-2007.

Vincent, M. and J. Sneddon. McSU. **Determination of 1,2-dischloroethane on oysters by gas chromatography-mass spectrometry**.—The American oyster (*Crassostrea virginica*) is found throughout the Atlantic coast and the coast of the Gulf of Mexico. A method for detection of 1,2-dichloroethane in oysters was developed. 1,2-dichloroethane also known as ethylene dichloride (EDC) is the chief reactant used in the production of vinyl chloride monomer, which is the major precursor for the thermoplastic polymer PVC (polyvinyl chloride) production. 17.5 million tons of 1,2-dichloroethane are produced in the United States, Western Europe, and Japan annually. 1,2-dichloroethane is toxic, corrosive, highly flammable, and possibly carcinogenic. A soxhlet extractor was used along with 1,2-dichloromethane as the solvent. The oyster was injected with 100-300 µL of 1,2-dichloroethane. The sample was placed into the soxhlet extractor for up to 4 hours and then analyzed in a quadruple GC-MS. The 1,2-dichloroethane was detected and then a standard was used in order to determine a detection limit. Results of this work will be presented.

Wilson, D. McSU. **Identification of organic molecules susceptible to oxidation in red wines**.—The mechanism by which wine is oxidized and, therefore, spoiled is not well understood. Our preliminary efforts are focused on identifying the chemical species in wine that are susceptible to oxidation. We are interested in both the effects of oxygen and reduced oxygen species on the constituents of wine and the mechanism of oxidation. We are employing various chromatography and mass spectrometry techniques at McNeese State University to identify and characterize these organic molecules. Our aim is to understand the mechanism associated with wine oxidation and to elucidate the role of trace transition elements in this oxidative mechanism.

Computer Science Section

Brandy, G. GSU. **Detecting a faulty sensor in a sensor network**.—A wireless sensor network is a wireless network consisting of spatially distributed autonomous devices using sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants, at different locations. The development of wireless sensor networks was originally motivated by military applications such as battlefield surveillance. However, wireless sensor networks are now used in many civilian application areas, including environment and habitat monitoring, healthcare applications, home automation, and traffic control. In addition to one or more sensors, each node in a sensor network is typically equipped with a radio transceiver or other wireless communications device, a small microcontroller, and an energy source, usually a battery. Wireless sensor networks are the key to gathering information needed by smart environments, regardless of location such as buildings, home, shipboard. etc. Wires are impractical in guerilla warfare concepts and a wireless sensor network is most practical. In this work we discuss an algorithm to determine the faulty sensor based on physical measurements compared with the predicted value.

Chao, S., N. Hebbard and Y.B. Reddy. GSU. **Hybrid bidding process for auctioning products**.—There are many ways of auctioning the items in the market. Once the items were placed in auction the bidders bid for the item. The sellers use various opportunistic ways to sell the item for higher price and bidders use different strategies to get the item for lower price. The sellers may use their own agents as bidders (shill bidding) to get a better price. In other cases, they use their own agents to bid on multiple similar items so that they can sel1 their item for the expected price (mole bidding). Bidding process is another adventure in e-market and many opportunistic bidding procedures were introduced in the market through e-commerce. The well known e-bidding internet examples are e-bay.com and priceline.com. In the current research, we explain various bidding procedures in the market and explain their role in the bidding process. We survey the literature particularly for shill bidding, mole bidding and discuss their role in optimal and opportunistic bidding processes. Further we discuss how mole bidding helps sellers better than shill bidding in getting a fare price for their product particularly when a product is in demand.

Etherly, K. GSU. **Cyber security–possible attacks and solutions**.—Cyber security involves the security of critical information by preventing, detecting and responding to attacks The risks involve viruses that erase the entire system or part of the system, hacking and altering files, stealing credit card information, stealing or altering medical records, attacking bank records, and many similar risks that put a halt to our daily life. There are several different security preventions available such as encryption, firewalls, spy-ware, anti-virus programs and many more that can help one prevent some of these attacks from occurring. As the rate of different attacks and viruses increases rapidly each day, we must be careful when dealing with sensitive information. The first step is protecting sensitive information by recognizing the risks that are familiar and find new attacks to protect sensitive information. In this study, we will review literature of possible attacks on sensitive information, discuss some of the risks, and possible solutions.

Gao, K., Z. Fu, G. Wang, P. Regan and Z. Pan. ULL. **Dispersion slope compensation using EDC and FEC in a 24*10 Gb/s 7800 km fiber transmission system**.—The ≥ 10 Gb/s long-haul WDM systems that use dispersion-compensating fiber (DCF) may have dispersion-slope mismatch problems. When the central-channels are compensated exactly, there will be a residual dispersion at other WDM channels. Many optical solutions have been proposed to compensate this residual dispersion. The most cost-effective method for fiber chromatic dispersion compensation most likely will be electronic solutions, such as forward error correction (FEC) coding and electronic equalizers or electronic dispersion compensator (EDC). In this paper, we compared the performances between EDC and FEC for chromatic dispersion compensation at 10 Gb/s transmission systems. The simulation shows that for short single channel fiber link, Q factor of FEC is better than EDC by 0-5dB when the accumulated dispersion is less than 2500 ps/nm. On the other hand, Q factors of EDC are still >15dB until the accumulated dispersion reaches to 6000 ps/nm. In a 24x10 Gb/s 7800 km WDM system, we find that in channels that accumulated dispersion ≤ 1500nm/ps, FEC is better than EDC. Moreover, if both EDC and FEC are added in the receiver to compensate the residual dispersion, the Q factors of all 24 channels can be above 15dB. Supported by Louisiana Board of Regents.

