

ABSTRACTS OF PAPERS PRESENTED AT THE 2010 COLLEGIATE MEETINGS

EASTERN REGION

WALTERS STATE COMMUNITY COLLEGE
MORRISTOWN, TENNESSEE
24 APRIL 2010

ORAL PRESENTATIONS

COMPUTER SCIENCE

COMSOL VS. MICROSOFT EXCEL. *Eugenie de Silva* and Eugene de Silva, Missouri University, Columbia, Missouri, and Lincoln Memorial University, Harrogate, Tennessee.* In this presentation, a comparison of COMSOL software vs. Microsoft Excel will be discussed in teaching and research settings. The use of software in the conduction of heat and kinetic reactions will be discussed with a view to highlighting the advantages of COMSOL software. The future opportunities in the use of COMSOL and its developments will be further discussed.

ENVIRONMENTAL SCIENCE

THE EFFECTS OF FECAL CONTAMINATION ON A STREAM THAT DRAINS INTO THE CLINCH RIVER BASIN. *Beth Mattie*, Lincoln Memorial University, Harrogate, Tennessee.* The study of the ecological and health risks associated with owning a small farm on a stream that drains into the Clinch River basin is vital knowledge. Farming is a large industry in the Southeastern United States. Several farms in Eastern Tennessee specifically are located near or on water bodies that the public has access to. While it is vital to protect these streams, further regulations could be potentially costly and inconvenient for farmers. For example, building fences to limit livestock access to streams and rivers could prove very expensive to many small farms. In this experiment, anticipated results will demonstrate that a small farm with only six cattle will only see fecal contamination in the stream for a short distance. Furthermore, this study will investigate at what distance from the cattle access point fecal bacteria present in the water are no longer considered harmful to people or animals. If the null hypothesis of this experiment is accepted then the EPA should begin considering the amount of livestock on a farm before setting strict regulations on water quality. If the alternative hypothesis, however, is proven correct then the regulations in place may not be enough to preserve aquatic ecosystems and to maintain nonhazardous conditions in public access water.

HEALTH SCIENCE

ANTIBIOTIC RESISTANCE ANALYSIS AS A METHOD FOR TRACKING FECAL CONTAMINATION IN NORRIS RESERVOIR, TENNESSEE. *Shelby Kirkpatrick*, Lincoln Memorial University, Harrogate, Tennessee.* This study evaluated the presence of *E. faecalis* in recreational waters and tracked its source using antibiotic resistance analysis. Enterolert was used to measure levels of *E. faecalis* in water samples collected from four marinas. The levels were compared to the EPA standard, among marinas, and among summer holidays. No statistically significant differences were found. Two libraries of antibiotic resistance patterns were created employing isolates from human sewage (human library) and cattle sources (cattle library). Antibiotic resistance patterns from isolates collected from marinas were then compared to the libraries and classified using discriminant analysis. The major source of fecal bacteria was determined to be human.

MEDICAL SCIENCE

AN INVESTIGATION INTO OSTEOPATHIC MANIPULATION TREATMENT FOR CARPAL TUNNEL SYNDROME. *Justin Patel* and Eugene de Silva, Lincoln Memorial University, Harrogate, Tennessee.* [Editor's Note: The abstract for this presentation, delivered at the 2009 Collegiate Division Meeting, was printed in *JTAS* 84(3):55]

PHYSICS AND ASTRONOMY

THE BAT SPEED REQUIRED FOR A HOME RUN. *Samantha Christian* and Eugene de Silva, Lincoln Memorial University, Harrogate, Tennessee.* When watching a baseball or softball game on television or in person, there is nothing more exciting than when a batter hits a home run. Home runs have an immediate impact on the game, and can change the overall outcome of the game with just one swing. In my life, I have only ever hit one over the fence home run, so in order to help myself as a player and my teammates, I am going to find out what bat speed is required to hit the softball over the outfield fence. In order to find what bat speed is required, I am going to use a radar gun to measure the bat's speed as balls are hit both to the fence and over the fence. Home runs are exciting for the batter, his/her teammates, and especially for the fans. They advance careers and have an immediate positive impact on the game. No matter what level the player is on, hitting a home run is an awesome feeling! [Editor's Note: A similar abstract was presented at the 2009 Annual Meeting of the Tennessee Academy of Science and printed in *JTAS* 85(1):25]

MIDDLE REGION

BELMONT UNIVERSITY
NASHVILLE, TENNESSEE
17 APRIL 2010

ORAL PRESENTATIONS

BIOLOGY I

MONITORING OF REAL-TIME CELL CYCLE OF *SACCHAROMYCES CEREVISIAE* IN MICROFLUIDIC DEVICE. *Bao Nguyen, Ayeeshik Kole, Kevin T. Seale, Lori McGrew, John P. Wikswo, John A. McLean, Jeffrey R. Enders, Todd R. Graham, P. Anthony Weil, and Tessa Sebastian, Vanderbilt University, Nashville, Tennessee, and Belmont University, Nashville, Tennessee (LM)*. Biological systems, such as the cellular regulatory and signaling systems, exhibit an extremely complex system of internal controls at multiple spatial and temporal depths that have yet to be understood. Typical biological experiments tend to modify one variable with the focus of identifying a specific response. The goal is to simultaneously adjust multiple variables while observing multiple system responses within a controlled microfabricated nonbioreactor. The budding yeast *Saccharomyces cerevisiae* serves as a great model to study this complex system. In this study, microfluidic device consisting of 8–12 μm , U-shaped traps were used to probe the yeast cell cycle when it is culture in different media. The yeast cell cycle is monitored with MetaMorph software and effluent containing secretomes are spotted on MALDI plates with Fab@Home x,y,z robot and further analyze with mass spectrometry. My results demonstrate that the length of *S. cerevisiae*'s cell cycle is greatly dependent on the growth media. Additionally, I have shown correlation between the location of cells in a microfluidic device and the length of their cell cycle. After identifying other variables that induce cell response, I hope to manipulate multiple-variable inputs in an aim to control a predictive cellular response.

DEVELOPMENT OF A VERSATILE MECHANICAL DEVICE FOR LONG-DURATION IMMOBILIZATION AND MICROSCOPY OF SINGLE CELLS AND SMALL ORGANISMS. *Liwei Jiang*, Gus Wright, and Chris Janetopoulos, Vanderbilt University, Nashville, Tennessee*. A major difficulty in the study of live organisms is that many specimens move in and out of the field of view or focal plane during microscopy. To combat this problem, we have developed a mechanical microcompressor that immobilizes living cells and small organisms for long-duration optical microscopy. The trapped specimen is kept alive over several hours by a perfusion system. Refinements to the device, such as incorporating internal polydimethylsiloxane structures to improve the efficacy of immobilization, are in active development. Applications of the microcompressor are currently focused on fluorescent imaging of the neural network development of *Caenorhabditis elegans* over many hours, and total internal reflection fluorescence microscopy (TIRFM) of membrane associated molecules during signal transduction in *Dictyostelium discoideum*. Preliminary data have demonstrated that the device excels under both applications. While we have focused on these two species, the microcompressor is useful for many other specimen types and applications.

NONYLPHENOL INTERFERES WITH THE IMMUNE FUNCTION OF HUMAN NATURAL KILLER CELLS. *Rachel Etherton* and Margaret Whalen, Tennessee State University, Nashville, Tennessee*. Nonylphenol (NP) is a degradation product of compounds used as surfactants in various applications including household products. It has been found in human blood samples. Human natural killer (NK) lymphocytes are able to lyse virally- infected and tumor cells. Agents that interfere with the ability of NK cells to lyse targets may increase tumor development or viral infection. We examined the effects of NP on the lytic function of human NK cells. Exposures to 5 and 10 μM NP for 24 h decreased lytic function 30% and 51%, respectively. Exposures to 2.5 and 5 μM NP for 48 h decreased lytic function by 14% (2.5 μM) and 27% (5 μM). These results indicated that exposures to NP can cause significant loss of lytic function, which increases with length of exposure after 48 h.

ANALYSIS OF TELOMERASE PROCESSIVITY IN YEAST EST2 LONG-TELOMERE MUTANTS. *Jessica L. Miles*, Robin C. Bairley, Margaret H. Platts, and Katherine L. Friedman, Vanderbilt University, Nashville, Tennessee*. Telomerase maintains telomeres, regions of repetitive DNA that protect the ends of eukaryotic chromosomes. The yeast *Saccharomyces cerevisiae* requires a reverse transcriptase (EST2) and its RNA template (TLC1) for telomerase activity. A mutation in Est2p (est2-LT^{E76K}) that over-elongates telomeres has been reported to enhance the ability of telomerase to reiteratively copy the RNA template in vitro, activity termed repeat addition processivity (RAP). To test the hypothesis that this mutation increases RAP in vivo, individual telomeres were sequenced from WT EST2 and est2-LT^{E76K} strains expressing two versions of TLC1 that generate distinguishable telomeric repeats. Although analysis of the newly incorporated telomeric sequences reveals differences in the interspersions of the two telomeric repeat types, control experiments are needed to confirm that these differences reflect differences in RAP. As RAP is implicated in the ability of telomerase to rescue critically short telomeres, we anticipate that these experiments will elucidate this mode of regulation.

ANALYSIS OF THE EFFECTS OF DICHLORO-DIPHENYL-TRICHLOROETHANE (DDT) ON NATURAL KILLER CELLS. *Felicia Udoji* and Margaret Whalen, Tennessee State University, Nashville, Tennessee*. Annually, 1.2 million new cases of cancer are diagnosed in the United States annually, and half a million people will die from it. While a small percentage of these cases may be attributed to inherited genetic mutations, the majority of these cancers occur from acquired mutations. That is, environmental exposure to carcinogens, such as dichloro-diphenyl-trichloroethane (DDT), may lead to the accumulation and proliferation of mutated cells. Normally, cytotoxic cells, such as Natural Killer Cells (NKC) eliminate cancerous cells by initiating apoptosis. However, in the presence of DDT, this process may be interrupted. Recently, there has been a demand for investigation into DDT's inhibition of NKCs. In this realm, fixed concentrations of NKCs were exposed to three different DDT concentrations (5 μM , 2.5 μM , and 1 μM). Results suggest DDT drastically reduces their cytotoxic functions by 46–89%. This study provides the opportunity to further investigate the effects of structurally similar compounds on NKCs. [Editor's Note: A similar abstract was presented at the 2009 Collegiate Meetings and printed in *JTAS* 84(3):63]

MUTATIONS IN TELOMERE LENGTH REGULATION PATHWAYS AFFECT DE NOVO TELOMERE ADDITION AT DOUBLE STRANDED DNA BREAKS. *Stoycho M. Velkovsky*, Shira R. Paul, Margaret H. Platts, and Katherine L. Friedman, Vanderbilt University, Nashville, Tennessee.* Telomeres are regions of non-coding repetitive DNA found at the ends of chromosomes. To maintain genetic integrity over time, organisms must extend the telomeres of certain cells. The protein responsible for telomere regulation is telomerase. In this study I look at mutations in EST2, the reverse transcriptase subunit of telomerase in *Saccharomyces cerevisiae*. My primary method of study is the Gross Chromosomal Rearrangement Assay. Gross chromosomal rearrangement occurs when there is a double stranded DNA break that is not repaired correctly. The repair of a double strand break can be achieved by the addition of a telomere to the newly formed chromosome end in a process known as de novo telomere addition. Changes in the activity of telomerase caused by mutations such as the long telomere mutants of EST2 influence the rate at which these gross chromosomal rearrangements are healed by de novo telomere addition.

THE EFFECT OF 6-OHDA ON LOCOMOTION AND EGG LAYING IN *C. ELEGANS* UNDER THE STIMULATION OF A CHEMICAL ATTRACTANT. *Anwesa Chakrabarti and Nick Ragsdale, Belmont University, Nashville, Tennessee.* Parkinson's Disease is a neurodegenerative disorder that upsets locomotor activity. This disease is brought about by the death of dopaminergic cells of the nervous system. 6-hydroxydopamine (6-OHDA) is an environmental toxin that has been found to kill these neurons, but few studies have characterized its effects in a nematode model. Previous studies at Belmont University have looked at the influence of 6-OHDA over motility and egg laying in *Caenorhabditis elegans* (*C. elegans*). Their results showed that the neurotoxin increases locomotion in response to a physical stimulus. This study adds to previous studies by examining the influence of 6-OHDA on locomotor activity using a chemical attractant. The data from this study will hopefully show that 6-OHDA increases locomotor activity to this attractant, adding to previous findings.

CHARACTERIZATION OF METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* ISOLATES FROM COMMUNITY DORMITORY SHOWERS AT BELMONT UNIVERSITY. *Amanda M. Castro* and Jennifer T. Thomas, Belmont University, Nashville, Tennessee.* Methicillin-Resistant *Staphylococcus aureus* (MRSA) is a potentially pathogenic bacterium that is resistant to antibiotics within the penicillin family and is becoming more of a threat in public places. For this reason, I chose to identify and characterize MRSA found in and around shower stalls in community style bathrooms in two dormitories at Belmont University. After confirming isolation of *Staphylococcus aureus* by growth on differential media, Gram staining, and coagulase testing, isolates were identified as MRSA using a disk-diffusion assay to test antibiotic resistance. A total of 33 *S. aureus* isolates were found and 15.15% (5/33) of these isolates showed antibiotic resistance. Of those isolates, 80% (4/5) tested positive for the PBP2a protein. These findings are in agreement with previous research showing MRSA across campus. Future studies on these isolates will determine other mechanisms of resistance and the presences of a pathogenic factor, PVL.

BIOLOGY II

THE EFFECT OF ACUTE ETHANOL EXPOSURE ON THE WORKING MEMORY AND LEARNING OF ADULT ZEBRAFISH. *Kendra Cowan and John Niedzwiecki, Belmont University, Nashville, Tennessee.* Zebrafish, *Danio rerio*, have become an excellent model organism in the areas of neurology and behavioral research due to the knowledge that Zebrafish are comparable vertebrates to humans. Their entire genome has been mapped and much is known about their genetics and development. In this experiment, *D. rerio*, were utilized in order to observe the effects of acute exposure to various levels of ethanol affected their ability to learn. A T-maze with different color reinforcements was used to both train and test for Learning of a particular side. All experiments consisted of two stages that tested for working memory and long-term memory (next day). Data were compiled based on the different levels of ethanol and whether the fish learned or not. Also, data were taken for color preference. While Ethanol did not affect the time to learn a particular side, the results suggested an effect of EtOH on ability to learn and possibly on memory of a side the following day. However, perhaps the strongest results concerned overall color preference regardless of dosage level, which may have obscured any ethanol effects. Future studies may include the testing of various colors against one another in order to gain a clearer perception on the learning behaviors of *D. rerio*, and how color preferences may have developed.