George, K.S. and M.K. Kourouma. SU-BR. **A self-service support software tool for troubleshooting Windows XP system errors**.—As the production and development of computing systems, laptops and desktops, continue to increase, so has the need for technical support and help desk assistance for these systems. As a result, companies are faced with the task of keeping the number of help desk calls to a minimum. On a given day, customers may spend 30 minutes to an hour or even spend days waiting for technical support assistance. In addition, companies are spending an excessive amount of money to train computing technicians. In this paper, we intend to provide a novel method for troubleshooting laptop and desktop systems by means of a real-time "self-service support" software tool. This software tool consists of a step-by-step graphical user interface that the users of these systems can use to troubleshoot system errors that occur in Windows XP's operating system. The tool is aimed to lessen some of the issues that end-users may face while waiting for technical support assistance which include high levels of frustration, time consumption, and a loss of productivity. Two implementations of the tool will be considered: static and dynamic. The static version requires some input, such the system error code from the user while the dynamic version communicates with the operating system directly.

Gwee, N. SU-BR. **Solving NP-hard problems with hybrid heuristic algorithms**.—We describe three procedures that exploit the combined resources of heuristic algorithms to solve NP-hard problems. The Democratic Algorithm uses a consensus-based approach, whereby a solution is built from the combined outputs of a set of heuristic algorithms. The Super Heuristic Algorithm fixes certain elements of the problem and uses other algorithms to solve the reduced problem. Finally, we apply heuristic algorithms within Lagrangian-based algorithms both to make feasible solutions and to improve upon previous solutions. We test our procedures upon the Set Covering Problem and the Multidimensional Knapsack Problem, and show that they produce significantly better solutions than do individual heuristic algorithms currently known.

Jacobs, C. GSU. **E-Commerce: Simulating a movie rental store**.—Electronic commerce is a concept that has boomed in modern years. Many platforms have been established that use a development interface and back end support for information transmittal. A project was created using principles of e-commerce simulating a movie rental store. This project would be of great service to movie rental companies and general stores. Situations for use include login and sign up for an account, update account information, browse the selection of movies, retrieve customer password if forgotten, select movies to check out, get an estimate of the total amount, view the affiliate programs, check out the career aspects of a company and store locations, and view store locations. The requirements for this project would include Visual Studio 2005, Access, and Visio. Testing techniques included requirement testing, module, unit, and code testing.

Smith, N. and Y.B. Reddy. GSU. **Role of cognitive radios for efficient utilization of spectrum**.—The cognitive radio (CR) is an emerging wireless technology for dynamic spectrum allocation and spectrum reconfiguration. It helps efficient spectrum utilization, interference avoidance, better system performance, and spectrum sensing followed by adaptation. The cognitive radio will also be used to alter the frequency, power, modulation, coding, and other transmission parameters in real time. In the current research we use CR technology to detect the primary user (signal) so that the unutilized spectrum by primary user will be efficiently utilized by secondary users.

Wright, B. GSU. **On-line adaptive developmental math system for children**.—The proposed online adaptive developmental math system for children four to eight years of age enables them to develop math skills. The system meets the standards and requirements of the National Council of Teachers of Math, and the United States Department of Education. The system adjusts to the performance of its user based on correct or incorrect responses given to exercise questions, and utilizes audio and graphics to bolster its user to develop math skills and learn proper use of a computer and its peripherals. Database technology is utilized to store data like: system-generated transcripts and personal data; and it will be updated as its users make changes. This tool is a free service that its users can utilize to help build a mathematical foundation.

Earth Sciences Section

Bass, J., H. Neal and M. F. Ware. GSU. T.G. Guzik, J. Giammanco, B. Ellison and J. Wefel. LSU-BR. **Atmospheric temperature, pressure, and density and photographs by Grambling State University's high-altitude temperature, pressure, and clarity BalloonSat payload**.— Grambling State University (GSU) has been selected as the first institution to participate in the Physics and Aerospace Catalyst Experience in Research (PACER) consortium led by Louisiana State University (LSU). In July 2007, two GSU undergraduates and a faculty member and members of the LSU Department of Physics and Astronomy traveled to NASA's Columbia Scientific Ballooning Facility in Palestine, TX where they launched GSU's High-Altitude Temperature, Pressure, and Clarity (HATPaC) scientific payload beneath a latex sounding balloon. The balloon reached an altitude greater than 32 kilometers before it burst. Sensors on board the payload performed measurements of ambient temperature, internal temperature, and ambient pressure. Cameras on board the payload captured photographs both above and below the

horizon for the duration of the flight. Profiles of the temperature, pressure, and density of the atmosphere were developed for altitudes up to 32 kilometers. Supported by NSF Grant No. PHY-0653423/17463.