THE EFFECTS OF NICOTINE TREATMENT ON WORKING MEMORY IN ZEBRAFISH. *Alyson Singh and Lori L McGrew, Belmont University, Nashville, Tennessee.* Behaviors such as learning and memory in animals have been known to be affected by the presence of nicotine in the blood stream. In low doses, nicotine acts as a stimulant for mammals and is known to be a very addictive substance. It spreads quickly once inside the body and affects the nervous system by increasing brain activity. Zebrafish is the organism of choice for this study because they have a short generation time; therefore, many studies can be done in a short period of time. The purpose of this study is to observe the effects of nicotine on working memory in zebrafish. Memory improvement due to nicotine exposure could lead to potential treatments for people with neurological disorders such as Alzheimer's, Parkinson's, and learning and memory problems. The zebrafish were administered two doses of nicotine for three different time exposures to observe the effect on working memory in a plus-shaped maze. The fish exposed to a 1.2 mg/L dose for 2 min showed the quickest rate at choosing a side of the maze; however, the fish exposed to a 0.6 mg/L dose for 2 min chose the correct side 10% more than the other concentrations and exposure times. There was significance among the groups so studying the effects of nicotine on the behavior of zebrafish can help in comparing and predicting its effects on a broad range of other organisms.

THE EFFECT OF ETHANOL ON THE WORKING MEMORY OF *DANIO RERIO*. *Olawale A. Osinusi* and Lori McGrew, Belmont University, Nashville, Tennessee.* Previous research has shown that at high concentrations ethanol either stunted the development of or produced deformities in zebrafish offspring. The current study focuses on the effect of ethanol on the working memory of zebrafish, *Danio rerio*, and neurological receptors that are affected. Two concentrations of ethanol were used in the

experiment, 0.5% ethanol and 1.00% ethanol, and compared to control fish (0% ethanol). The fish were then taught to solve a T-maze by choosing the side designated as the correct side. It was shown that ethanol has an effect on the working memory of zebrafish, with the ability of zebrafish to learn decreasing as the concentration of ethanol increases. The data also showed that there may be an optimum concentration that increases the working memory of zebrafish. [Editor's Note: A similar abstract was presented at the 2009 Annual Meeting of the Tennessee Academy of Science and printed in *JTAS* 85(1):29]

CHRONIC NICOTINE EXPOSURE FROM THE EMBRYO TO JUVENILE STAGE IN *DANIO RERIO* AND ITS IMPACT ON WORKING MEMORY. *Abby Murphy* and Lori L. McGrew, Belmont University, Nashville, Tennessee.* Zebrafish, or *Danio rerio*, are model organisms that have recently been utilized in nicotine studies to evaluate the effects that this stimulatory drug has on the brain. There is a strong correlation between nicotine exposure and efficacy of working memory. Nicotine is known to improve cognitive function in moderate dosages, yet high dosages lead to impairments in memory. However, the learning and behavioral changes that results from nicotine treatment in all life stages of zebrafish remains largely unknown. In order to explore this further, this experiment involved daily treatment of zebrafish embryos with an acute dose of nicotine. These treatments were then executed up to the mid-juvenile stage. The proposed hypothesis was that chronic exposure to acute doses of nicotine will result in neural deficits. Results of this research experiment have shown that chronic nicotine exposure in the early life stages of zebrafish are responsible for severe stunting of development.

ANALYSIS OF MORPHOLOGICAL MALFORMITIES IN ZEBRAFISH EMBRYONIC DEVELOPMENT STAGES WHEN EXPOSED TO MONO-2-ETHYLHEXYL (MEHP). *Hannah Wherry* and Karen Meisch, Austin Peay State University, Clarksville, Tennessee.* The understanding of human development is mostly understood through researching the embryonic stages of other vertebrates having similar developmental and genotypic characteristics, using them as a prominent model system. Zebrafish, *Danio rerio*, have recently become a popular system to use for better understanding of vertebrate development. In this experiment zebrafish will be used as a model system to determine the effects of mono-2-ethylhexyl (MEHP), a metabolite of Di-2-ethylhexyl (DEHP), when exposed to developing embryos. Malformations potentially caused by MEHP will be tested at specific concentrations throughout embryonic development. It is hypothesized that MEHP will cause phenotypic malformations in developing embryos. Data collected, along with transgenic zebrafish experiments, will be used to test for more specific malformations such as disruption of neuronal cell migration from the central nervous system.

ANALYSIS OF PHENOTIPIC MALFORMITIES IN *DANIO RERIO* WHEN EXPOSED TO DI-2-ETHYLHEXYL PHTHALATE (DEHP) DURING EARLY STAGES OF DEVELOPMENT. *Zackary L. Powers* and Karen Meisch, Austin Peay State University, Clarksville, Tennessee.* Di(2-ethylhexyl) phthalate (DEHP) is a common plasticizer found in many products and is potentially harmful to human development and may cause birth defects. To determine the extent of potential developmental defects in humans, a simple vertebrate organism should be used

to research malformations from exposure to DEHP. Thus far, studies on rats show that DEHP has a demasculinizing effect on developing rats as a result of perinatal exposure. However, there is a lack of direct evidence for developmental defects on embryos because of the limitations of the organisms studied. To expand on the idea of DEHP exposure causing developmental defects, embryos from the model organism, *Danio rerio*, can be used to obtain more experimental evidence. This jawed vertebrate is a viable subject for biological research because zebrafish develop rapidly and are transparent during embryonic development, have high fecundity. Our hypothesis is that exposure to zebra fish embryos to levels of DEHP equivalent to human exposure during early stages of development will result in phenotypic malformations.

CHRONIC ETHANOL PROMOTES CELL DEATH IN HYPERTENSIVE VASCULAR SMOOTH MUSCLE CELLS. *Catherine Jackson*, Taylor Dugger, Brittany M. Washington, Elbert Myles, and Benny Washington, Tennessee State University, Nashville, Tennessee.* Chronic alcoholism is associated with widespread tissue damage leading to cirrhosis, cardiomyopathy, cerebral atrophy, neuropathy, and anemia, among other conditions. Ethanol alters the biophysical properties of the membrane and proteins, and affects biochemical processes throughout the cell. Also, it is possible the manifestations of alcoholism are the result of a specific toxic action of ethanol at the cellular level. However, the concept that tissue damage is the direct result of ethanol toxicity is problematic. Our previous data indicate that treatment of vascular smooth muscle cells (VSMCs) with 100 mM ethanol for 16 h or longer prolonged the activation of mitogen activated protein kinases (Erk 1 & 2). We hypothesized that chronic ethanol exposure of hypertensive cells alters expression of the mitogen activated protein kinases (ERK 1 & 2) leading to cell death or apoptosis. To test this hypothesis we exposed VSMCs from normal and hypertensive rats (SHR) to elevated concentrations (50–800 mM) of ethanol for 24, 48, and 72 h. Our results indicate that cell viability for both cell types decreased significantly with 50–800 mM of ethanol at 24 h. Forty-eight hrs treatment of both normal and hypertensive cells were even more dramatic when compared to controls. Seventy-two hour treatment decreased cell viability of hypertensive cells by 80% which was not observed in normal cells. The results demonstrate that elevated ethanol exposure of hypertensive VSMCs for longer than 48 h can lead to cell death by impairing survival signaling which can be observed through the mitogen activated protein kinase pathways.

THE EFFECTS OF SEROTONIN ADMINISTRATION ON THE WORKING MEMORY OF ZEBRAFISH. *Kelli Boone* and Lori L McGrew, Belmont University, Nashville, Tennessee.* Previous zebrafish studies have focused on working memory and learning utilizing a variety of substances. However, little research has been noted with an emphasis on serotonin. Understanding the effects of treatment conditions using serotonin can shed light on certain neurobehavioral changes. The purpose of this study was to analyze how working memory was affected using varying levels of serotonin. Subjects consisted of 100 *Danio rerio*, half male and half female. In this study, two different concentrations of serotonin, a high dosage and low dosage, were administered and changes in short term memory were observed using a T-maze. There was significance between the control fish and the

low level serotonin group with respect to time and choosing the correct side. No gender differences were observed.

CHEMISTRY

FT-IR STUDY OF POLYSACCHARIDE STABILIZED NANOPARTICLES. *Damitea Johnson* and Koen Vercruyse, Tennessee State University, Nashville, Tennessee.* Various types of nanoparticles (CdS, Cu(OH)₂, FePO₄) were synthesized in the presence of different polysaccharides. The polysaccharide itself and any polysaccharide/NP preparations were centrifuged and the supernatants containing the stabilized nanoparticles were dialyzed to remove excess salts and lyophilized. The lyophilized materials were analyzed using FT-IR spectroscopy in an attempt to identify the functional groups present on the polysaccharides that may be involved in the stabilization of the NPs.

SYNTHESIS AND CHARACTERIZATION OF ACRIDONE DERIVATIVES AS POTENTIAL BIOLOGICALLY ACTIVE COMPOUNDS. *Deanna Bogan*, Otome Okoromoha*, and Cosmas Okoro, Tennessee State University, Nashville, Tennessee.* Acridone and acridone based compounds have been known for decades to exhibit a wide range of biological activities, including antibacterial, antimalarial, and antitumor activities. The anticancer activity has been proven to be related to intercalation of DNA and inhibition of type II topoisomerase. The synthesis and biological activity of a fluorinated acridone using 5-trifluoromethyl-1, 3-cyclohexanedione as a building block, was previously reported by our research group. The cytotoxic activity of the compound studied in several cancer cells exhibited significant anticancer activity. The activity of the fluorinated acridone showed GI50 that ranged in values from 0.13 to 26 μ M, covering a wide range of cancer cell lines. Our research involves the synthesis and testing of related non-fluorinated acridones with the aim of comparing their anticancer activities with the active trifluoromethylated lead compound. This study, when completed will provide insight to the role of the trifluoromethyl group in anticancer and other activities. The synthesis and characterization of the above compounds will be presented.

PD-CATALYZED MICROWAVE IRRADIATED CROSS-COUPLING REACTIONS FOR CHALCONE SYNTHESIS. *Eunice Ng* and Mohammad Al-Masum, Tennessee State University, Nashville, Tennessee.* Potassium organotrifluoroborates are new organometallic reagents in organic synthesis. The oxidation of the carbon-boron bond is a key step. In current literature, the coupling reaction of potassium arylvinyltrifluoroborate and benzoyl halides in the presence of a transition metal catalyst is yet to be facilitated. Previous research has shown that palladium catalyzed carbonylation reactions can be carried out in a two-step procedure. The palladium catalyzed cross-coupling reaction of potassium arylvinyltrifluoroborates and benzoyl halides was investigated and it was found that the CO moiety could be successfully introduced in a single step. The cross-coupling products generated are chalcones, which have been known to possess anti-inflammatory and anti-cancer properties.

SYNTHESIS AND ANTIOXIDANT ACTIVITY OF 3-(TRIFLUOROMETHYL)-3,4-DIHYDROACRIDIN-1(2H)-ONE. *Jarvis J. Callicutt*, William Y. Boudi, and Cosmas O. Okoro,*

Tennessee State University, Nashville, Tennessee. Fluorinated acridone compounds are of interest because of their lipophilicity, electron-withdrawing character, and metabolic stability. The synthesis of fluorinated acridone derivatives has a promising future for potential anti-cancer and other applications. This project will involve the synthesis of fluorinated acridone derivatives and the testing of their antioxidant activities. Oxygen radicals play important roles in initiation, promotion, and progression of carcinogenesis. Our ultimate goal is to evaluate fluorinated acridones with regards to oxidation and to test their antioxidative properties. We hope to effectively develop a compound that can reduce the amount of oxidation as well as mutagenic burden of cells. Our results so far have shown that 3-(trifluoromethyl)-3,4-dihydroacridin-1(2H)-one can reduce the formation of lipid peroxides in methyl-linolenate in a time- and dose-dependent manner. Further research needs to be conducted to investigate the effectiveness and the potential use of acridone and its derivatives as antioxidative agents.

STRUCTURAL DETERMINATION OF 1,N²-ETHENO-2'-DEOXYGUANOSINE ADDUCT OPPOSITE DEOXYCYTIDINE IN THE CXG SEQUENCE CONTEXT IN DUPLEX DNA AT PH 8.6. *Jayda L. Erkal*, Ganesh Shanmugam, Ivan Kozekov, F. Peter Guengerich, Carmelo J. Rizzo, and Michael P. Stone, Vanderbilt University, Nashville, Tennessee.* The purpose of this project was to determine the structure of the 12-mer oligonucleotide 5'-d(CGCACXGAATCC)-3'•5'-d(GGATTC-GTGGC)-3' where X= 1,N²-etheno-2'-deoxyguanosine (1,N²-edG). This was accomplished using high resolution NMR spectroscopy (NOESY and COSY) to obtain proton-proton distances, which were then used in molecular dynamics calculations to derive a structure for the duplex. Results suggested that the adduct induces a local perturbation at the lesion site and that it adopts the anti conformation about the glycosyl bond, which is consistent with the NOESY data. Further, the observed cross strand NOEs between the etheno protons of 1,N²-edG and opposite C¹⁸ and C¹⁹ confirmed the anti conformation of the 1,N²-edG adduct. A total of 395 NOE distance restraints were used, 232 intra- and 163 inter-nucleotide distances. The emergent rMD structure showed that 1,N²-edG adduct adopts the anti conformation about the glycosyl bond, and the opposite cytosine is displaced.

THE DETERMINATION OF THE ANTIOXIDANT CAPACITY IN HERBAL TEAS USING THREE METHODS. *Robin M. Crowell*, Autumn Marshall, and Kent Clinger, Lipscomb University, Nashville, Tennessee.* There are many methods to determine the antioxidant capacity in herbal teas and the purpose of this research is to distinguish between three of the methods: the CUPRAC method, the FRAP method, and the Folin-Ciocalteu method. Antioxidant capacity refers to the reactivity the antioxidant has against unique oxidizing standards. Three herbal teas, red raspberry leaf tea, eleuthero root tea, and chamomile tea, were analyzed and the antioxidant capacities were determined. Antioxidant capacity was determined using spectrophotometric analysis and the absorbance plotted against the tea concentration. The slope of each plot gives the antioxidant capacity of the sample. Each method yielded the following order of increasing antioxidant capacity: eleuthero root tea, chamomile tea, and red raspberry leaf tea. It is concluded that red raspberry leaf tea has a higher antioxidant capacity than

the other teas tested and that each method used, despite different procedures, was similar in the results it produced.

ECOLOGY

ASSESSING INTERACTIVE RESPONSES IN LITTER DECOMPOSITION IN MIXED SPECIES OF SUGAR MAPLE AND SCARLET OAK. *Sara Jabeen**, *Diana Kiser*, and *Dafeng Hui*, *Tennessee State University, Nashville, Tennessee*. Litter decomposition plays a significant role in carbon and nutrient cycling in terrestrial ecosystems. As the litter decomposes, it releases CO₂ into the atmosphere and makes available nutrients such as nitrogen for plant uptake. Much of the knowledge about litter decomposition is derived from studies involving only individual species. However, data from recent studies have suggested that the rate of litter decomposition varies with mixed species, a condition that is present in the natural environment. We conducted field and laboratory experiments with individual and mixed species of maple and poplar to detect and analyze the different rates of litter decomposition. Our results showed litter of all species followed exponential decay functions and poplar litter decomposed faster than maple. Additive responses of maple and poplar were detected in the mixed species. Litter decomposed faster in the incubator than in the field condition. The mechanisms of these responses will be further investigated.