Bonton, M., F. Namwamba, L. Guyon, A. Shams and T. White. SU-BR. **GIS supported land use change analysis of a Midwestern floodplain**.—Utilizing field data and existing aerial photography, the authors produced a land cover map (in ArcGIS shape file format) depicting existing vegetation conditions in the project area. They shall also produce a land cover map utilizing the LTRMP 31-class vegetation classification scheme. They assessed vegetation change in the project area using existing conditions and existing photo-interpreted data from 1975, 1989, and 2000 that have been classified to the LTRMP 31-class vegetation classification scheme and clipped to a common study area boundary. Data were provided in the ArcGIS shape file format in the UTM Zone 16 projection and in both NAD27 and NAD83 data. A detailed document summarizing the land cover changes also will be provided.

Glawe, L.N., D. Bell and J. Anderson. ULM. **A 57 ma larval bivalve from Louisiana**.—Two larval bivalve specimens (a left valve prodissoconch and a right valve prodissoconch about 500 microns in height) were found in a core sample from the Carter #2 well, Sabine Parish, LA. SEM micrographs of the prodissoconch shells reveal growth lines on the exterior and interlocking hinge teeth/sockets and interlocking valve margins on the interior. The initial larval shell, which is without prominent commarginal growth lines, is called the prodissoconch-I stage. The prodissoconch-II stage exhibits prominent commarginal growth-line ridges. The boundary between the two stages is abrupt. This boundary between prodissoconch-I and prodissoconch-II on the left valve SEM micrograph is at a growth stage of 165 microns from the beak. The prodissoconch-I stage represents about 25% of the larval shell. The prodissoconch I-II boundary on the right valve SEM micrograph occurs at 130 microns from the beak. Again, the prodissoconch I stage represents about 25% of the larval shell, a percentage that is consistent with that observed in extant, oviparous, larval bivalves. Larval bivalve specimens of the present study are part of a diverse foraminiferal and molluscan assemblage that is stratigraphically dated at 57 ma. The assemblage is interpreted to represent a tropical, normal-marine, near shore-shelf paleoenvironment. Research supported by ULM Museum of Natural History.

Hanks, A.T.C. ULM. L.G. Huey and D. Tanner. GIT. J.R. Olson and G. Chen NASA-LRC. **Boundary layer sulfuric acid measurements during NEAQS-ITCT 2K4: Implications for photochemistry and aerosols**.—We report values of gas-phase sulfuric acid, H_2SO_4, from the New England Air Quality Study 2004 as measured by Chemical Ionization Mass Spectrometry (CIMS). The mean sulfuric acid value for daytime boundary layer is 2.06×107 molecules cm^3 for the Northeastern U.S. Because aerosol scavenging is efficient, sulfuric acid observations provide a simple tool for calculating steady-state hydroxyl radical concentration and thus tests our ability to predict H_2SO_4 levels. The hydroxyl radical concentrations are compared with the output of the NASA photochemical box model. Model to steady-state value for the field campaign is 1.68. The overestimation of the model can be attributed to the interpolations used to account for the variation of volatile organic compounds (VOCs) during the flights. However, good agreement was found between model predictions and steady state calculations of OH when VOC variability could be captured in the model. Several night flights occurred. Consequently, it was possible to

calculate steady state OH at a fast time response of 1 second. A dimensionless parameter, L, was also calculated for 8 daytime flights to determine when nucleation was possible. The L parameter indicated nucleation was possible 10% of the time for the flights examined and mainly occurred within urban plumes.

Mills, B. J. ULM. **Atmospheric conditions for polar low genesis**.—Polar lows are small (<1000 km), intense mesoscale winter storms over water. They are non-frontal weather systems that occur in very cold air masses. Meteorologists have studied polar lows over the extreme North Atlantic and nearby Nordic seas since the 1960s. Improvement in satellite remote sensing has shown that polar lows also occur in the North Pacific Ocean as well as in the Southern Sea around Antarctica. Polar lows have short life spans, varying from 3 to 48 hours. Polar lows can generate gale to hurricane force winds, high deep-sea waves, heavy and blowing snow and thunderstorm activity. Although small in size, polar lows can produce hazards for shipping and coastal boating and raise environmental concerns because of their rapid development and intensification. Because polar lows evolve rapidly under various atmospheric conditions, this study will look at the favorable atmospheric conditions for polar low development and which ones can be used as forecasting tools to predict them.

Saunders, J.W. ULM. **A prehistoric mound building hiatus 2800–1200 B.C.—**Middle Archaic (3400-3800 B.C.) mounds were verified by ULM excavations at Hedgepeth and Frenchman's Bend Mounds, and Watson Brake in the 1990s. Recent radiocarbon dates from Hedgepeth Mounds and Watson Brake indicate mound building suddenly ended ca. 2800 B.C. and did not resume until the mounds at Poverty Point were built 1000 years later. Paleosols in northeast Louisiana may offer a clue for the hiatus. Soil profiles in mounds and alluvial deposits in northeast Louisiana suggest a period of environmental stabilization ceased around 3000 B.C.

Stringer, G. ULM. D. Cicimurri. BCMG. J Knight. SCSM. L. Campbell. USC. **Otoliths provide clues to the fossil actinopterygians (bony fishes) of the pliocene of South Carolina**.—In spite of the Pliocene being studied extensively geologically and paleontologically in South Carolina, actinopterygians (bony fishes) from this age are poorly known. Knowledge of cartilaginous fishes is also limited in many areas, but the most significant gap occurs in the teleosts. Fossil remains from the Eagle Point Quarry located in Darlington County, South Carolina, have provided insight into the Pliocene vertebrate assemblage. Initially, four elasmobranches were identified and included Mustelus, Carcharias, Carcharhinus, and Rhizoprionodon. Limited teleost teeth and bones were recovered, but none of the remains could be specifically identified with the exception of possible albulid teeth. Screen washing and subsequent microscopic examination has produced approximately 130 fish otoliths (earstones). Otoliths have proven invaluable in the identification of fossil actinopterygians, especially in the Cenozoic deposits of the Gulf Coast and Caribbean. Identification of the Eagle Point otoliths revealed a fish assemblage of at least 16 taxa that is dominated numerically and taxonomically by ophidiids (cusk-eels). Otoliths also indicate the presence of conger eels, anchovies, phycid hakes, midshipman, sea basses, cardinal fishes, drums, jaw fishes, butterfishes, sand flounders, and tonguefishes. This study greatly increases the understanding of the Pliocene bony fishes for South Carolina. Research partially funded by ULM BellSouth Endowed Professorship.

Materials Science and Engineering Section

Bass, J. and N.V. Seetala. GSU. A.M.R. Jayasingha, R.K. Garudadri and U. Siriwardane. LTU. **Preparation and characterization of sol-gel alumina supported bimetallic nanocatalysts for WGS reaction**.—We have synthesized Water Gas Shift (WGS) reaction catalysts for hydrogen production using sol-gel/oil-drop methods. Two granular catalyst systems: 1) Cu (7%) and Ce (8%) in alumina and 2) Cu (5%), Ce (7%) and Ni (8%) were synthesized starting with metal oxide nanoparticles and incorporated into alumina sol-gel. The granules were studied by DTA and TGA, and determined the calcinations temperature of 450^{o}C. The calcined granules were examined by SEM prior to the catalytic studies using a Gas Chromatograph (GC). The Cu-Ce catalyst granules are larger with larger pores and have less mechanical strength compared to Cu-Ce-Ni. A batch reactor was operated starting with a gas mixture of N_2 (80%), CO (16%), and H_2O (4%) at optimum reaction temperatures 250^{o}C and 200^{o}C, respectively, and obtained from a gas flow reactor. After ~1 hr reaction, ~43% CO is converted in the case of Cu-Ce catalyst and about 62% CO in the case of Cu-Ce-Ni catalyst. The overall CO conversions after 10 hrs reaction were 69% for Cu-Ce catalyst and 83% for Cu-Ce-Ni catalyst. In summary, Cu-Ce-Ni/ Al_2O_3 catalyst is a better candidate for WGS reaction to produce hydrogen from CO and H_2O mixture compared to Cu-Ce/Al_2O_3 catalyst.

Bastola, M., S. Neupane and P. Derosa. LTU. **Quantum mechanics study of electronic properties of polyanilines and polypyrroles**.—Polymers are found to be able to conduct electricity upon appropriate doping, and a number of technological applications have been implemented. There is however still a lack of deep understanding of the correlation between the properties at the molecular level and the corresponding properties at the macroscopic level. One step towards that aim consists of the development of strategies that allow inferring from molecular properties macroscopic properties that requires sufficiently accurate and computationally inexpensive models able to study the evolution of molecular properties into macroscopic properties. This work presents a density functional study of polyanilines and polypyrroles. Geometries, HOMO-LUMO gap energies, charge distributions and the molecular orbital structures of polypyrrole oligomers up to pentamers have been calculated and analyzed as a function of polymer size and structure using semi-empirical AM1 and DFT (B3PW91/6-311G**) methods. For the polyanilines, in addition to the geometry and HOMO-LUMO gap calculations, the fully reduced leucoemeraldine based, the half oxidized emeraldine based and the fully oxidized pernigraniline are studied and compared, by optimizing the molecules with AM1 method and performing a single point calculation. The significance of a doped form of emeraldine salt in electrical conductivity is discussed.