THE SPECIFICITY OF THE ANTI-PREDATION RESPONSE OF *AMBYSTOMA BARBOURI*. *Sara Bentley* and *John Niedzwiecki*, *Belmont University, Nashville, Tennessee*. The evolutionary trade-off of safety versus development selects for the animals that can adequately split time between avoiding predators and foraging for food. Previous research has shown that chemicals produced by the salamander's main predator, the green sunfish, *Lepomis cyanellus*, elicit a very strong anti-predation response in the streamside salamander, *Ambystoma barbouri*. However, the specificity of this response beyond the streamside salamander's main predator, is unknown. This research compared the anti-predation responses of *A. barbouri* to the green sunfish and several other fish species to test if the phylogenetic relationship of these fish to the green sunfish affected the response level. Response mechanisms include maintaining a low height in the water, spending less time moving, and spending more time in shelter. This experiment compared these three response mechanisms (height in water, movement, and refuge use) among six different water treatments: control, salamander metabolites, minnow, green sunfish, black crappie, and white crappie. The strength of the responses among the Centrarchidae family, minnows, and controls decreased respectively, but no significant differences were found within the Centrarchidae family. Therefore, some evidence for the specificity of the *A. barbouri* anti-predator response has been provided by these results. The anti-predation response was specific at least to the degree of predatory fish in the family Centrarchidae. Since some previous research suggested specificity within Centrarchidae, future research could examine this in more detail. It would be interesting to further test centrarchid anti-predation response specificity, or to test an unrelated predatory fish.

ESTABLISHING CRITERIA TO CHARACTERIZE THE HABITAT OF *TRIATOMA SANGUISUGA* IN SYLVATIC AREAS

OF MIDDLE TENNESSEE. *Ryan S. Alexander** and *C. Steven Murphree*, *Belmont University, Nashville, Tennessee*. Chagas disease is a tropical disease caused by the hemoflagellate *Trypanosoma cruzi* in countries of Central and South America where it is transmitted by conenose bug species. Chagas disease is an emerging infectious disease in North America where it is vectored by the conenose bug *Triatoma sanguisuga*. Research regarding the preferred habitat of *T. sanguisuga* will allow further studies on its prevalence, distribution, and infection rate with *T. cruzi* in middle Tennessee. We propose that the habitat of *Triatoma sanguisuga* can be defined by a set of criteria involving tree and tree hole characteristics. Two test sites were chosen based on preliminary research performed from March to April 2009. A standardized plot and sample size were designated and trees sampled and measured for eleven characteristics. Results showed eight criteria that define a *T. sanguisuga* habitat as well as a potential preference for *Celtis occidentalis*, the common hackberry tree.

USING SATELLITE REMOTE SENSING PRODUCTS TO MONITOR CORAL BLEACHING. *Wilsharo Scott** and *Gang Liu*. Often referred to as the rainforests of the ocean, coral reefs are among the most diverse and beautiful of all marine ecosystems. They are home to millions of marine species. They are also of great importance to humans, providing the major food source to many coastal communities, protecting coastal areas from erosion, generating tourism income, and providing medicinal benefits, among other services. However, coral reefs face many major global threats, including climate change, pollution, and over-fishing, and have been degrading rapidly during the past few decades. Mass coral bleaching and mortality, caused by anomalously high water temperatures associated with climate change, have increased in both frequency and intensity. To monitor the coral reef environment, to improve understanding of coral bleaching, and to provide timely and accurate information and effective tools to aid coral reef management decisions, NOAA's Coral Reef Watch (CRW) has developed products that monitor coral reefs on a global scale using satellite remote sensing data. The satellite products track areas where mass coral bleaching may occur, providing valuable information to coral reef managers and allowing them to act in a timely matter. Various new products are under development at CRW to improve the monitoring and prediction of coral reef environments. The task of my project includes building a database of high-quality *in situ* water temperature observations at or near coral reefs and statistically analyzing the relationship between the *in situ* data and CRW satellite data. The purpose of my project is to validate the satellite measurements, to provide information on the accuracy and efficiency of the CRW products, and to assist in the development of improved monitoring products. This work will eventually help to improve the information available for coral reef scientists and managers.

POTENTIAL SITES FOR WIND POWER. *Robert Baert* and *Peter Li*, *Tennessee Technological University, Cookeville, Tennessee*. The purpose of this project is to further the current research on wind energy and to find more possible site locations for wind turbines/wind farms within Tennessee. A 50-m wind map was used along with elevation models and other various shape files to determine the potential for installing a utility scale wind farm or a personal wind turbine within Putnam and White counties. Using ArcMap software, I was able to find the most suitable sites

within these two counties to produce electricity through the use of the wind.

PHYSICS, MATH, COMPUTER SCIENCE

PARTICLE IDENTIFICATION USING AN ISOPROPYL ALCOHOL BASED CLOUD CHAMBER. *Drew Kerr**, *Mason Yost**, and *B. Alex King III*, *Austin Peay State University, Clarksville, Tennessee*. Many of the problems with doing research in particle physics stem from the scale of the events which physicists try to model. To combat these problems, physicists invented the cloud chamber to observe trajectories of particles passing through a magnetic field. A constant magnetic field applies a centripetal force to the particle, which causes a curved path. By measuring the radius of this curve and the average speed of the particle, we are able to determine certain characteristics about the particle, allowing us to identify it. The ability to identify these particles is important when differentiating types of interactions and their results. Without the ability to differentiate between these interactions it would be impossible to construct accurate models of these subatomic events.

ON SOME GEOMETRICAL ASPECTS OF THE FINITE ELEMENT METHOD. *Robert D. French**, *Casey L. McKnight**, and *Amber O'Connell**, *Austin Peay State University, Clarksville, Tennessee*. The Finite Element Method is a technique for the numerical solution of partial differential equations. A continuous solution to the governing PDE modeling a physical system can be approximated by discretizing the domain into a set of finite geometrical elements which will be: intervals (1-dimensional), triangles (2-dimensional), or polyhedra (N-dimensional). We then approximate the value of the solution at the nodal points. In this talk, we introduce the finite element method and discuss some geometrical aspects that are pertinent to the approximation. Examples in one-dimension are also presented.

SURFACE PLASMON RESONANCE. *Sarah-Ann M. Claiborne** and *Stephen J. Robinson*, *Belmont University, Nashville, Tennessee*. Surface plasmon resonance is a subject of great interest among chemists, biologists, physicists, and materials scientists. The study of surface plasmons could be useful in the areas of optics, magneto-optic data storage, microscopy, solar cells, and the production of sensors for detecting biologically interesting molecules. Surface plasmons are electron oscillations that propagate along the surface of a conductor because of their interaction with incident light. The electrons will oscillate in resonance with the light waves. This resonance is called surface plasmon resonance. Light incident on the conductor that is of similar wavelength to the resonance will be more likely to absorb. A software program, MQMie, can find the wavelength at which a material implanted with some sort of conductor will absorb most strongly. Understanding how this wavelength changes with respect to the material is the goal of the research.

USING WORKFLOWS TO INTEGRATE WEATHER DATA SERVERS INTO A WEBSERVICE. *Alok Hota**, *Fabian Okeke**, *Lei Qian*, *Yaohang Li*, and *Albert Esterline*, *Fisk University, Nashville, Tennessee (AH, FO, LQ)*, and *North Carolina A&T State University, Greensboro, North Carolina (YL, AE)*. Identical weather stations were planted at both Fisk University and North

Carolina A&T State University (NCAT). The stations are capable of transmitting data every minute to a receiver, which in turn would store the data at five-minute intervals to a database at each university. A server and a simple client interface were then constructed for both databases, allowing anyone to access the data contained within. These servers were built as SOAP servers, including a WSDL file that contained the structure necessary for data communication between client and server. The ultimate goal of the project was to integrate both of these servers using a workflow. Though typically used for business applications, workflows provide an extremely simple and straightforward method for directing data from the databases at Fisk and NCAT to the client. The code is still being modified so as to be compatible with Kepler, and the project is still a work in progress.