Dhawan, N. PEC. **Electrokinetics and flocculation studies of coal**.—Indian coal contains high ash content around 25-35%. If it is not treated before use in a blast furnace, it will lead to some problems like high slag volume and lower calorific value. Washing of coal is done to remove ash content, but it retains some water along with it which makes it difficult to process as it reduces heating value, increases transport costs and also makes handling difficult. Mechanical dewatering is done by pressure filtration, vacuum filtration and centrifugal filtration. Significant portions of solids go along with the water in the effluent stream and the rest remains in the centrifuge. Thus, there is need of recovering those solids and water also which can be further

used in the plant. This paper reports determination of iso-electric point, to find out the best flocculent along with its optimum dosage required for flocculation by considering turbidity, faster settling, compactness and moisture content. Flocculation is employed and optimal conditions are obtained from electro-kinetic studies of coal centrate samples (i.e. determination of PZC (point of zero charge)). The coal sample used is sample of size 37 microns obtained from Tata Steel.

Fu, Z., K. Gao and Z. Pan. ULL. **Bidirectional surface plasmonic polaritons lightwave coupler**.—Surface plasmonic polaritons (SPP) is a kind of electromagnetic (EM) field that is bounded along the interface and decreases exponentially in the direction perpendicular to the interface resulting in a sub-wavelength confinement. Consequently, SPP devices have been considered as a candidate to conquer the diffraction restriction that limits the miniaturization of photonic integrations. The structure studied in this paper is a metal-dielectric-air (MDA) waveguide, which has great potentials for directional beaming of light, unidirectional couplers, and bidirectional surface wave splitters, etc. In this paper, the SPP Bragg gratings based on MDA waveguide will be analyzed, which could be used to realize a bidirectional surface wave coupler in the near infrared domain. We will show how to design bidirectional wave couplers theoretically based on plasmatic Bragg gratings in the near infrared domain. We will employ effective index and band structure theories to explain the coupling mechanisms and physics of the bidirectional guided surface modes, and predict the working wavelengths for the bidirectional surface wave coupler. Based on the theoretical design approach, the structure parameters of the devices can be predicted for FDTD modeling as well as the experiments.

Loche, J.N., S. Singh, B.C. Hollins, S.A. Gold and D.P. O'Neal. LTU. **Measuring the size and surface charge of colloidal SERS substrates**.—Raman spectroscopy is associated with the scattering of radiation by a sample using a monochromatic, high-intensity light source. The spectrum obtained from Raman spectroscopy can be used as a fingerprint to identify different types of molecules in an unknown sample. Surface enhanced Raman spectroscopy (SERS) is a much more sensitive method that involves taking Raman spectra on the molecular level (i.e. physiological molecules) of substances that have been adsorbed on metallic surfaces. SERS signals are at least 104 times greater than what the Raman scattering of the compound would be in solution. One metal used to obtain SERS spectra is gold. Understanding and defining the surface characteristics of gold is important in optimizing the usage of gold as a SERS substrate. The optimum surface charge and surface chemistry will be determined by finding the relationship between the intensity of spectra obtained from an analyte in gold colloid over time. The gold colloid at the time that yields the maximum SERS enhancement will be correlated to the surface charge and size of the colloidal particles to direct development of a solid gold substrate. We present a size and charge analysis of gold colloid used to obtain SERS spectra for this purpose.

Namwamba, J.B. SU-BR. **An experimental analysis of forced convection drying process for potatoes**.—This research analyzed the mass loss as a function of time and temperature, and moisture content as a function of drying air flow and time. The dehydration process was done by a graphical method. Compared to natural air, heated driers absorb more moisture from food products thus drying food faster. Experiments involved heated air flowing through potato layers.

Drying air was heated by electric elements. The drying chamber had a square base of sides 17 cm by 17 cm. Peeled potatoes in square shapes of approximate side lengths 37 mm and 10 g mass were laid on four galvanized mesh trays. An adjustable suction pump capable of moving at least 850 liters per minute of air was mounted to the top back of the chamber. Air velocity was varied by adjusting the pump's discharge. Temperature was varied by heater knob. The heating chamber was positioned immediately below the bottom tray. The drying apparatus was placed on a concrete surface. Ambient temperature and temperatures of at least 60 points within the drying chamber were recorded during each experiment by use of LABVIEW software. Dehydration was carried out at different temperatures and air speeds. Analysis of the dehydration process was conducted.

Phillips, E.A. GSU. J. O'Sullivan. NOAA. **Exploring the environmental impacts and the in-flight photooxidation of balloons used in NOAA operations and activities**.—The National Oceanic and Atmospheric Administration (NOAA) has developed a concern that the agency's upper-air activities may negatively impact the environment. One area of interest is the photooxidation of meteorological balloons during their atmospheric flight. This investigation may help determine possible chemical changes on the balloons' surface. A retrieved polyisoprene balloon fragment and new polyisoprene and polychloroprene meteorological balloons were examined using Fourier transform infrared spectroscopy as a method for comparison. Infrared bands were easily identified as typical components present in polyisoprene. It was determined that the signals generated at 1548.6 and 1014.7 cm-1 were caused by the presence of carbon-sulfur and disulfide bonds, respectively, meaning that rubber had undergone vulcanization. The source signaling a band near 1739.7 cm-1 still remained elusive. Thus, there were no indications of chemical change in the examined samples. Since the recovered fragment only served as a lower hemisphere sample, further tests, such as a chamber study, should allow for controlled photooxidation of balloons, promoting higher recovery of balloon fragments. Overall, a thorough investigation of photooxidation on balloons could also shed additional insight on the mysteries of atmospheric photochemistry and help NOAA and other balloonists understand the magnitude to which balloons further impact the environment.