DOMAIN DECOMPOSITION METHODS FOR SOLVING ELLIPTIC EQUATIONS. *Zachary D. Hodge**, *Jesse Hotchkin**, and *John P. Salter**, *Austin Peay State University, Clarksville, Tennessee*. We present the finite element technique for solving elliptic problems. In particular the method of domain decomposition (triangulation) into elements is presented. This reduces the problem into a system of linear equations, whose solution is easier than the original partial differential equation. Examples with error estimates are presented.

WESTERN REGION

CHRISTIAN BROTHERS UNIVERSITY
MEMPHIS, TENNESSEE
10 APRIL 2010

ORAL PRESENTATIONS

SESSION ONE ENGINEERING

DR. JOHN VENTURA, MODERATOR

WIRELESS CHARGING STATION FOR LOW-POWERED ELECTRONIC DEVICES. *Binh Nguyen** and *Russel Saliendra**, *Christian Brothers University, Memphis, Tennessee*. The purpose of this project is the design and implementation of a Wireless Charging Station (WCS) for low-powered electronic devices. The project focuses on the charging of mobile phones, hand held media players, remote controls and sensors, and other commercial and industrial low-powered portable electronic devices. The WCS can aid the world's energy crisis by preserving energy and being environmentally friendly. This project has the potential to decrease daily energy requirements while delaying the depletion of global energy sources. The WCS successfully charged two mobile phones simultaneously, a Sony Ericsson T610i and a Samsung E700, using one charging station. This result demonstrated that multiple devices can be charged using wireless technology using one charging device and at the same time, it provides convenience to consumers.

RAIN CATCH/IRRIGATION SYSTEM. *Ryan J. Nicolini**, *Christian Brothers University, Memphis, Tennessee*. The main purpose of the system is to provide water to the community

garden at Christian Brothers University. The system is controlled by a PLC, valves, and pump. A PLC is a programmable logic controller that is essentially a rugged and simple computer. The system can run independently and has a built in timer to water the garden multiple times each week. There is a rain/freeze sensor to prevent overwatering of the garden and to protect the system and plants from freezing water. There is a barrel to collect rainwater from a nearby roof and a pump to send the water to the garden. Rainwater has more nitrogen and fewer chemicals than tap water, which results in better plant growth. The system is effective in watering the garden and it will allow students and faculty gardeners to focus on class work and not have to check on the garden everyday.

BLIND SPOT AND REAR END DETECTION SYSTEM FOR VEHICLES. *Patrick Louie**, *Christian Brothers University, Memphis, Tennessee.* The purpose of this project is the design and implementation of a blind spot detection system for motor vehicles. It is the design and implementation of a detection system that is dependent on the blinker system of a vehicle and a rear end detection system that is independent of a vehicle's braking system. The blind spot detection system assists drivers when changing lanes and the rear end detection system allows drivers to be aware of obstructions and drivers behind their vehicles. In addition, the rear end detection system also controls a display to warn tailing drivers when they are too close to the car in front of them. The project resulted in the construction of a blind spot and rear end detection system that is accurate, precise, and cost effective. This practical system provides drivers a system that will enable them to detect otherwise undetectable vehicles or obstructions and reduce the number of accidents.

GPS TRACKING DEVICE FOR AIR CONDITIONER COILS. *Fredrick D. Durham**, *Christian Brothers University, Memphis, Tennessee.* The purpose of this project was to design and implement a device that will allow a person to track the coils of an air conditioner in the event of theft. The device must be small, reliable, and easy to operate and maintain. A Telit GM862 GPS Module was implemented that uses GPS technology to track air conditioner coils. A GSM Network was employed to obtain tracking information on the longitude and latitude of coils from the Telit GM862 GPS Module. The coordinates of the coils can then be uploaded to Google Maps to provide the location of coils.

MULTI CHANNEL BATTERY CHARGER. *Osborn F. de Lima**, *Christian Brothers University, Memphis, Tennessee.* An Emergency Light is a device that turns on during any power failure. It consists of a battery that provides power to the lamp during a power outage and charges during regular AC power. Today, according to building code emergency lighting units are required in all buildings in the form exit signs or stairwell lighting. Philips Emergency Lighting located in Collierville, Tennessee, is a leading innovator and provider of emergency lights. Since batteries are an integral part of an emergency light, they need to be charged before being shipped off to the customer to at least half of its capacity. This project deals with the design and implementation of a safe, cost effective and efficient Nickel Cadmium Battery Charger. The charger was built successfully with the design topology selected and charged different types of batteries based on the charging specifications.

USE OF GREEN ENERGY IN AUTONOMOUS VEHICLES. *Harshit R. Shroff**, *Anthony Bownes**, *and James Brown**, *Christian Brothers University, Memphis, Tennessee.* The purpose of this project is to design and develop an autonomous a solar-powered robot to compete in the IEEE SoutheastCon 2010 Hardware Competition. The robot navigates obstacles such as two gates of different sizes, a ramp, and must travel on a ten-foot-by-ten-foot track. The only source of power is four high-intensity lamps locate on the track at regular intervals. Points are allotted for obstacles and laps completed in each run. The robot utilizes a design that includes high-quality photovoltaic cells, a two motor system, infrared proximity and photo-resistive sensors, a capacitor bank, and a microcontroller to manage all systems. The robot is capable of tracing an inner wall to pass through the two gates and complete a lap.

OFFLINE WINDOWS REGISTRY EDITOR AND AUTORUNS DISABLER. *Michael A. Yarbrough**, *Christian Brothers University, Memphis, Tennessee.* The purpose of this project is to create a new method for disabling the programs that run automatically when a Microsoft Windows computer boots up. While there are a number of programs already that will disable autoruns while the computer is running, this one can turn off unwanted entries before the computer is booted. This allows the client to disable unwanted programs without the chance of them re-enabling themselves. The project is fundamentally an offline registry editor because the platform needs to be able to edit the Windows Registry without using the advanced programming interface (API) that comes with the operating system. The program is successful in automatically backing up and modifying the registry hives, and recognizing and disabling a number of autorun entries.

CHRISTIAN BROTHERS UNIVERSITY'S IPHONE APPLICATION. *Grey M. Dziuba**, *Christian Brothers University, Memphis, Tennessee.* The purpose of this project is to design an application that allows the user the ability to obtain pertinent information from a mobile device, the iPhone. The application includes four main features: (1) a map that pinpoints the exact location of the user while on the Christian Brothers University campus; (2) a list of office locations of all Christian Brothers University professors with the ability to call or email each professor from the mobile device; (3) a link to the Christian Brothers University Connection, a bulletin of student activities; and (4) a link to the Christian Brothers University's Lifeline, a weekly publication of the Christian Brothers University's career center. These features are included in one simple application that improves the efficiency of communication in the Christian Brothers University's community while using engineering techniques and principles.

AUTOMATED HOME SECURITY USING RFID TECHNOLOGY. *Keith Lynn Wyrick** *and Jacky Wong**, *Christian Brothers University, Memphis, Tennessee.* The purpose of the project is to design and implement a RFID security lock. The objective is to open electronically a deadbolt with the use of an RFID reader in conjunction with an RFID tag. The results are a working prototype that uses a microprocessor to validate RFID tags. The prototype has been equipped with a unique function of adding and removing additional valid RFID tags for practical use. In conclusion, RFID home security is a very costly and effective

security tool that if implemented into the home could provide the user with extra safety and allow for a hassle free security system.