Singh, S., J.N. Loche, B.C. Hollins, S.A. Gold and D.P. O'Neal. LTU. **Modulated adsorption of analytes on SERS substrate**.—Discovery of Surface Enhanced Raman Spectroscopy (SERS) led to reincarnation of the Raman Effect. The magnitude of enhancement observed in SERS is 10^4 or more compared to the unenhanced Raman signal. This has made single molecule detection an achievable task and opened new avenues in nondestructive sensing of analytes present in low concentration (e.g., in biomolecules). SERS is a surface phenomenon where enhancement critically depends on surface geometry and, with the advent of nanoscale engineering, the substrate surface can be designed to suite the analyte type and the desired output (enhancement). We are developing a novel metal coated dielectric, porous sensor that is a promising SERS substrate. The porous surface of sensor behaves like a molecular sieve of size 0.02 and 0.1 micron in diameter and is used for exclusion of the analytes. The adsorption of analytes on the sensor is controlled by varying the surface charge of the sensor or the pH of the solution under observation enabling improved sensing. We present data showing that adsorption and desorption of analytes of gold substrate.

Mathematics and Statistics Section

Munoz, H. and N. Gwee. SU-BR. **Nonlinear parameter estimation with interval arithmetic**. —The reliable solution of nonlinear parameter estimation problems is an important computational problem in many areas of science and engineering, including such applications as real time optimization. Its goal is to estimate accurate model parameters that provide the best fit to measured data, despite small-scale noise in the data or occasional large-scale measurement errors (outliers). In general, the estimation techniques are based on some kind of least squares or maximum likelihood criterion, and these require the solution of a nonlinear and non-convex optimization problem. Classical solution methods for these problems produce local, but not necessarily global, optima. Thus, they do no guarantee the best model parameters. We demonstrate how interval arithmetic can be used to compute reliably the global optima for the nonlinear parameter estimation problem. We will also compare the robustness of the regression methods that use the least squares, and the least absolute value estimates.

Physics Section

Batham, J.M. and P. Derosa. LTU. **Comparison of four different DFT methods**.—Density Functional Theory is a widely used and accepted tool for the prediction of ground state molecular properties. A variety of functional's are used for several applications that include Local (LDA) and non-local (GGA) spin density approximations as well as hybrid and non-hybrid approaches. Despite the fact that the hybrid GGA functional B3PW91, that uses the 3-parameters Becke combined with the Perdew-Wang 91 exchange and correlation has proven to be successful for many applications, its use seems not to be as widespread. In this work, we compare the performance of B3PW91, with B3LYP, also a hybrid functional, and the corresponding non-hybrid GGA BLYP and BPW91 for a set of 27 molecules. We compare HOMO, LUMO and HLG to the experimental ionization potential (IP), electron affinity (EA), and first excitation energy among the four methods. In addition we formally calculated the IP and EA by explicitly calculating the anion and cation. A complementary study of polyacetylene (PA) focused on the evolution of the HLG as the oligomer size increases will be described. A main finding was that a simple exponential extrapolation of the HLG show an asymptotic behavior in perfect agreement with the experimental value of the PA absorption energy.

Charles, N. GSU. P. Derosa. GSU/LTU. **A Monte Carlo approach to electrical conduction in polymers**.—Since the discovery that conjugated polymers can conduct electricity, provided adequate doping is added to them, there has been vast research to better understand the physical, electrical and chemical properties of these molecules. A number of models have been proposed so far. A Monte Carlo-based method early proposed by Bässler and coworkers have proven successful in reproducing a number of experimental findings. In this work, we propose a model based on the Bässler model to study conduction in polymers, which adds a realistic description of the polymer network. Configurational disorder is reproduced by disordered arrangements of hopping sites rather than by a parameter at the same time that those sites are associated in polymer strands, thus intramolecular conduction can be distinguish from intermolecular conduction. In this work, we describe the implementation of this model and the initial results

from it. In this stage, we have used the same parameters reported by other authors and our results are compared to them.

Harris, J.A. GSU. R. Knop and K. Chynoweth. VU. **Building optical spectroscopic datacubes of infrared-luminous galaxies**.—We have chosen two types of galaxies ESO264-G057 and NGC 5135 to study their interaction and mergers. From this we will be able to determine if there is star formation and, in the future with the help of further research, be able to understand the formation of our own galaxy. It is significant to note that at the center of every galaxy is a supermassive back hole. There is a small percentage of galaxies that actually have an active galactic nucleus (AGN). Dr. Robert Knop and Katie Chynoweth took measurements at the Small and Moderate Aperature Research Telescope System (SMARTS) consortium in Chile with the 1.5 m telescope. ESO264-G057 is a spiral galaxy and 76 Mpc. NGC 5135 is a barred-spiral and 52.15 Mpc. Both galaxies are luminous in infrared, Seyfert type galaxies, and have an active galactic nucleus (AGN). These types of galaxies show the strongest and most reliable signatures of rapid ongoing star formation. From data reduction of these galaxies, we expect to produce velocity of H-alpha, H-alpha Flux, and [NII]/H-alpha graphs.

Kukuy, L.J., P. Derosa and M. Lewis. LTU. **Molecular diffusion simulation using Monte Carlo method**.—More and more nanoparticles are playing the main role in materials, devices and processes. That is why it is crucial that today we study the properties of these particles, and better understand the role they play in the world in which we live. Understanding these properties gives us the resources needed to advance our technology to otherwise impossible new boundaries. The study of processes that involve the interaction of nanoparticles with other nanostructures is relevant to a number of disciplines including Physics, Chemistry, Biology, etc. Molecular dynamic simulations can be used to study the diffusion of molecules at an atomic level but is limited by the capabilities of computers. Instead, a mathematical approach that assumes that molecules are single particles instead of complex atomic structures seems more practical. The Monte Carlo method is ideal for this type of analysis. In this work, a Monte-Carlo-based study of nanoparticle diffusion in nanotubes is described. In its current state, the approach accounts for van der Waal interaction between particles and the nanotube walls for nanotubes with variable sizes as well as electrical and magnetic interactions between nanoparticles and with external electric and magnetic fields.

Ruibal, A.L. SLU. **The SEAL program and DMSO viscosities**.—The SEAL program is a program at Southeastern Louisiana University in which students conduct industrial research under the supervision of a faculty member. The program aims to give students experience researching in a lab while communicating with the needs of companies that assign the work to them. One of the companies that the program works with is Gaylord Chemical out of Bogalusa, Louisiana. Under the SEAL program with the expertise in polymer characterization of Dr. David Norwood, I have been working on a viscosity project for Gaylord. Gaylord manufactures a chemical called DMSO, dimethyl sulfoxide, and the company was interested in the viscosity of various DMSO/gel samples in order to use the information to sell the product to pharmaceutical companies. For the project, I used DMSO/gel samples, a syringe pump, a single capillary viscometer built around a pressure transducer, a demodulator, and various computer software.

The research was documented in plots, graphs, and a formal paper. A project involving mixing DMSO with water and methanol also was conducted using similar procedures.

Division of Science Education

Higher Education Section

Jackson, M.N. SLPSD. **Persistence of low-income students in STEM majors**.—Students who come from low socioeconomic families are at a severe disadvantage in their persistence towards a post-secondary education. This qualitative study investigates the experiences persistent of first-generation students who participated in a pre-college initiative program. Findings from this pilot study revealed that self-discipline, campus involvement, prior experiments, and a smooth transition from high school to college have significant impacts on the persistence of first-generation students in science, technology, engineering, and math (STEM) majors. The future aspirations of these students are enormously high beyond the four–year baccalaureate degree. In general, participation in pre-collegiate initiative programs has a positive impact and has a special meaning among first generation students.

Namwamba, J.B., F. Namwamba, M. Stubblefield and D. Bagayoko. SU-BR. **Integrated coastal education program for middle school STEM students**.—The Science Mission to Planet Earth SMPE, IT – Integrated Coastal Education provided an approach to science, technology, engineering, and mathematics (STEM) education that provided effective instruction to middle school science students with measurable improvements. Pre- and posttests at the program indicated improvement at all levels. Statistical procedures prove that the module developed in SMPE is an effective pedagogy tool in science and mathematics education. SMPE's extensive programmatic design had several attributes that made its approach to STEM education effective. The program provided: 1) professional development for teachers in information technology, math, and science enriched with strategic content alignment designed to foster higher levels of students investigation and inquiry, and 2) stand alone academic instructions in math, science, and innovative GIS instruction for 6-8th grade students. The sites in rural and urban areas were conducted at a 1:10 teacher:student ratio. Significant emphasis was placed on laying the foundation of knowledge and skills needed by future researchers, educators, and technology students. An important factor relating to the comprehensive scope of the project was cognitive science research integrated into pedagogy. This approach was helpful to students as teachers had more time for activities increasing students' critical thinking skills.

Pugh, A. and J. Washington. ULM. **Redesign in elementary education**.—During the professional block, candidates meet on campus for approximately 17 days and then go to their assigned schools for grades kindergarten through second grade. State requirements mandate they teach approximately 20 hours in each of the four subject areas - lower math, upper math, science, and social studies. For the first assignment they will teach a unit that incorporates lower mathematics and social studies. After the conclusion of the first assignment, they return to campus for an additional 17 days for further instruction in science and upper mathematics. They will then be assigned to a different teacher for grades three through five. Usually they are assigned to a different school in order for them to see different populations in different settings. They will be in the second setting for 17 days and will teach a unit that incorporates science and upper mathematics. They return to campus for debriefing and offering suggestions for the

forthcoming semesters. Therefore, the purpose of this paper is to discuss the organization of the new redesign program in Elementary Education and present samples of required documents.