SESSION TWO ANIMAL BEHAVIOR

DR. ANNA ROSS, MODERATOR

IDENTIFYING AND EVALUATING SOCIAL, DOMINANT, AND AGGRESSIVE BEHAVIORS AMONG THREE BOTTLENOSE DOLPHINS IN KEY LARGO, FLORIDA. *Kristi A. Prevost* and Holli Byerly, Christian Brothers University, Memphis, Tennessee, and Dolphin Cove, Key Largo, Florida.* Contributing factors such as health, reproductive state, genetics, climate, housing enclosures, and social dynamics appear to affect dolphin behavior and social alliances. Three male bottlenose dolphins (*Tursiops truncatus*), one juvenile and two adults, were observed multiple times daily. Data were collected post training sessions using a behavioral ethogram to monitor and categorize behavioral observations, including social and aggressive behaviors. The results demonstrated that the highest number of aggressive behaviors were from the believed to be subordinate male, Kimbit, perpetrated towards Leo, the youngest and least dominate male of the pod. Social variations of pairings during training sessions altered the amount of aggressive behaviors after the training sessions, as well as revealed different social alliances between the two adult males. With this knowledge, the animal care staff of Dolphin Cove may be able to curb aggressive acts between non-pair bonded and submissive animals with different social pairings during training sessions.

STOP AND SMELL THE ROSES: HOW OLFACTORY ENRICHMENT AFFECTS THE BEHAVIOR OF CAPTIVE JAGUARS (*PANTHERA ONCA*) AT THE MEMPHIS ZOO. *Stephanie N. Cassel*, Allison W. Graham*, Andrew Kouba, Morgan Powers, and Sarah A. Boyle, Rhodes College, Memphis, Tennessee, and The Memphis Zoo, Memphis, Tennessee.* Jaguars (*Panthera onca*) require enrichment to promote active behavior in order to maintain fitness while in captivity. The purpose of our study was to evaluate changes in behavioral and spatial activity with the introduction of novel scents for two captive female jaguars displayed at the Memphis Zoo in the fall of 2009, as well as to evaluate the effect of enrichment upon a single female jaguar in the spring of 2010. The jaguars spent more time sleeping and resting during control periods, using only a few areas within their exhibit. During enrichment periods, sleeping and resting behavior frequency decreased. The jaguars used more areas of their enclosure when enrichment items were present. Scents such as perfumes and deodorants received the greatest frequency and duration of enrichment behavior. Behavior of a single jaguar was affected similarly by olfactory enrichment. In conclusion, olfactory enrichment promotes positive active behavior in captive jaguars.

ADVANTAGES AND DISADVANTAGES TO TWO NON-INVASIVE RESEARCH METHODS FOR THE STUDY OF WILD JAGUAR POPULATIONS. *Caroline Mitchell*, Rachel Dutkosky*, Leandro Silveira, and Rahel Solomann, Christian Brothers University, Memphis, Tennessee, University of Tennessee at Knoxville, Knoxville, Tennessee, and Instituto Onça-Pintada-*

Jaguar Conservation Fund, Mineiros, Brasil. Scat detection and camera trapping are two valuable non-invasive research methods used in studying wild jaguar populations. Scat detection is useful for gaining genetic, distribution, hormonal, and dietary data on the species. Additionally, camera trapping can be used to obtain information on the distribution and abundance of a population in a set area. Both methods have marked advantages and disadvantages that must be taken into consideration; however, both are valuable research methods that should continue to be utilized in future research.

ROLE OF THE ALPHA-1-ADRENERGIC RECEPTORS ON THE RECONSOLIDATION OF OLFACTORY FEAR CONDITIONING. *Ting Wong, Fabricio HM Do-Monte, and Antonio P. Carobrez, Christian Brothers University, Memphis, Tennessee (TW), and Universidade Federal de Santa Catarina, Florianópolis, SC, Brasil (FD-M, AC).* After a short retrieval session (reactivation session), previous stabilized memories can become labile and subjective to pharmacological interference in a phenomenon called reconsolidation. Since the noradrenergic system has been widely involved in the long-lasting feature of the aversive memory formation, this study investigated the involvement of the alpha-1-adrenergic receptors during the reconsolidation phase. The olfactory fear-conditioning (OFC) paradigm was used since olfaction is a dominant sense in rats. Male Long-Evans hooded rats (12–16 weeks; $n = 27$) were systemically administered with saline or the alpha-1-blocker prazosin (0.5 and 1.5 mg/kg) immediately after the reactivation session. Results showed that both prazosin treated-groups demonstrated a significant ($P < 0.05$) reduction in the defensive behavior when tested one week later in a different behavioral chamber (ANOVA followed by Newman Keuls). This finding reinforces the described lability of fear memories after retrieval, suggesting an involvement of the alpha-1-adrenergic receptors during the reconsolidation of OFC.

EFFECTS OF DOPAMINE INHIBITION ON FLUID LICKING BEHAVIOR OF *UBE3A* DEFICIENT MICE. *Cameron Kasmai* and Detlef Heck, Christian Brothers University, Memphis, Tennessee, and University of Tennessee Health Science Center, Memphis, Tennessee.* Angelman Syndrome (AS) is a genetically-linked neurological disorder caused by a mutation or maternal deficiency of the *Ube3a* gene. Yet unpublished findings indicate elevated dopamine levels in *Ube3a* deficient mice. This experiment was to test if treatment with a dopamine antagonist would rescue a fluid licking phenotype previously found in *Ube3a* deficient mice. Mouse licking behavior was observed in the home cage with the use of a special lickometer. Randomly chosen mice were treated with the dopamine antagonist Risperdal. The results of this experiment were highly variable, possibly due to the method of drug delivery. Drug application was through intraperitoneal injection. Other routes, such as subcutaneous nanopumps, might be more effective. At this point, without additional experiments, no definitive conclusions can be made from these data about the action of Risperdal on fluid licking behavior in a mouse model of AS.

ATLANTOOCIPITAL DISSOCIATION: A UNIFORMLY FATAL INJURY? *Wallace C. Lock*, Louis J. Magnotti, and Martin A. Croce, Christian Brothers University, Memphis, Tennessee (WL), and University of Tennessee Health Science Center, Memphis, Tennessee (LM, MC).* The purpose of this

study was to evaluate the effect of rapid diagnosis and treatment (stabilization) of traumatic AOD. The objective of this study was to affirm or dispel the hypothesis that AOD is uniformly fatal in adults. This study resulted in the discovery of 21 AOD patients, 0.05% of all trauma admissions over the study period. The study population included 15 men and 6 women who were evaluated for markers of injury including admission GCS, ISS, and head AIS and Mean BE. Overall mortality was 29% with deaths caused by severe traumatic brain injury, sepsis, and multiple organ failure. The remaining 71% patients were surgically stabilized. All patients undergoing stabilization survived. In conclusion, traumatic AOD remains a relatively rare injury. Prompt diagnosis is crucial in promoting rapid stabilization and contributing to increasing survivability. Traumatic AOD should no longer be considered a uniformly fatal injury in adults.

SESSION THREE MOLECULAR AND CELLULAR BIOLOGY

DR. MARY OGILVIE, MODERATOR

IN VITRO MACROPHAGE RESPONSE TO TITANIUM PARTICLES. *Brooke Allen* and Richard Smith, Christian Brothers University, Memphis, Tennessee, and University of Tennessee Health Science Center, Memphis, Tennessee.* In total joint arthroplasty, the prosthesis becomes loosened due to endotoxins that reside on the wear particles from the titanium implant and the polyurethane cap. This results in the loss of the implant and osteolysis around the acetabular cup, which prevents a positive outcome after performing a second hip replacement. Due to the concern involving the cleanliness of the particles and the amount of particles, it was of interest to clean and dirty the particles at various degrees. Then, it was of importance to measure the amount of tumor necrosis factor alpha (TNF- α) that was released in correlation to the cleanliness of the particles and ratio of particles. After observing the results, it was found that endotoxin levels created high concentration levels of TNF- α and were notably greater in the dirty, LPS (lipopolysaccharide) bound particles than in relation to the clean and partially cleaned particles. Overall, it can be concluded that the dirty particles and the larger amounts of particles caused the release of the cytokine TNF- α , which causes osteolysis.