Robinson, D. I. SU-BR. **Teacher quality as a factor of student achievement: Do Louisiana teacher certifications correlate with student mathematics achievement?—**Teacher quality and quality of teaching have long been identified as factors linked to student achievement. The goal of this study is to illustrate two key provisions of the No Child Left Behind Act (NCLB), quality teachers and accountability in student assessment. It is of interest to determine if the teacher qualifications called for by the NCLB Act correlates with expected student achievement in mathematics. A pilot study will examine the relationship between student mathematics achievements with their teacher's type of certification. Data obtained from twenty Louisiana school districts was used in this initial investigation. Student mathematics performance was obtained from the 2004 10th grade Graduate Exit Exam. Teacher certification data were obtained from the Louisiana Department of Education. A bivariate correlational analysis will be used to determine the relationship between the districts' type of certification and student mathematics performance.

Washington, J. and A. Pugh. ULM. **An analysis of peer teaching**.**—**This study was designed to determine if pre-service teachers grow academically from peer teaching as an instructional strategy. The participants of this research consisted of four groups of five pre-service elementary education majors, who had enrolled in two elementary mathematics methodology courses (Lower and Upper Elementary Mathematics Methodology) immediately prior to student teaching. The group: (a) Administered their pretest; (b) Presented their activities or peer taught one skill or concept in one mathematics strand for each of the two courses; and (c) Administered their posttest. For the lesson plans, the group: (a) Provided a clear, interesting presentation of content; (b) Utilized technology, mathematics trade books/ children's books, audio and visual aids and other materials (handouts, transparencies, pictures, and charts); (c) Utilized Louisiana Mathematics Grade Level Expectations, Standards and Benchmarks; and (d) Decided on one or two skills or concepts to teach. For the peer teaching, each teacher candidate presented and taught at least one activity from their group lesson plan. The results showed a significant positive gain from the pretest to posttest for Lower and Upper Geometry, and Upper Algebra/Integers. The results present clear evidence that peer teaching was effective in geometry and algebra.

Wilkerson, D. and V. Mbarika. SU-BR. **Access to higher education: The case of the Virtual University of Pakistan**.**—**A major obstacle to expanded access to higher education is the problem of providing enough teachers, schools, and classroom materials to meet student's needs. Pakistan sought to address their education dilemma with the opening of The Virtual University of Pakistan in 2002. The Virtual University of Pakistan is Pakistan's first university built solely on the use of Information Communication Technology (ICT's). Upon opening as a non-profit university established by the government of Pakistan, the Virtual University's aim is to improve access to education, connect those in remote areas to quality education and offer a means of affordable education. The university offers three Masters Degree programs, Professional Certificate Courses, a 2-year Bachelor degree, and a 4-year Bachelor degree and Diploma program. The cost of a 4-year program at The Virtual University of Pakistan is approximately 1,200.00 US Dollars. Currently the university operates in over 100 campuses located in 60 cities

throughout the country. The university has also established a network with other universities within Pakistan enabling teachers and students to tap into more technology resources. In this paper, we discuss challenges faced by the Virtual University and implications for research and practice.

K-12 Education Section

Russell, C.A. SU-BR. **The effects of reading comprehension strategies on the mathematics achievement of algebra I students**.—The purpose for this investigation is to examine the effects of reading comprehension strategies on the mathematics achievement of Algebra I students. The reading strategies that will be used in this investigation are anticipation guides and graphic organizers. Anticipation guides and graphic organizers used in this study employ problem solving and other National Council of Teachers of Mathematics (NCTM) process standards to help students read and comprehend mathematical content. It is intended that this study be conducted with at least four groups of Algebra I students. Sixty-eight (68) students will be participants in this study. There will be two experimental (treatment) groups and two control groups.

Division of Social Sciences

Corrigan, G.E. EBRCO. **What's going on in the morgue?—**Human forensic autopsy data used for certification are presented, enumerated, and classified for the year 2007. Comparisons for the four previous years are shown. A recent change in gunshot wounding patterns is described, enumerated and discussed. Female victimology for 2007 is described and analyzed. The utility and value of regional and topographical autopsy data are presented in seven concepts.

Sothirajah, J. and J.S. Larson. SU-BR. **The effectiveness of the 1994 Crime Bill in reducing crime in the United States: Affirming liberal and conservative chestnuts**.**—**This paper analyzes the impact of the 1994 Crime Bill in reducing crime in the U.S., particularly in the Office of Community Oriented Policing Services (COPS) Program. The findings indicate that the increased presence of police in local communities significantly reduced the crime rate nationwide, thereby demonstrating the conservative chestnut that more police presence results in less crime. However, a major finding of this study is that socioeconomic factors play an even larger role in reducing crime, thereby proving the liberal chestnut. Time series data from 1984 to 2004 indicate that when the rates of inflation and unemployment are low, there is a lowering of the crime rate, suggesting that employment is a strong antidote to criminal behavior. While correlations do not demonstrate causality over the twenty year period, they present interesting preliminary findings that confirm both liberal and conservative assumptions.

Acknowledgement

The Abstract Editor would like to thank Kaleigh Helo for her assistance in reformatting the above abstracts from the original submissions.