INFLUENCE OF ACE-1, ACE-2 AND ACE-3 GENES ON SOIL NEMATODES. *William A. Simco* and Lynda R. Miller, Memphis University School, Memphis, Tennessee, and Christian Brothers University, Memphis, Tennessee.* The ACE-1, ACE-2 and ACE-3 genes code for acetylcholinesterase which affects the neuromuscular junction of *C. elegans*. The role of these three genes on development and activity in the worms was investigated. RNA interference (RNAi) was used to inhibit gene expression in F₁ individuals to determine the phenotypic effect on the animal. Gene function was examined individually by inhibiting single genes as well as inhibiting multiple ACE gene combinations simultaneously. Single gene inhibition resulted in a phenotype undifferentiated from the wild-type. Multiple gene inhibition affected hatching success and muscular function.

DERMACENTOR VARIABILIS: THE EFFECTS OF TICK SALIVA ON JNK AND P38 SIGNALING PATHWAYS IN

FIBROBLASTS. *Raelyn S. Pirtle*, Carolyn D. Kramer, Nina Poole-Mitchell, Lewis B. Coons, and Judith Cole, Christian Brothers University, Memphis, Tennessee (RP), and University of Memphis, Memphis, Tennessee (CK, NP-M, LC, JC).* We examined the effects of saliva from partially fed *Dermacentor variabilis* females on MAPK signaling pathways and eighty-four different genes associated with these pathways in murine NIH-3T3 fibroblasts. The Jun N-terminus kinase (JNK) and p38 pathways were studied. Enzyme linked immunosorbent assays (ELISAs) showed that activity of the epidermal growth factor (EGF)-stimulated JNK signaling pathway in the fibroblasts was not significantly decreased. However, the saliva did slightly increase the fibroblasts' EGF-stimulated p38 activity. Polymerase chain reaction (PCR) arrays showed that the tick saliva suppresses several sets of genes associated with many important cell processes in fibroblasts. These data support the hypothesis that saliva from *Dermacentor variabilis* affects the host's wound healing abilities.

COMPARING THE AMPLIFICATION OF WHITE SPOT SYNDROME VIRUS GENES WITH DIFFERENT PRIMERS. *Caitlin Ashley*, Juliana R Moser, and Maria Risoleta Freire Marques, Christian Brothers University, Memphis, Tennessee (CA), and Universidade Federal de Santa Catarina, Florianopolis, Brasil (JM, MM).* This study aimed to test different primers and optimize the Polymerase Chain Reaction (PCR) for detection of White Spot Syndrome Virus (WSSV), a highly lethal disease in shrimp. Kits, labeled probes, PCR and nested PCR are used for detection of WSSV. DNA extraction from frozen shrimp pleopods showed degradation so previously extracted DNA samples from the laboratory (Fixed pleopods) were used. For optimization of PCR, the concentration of MgCl₂, Taq polymerase, and primers were altered to produce the best results (presence of the 500 or 800 bp band in WSSV positive samples without nonspecific bands). UV light exposure was used to visualize and photograph the results run on an agarose gel. PCR 500-4, with decreased concentrations of primers and Taq polymerase, produced the least amount of nonspecific bands for primer 500. The increased concentrations of MgCl₂ and Taq polymerase in PCR 800-3 produced the least amount of nonspecific bands for primer 800.

DOSE DEPENDENT REGULATION OF TRANSGENE EXPRESSION IN VIVO. *Jessica Hines*, Siddharth Desai, Kishore Kodali, and Tonia Rex, Christian Brothers University, Memphis, Tennessee (JH), and The University of Tennessee Health Science Center, Memphis, Tennessee (SD, KK, TR).* We hypothesized that gene expression levels can be controlled by the tetracycline (tet) inducible promoter *in vivo*. Enhanced green fluorescent protein (EGFP) was used as a quantifiable marker of gene expression. We packaged tet.eGFP into a recombinant adeno-associated viral vector (rAAV.tet.eGFP). The vector was delivered subretinally to mice that express the reverse tet transcriptional transactivators from the vitelliform macular dystrophy2 promoter to induce expression specifically in the retinal pigment epithelium. Mice were intraperitoneally injected with increasing doses of dox (0.1 mg/ml, 1 mg/ml, and 10 mg/ml) and fluorescence was quantified *in vivo* to generate a dose curve. Peak fluorescence was detected 6.5 h after dox injection. The fluorescence levels increased with increasing concentrations of dox. The dose curve showed that transgene expression was directly dependent on dox dosage. This is the first study to

demonstrate that the tet-inducible promoter can be used to control transgene expression levels *in vivo* in a dose-dependent manner.

CYSTIC FIBROSIS: DEFINING A NOVEL AND RARE REGULATION MUTANT S549N-CFTR. *Fatima Anmol Khan**, *Anthony Rudine, Aixia Ren, Sunitha Yarlagadda, Dennis C. Stokes, and Anjaparavanda P. Naren, Christian Brothers University, Memphis, Tennessee (FK), The University of Tennessee Health Science Center, Cystic Fibrosis Care and Research Center at Le Bonheur Children's Medical Center (AR, AR, SY, DS, AN).* A Hispanic infant diagnosed with cystic fibrosis required multiple hospitalizations. Genotyping revealed F508 and S549N mutations and when paired, they cause classic CF with elevated sweat chloride measurements, pancreatic insufficiency, obstructive pulmonary disease, and mucoid *Pseudomonas aeruginosa*. Point mutation was generated using eukaryotic expression vector and was expressed in Human Embryonic Kidney cells (HEK-293). At the plasma membrane, S549N-CFTR appeared as a mature protein but lacked function. Does S549N-CFTR behaved similar to the regulation mutant G551D-CFTR? Previous studies illustrated that G551D-CFTR has little or no function but can be augmented with the addition of potentiator (P1). Similarly, VX770 is a G551D potentiator and is used in treating CF-patients with G551D-CFTR mutation. Results have shown increased CFTR functions, thus showing significant improvement in lung function and sweat chloride values. S549N-CFTR has little or no function but can be augmented to WT-CFTR functional levels in the presence of the CF-potentiator P1.

POLYCYSTIC KIDNEY DISEASE-1 PROTEIN EXPRESSION IN MURINE COCHLEA USING EGFP REPORTER. *Terence Netzel**, *Katherine Steigleman, and Jian Zuo, Christian Brothers University, Memphis, Tennessee (TN), and Saint Jude Children's Research Hospital, Memphis, Tennessee (KS, JZ).* The Polycystic Kidney Disease-1 (Pkd1) protein plays an integral role in the structure of hair cells' stereocilia in the cochlea (KA Steigleman, unpublished). To better understand how the lack of Pkd1 is producing this phenotype, we sought to examine the cell type specificity of Pkd1 in the murine cochlea. Using a Pkd1-EGFP (enhanced green fluorescent protein) transgenic animal, we were able to determine specific cells types in the organ of Corti that express Pkd1. At adult ages, these mice exhibited normal auditory brainstem response (ABR) thresholds indicating the tag is not inhibiting normal Pkd1 cochlear function. Pkd1 was visualized by immunohistochemistry for the EGFP tag and was determined to be present in hair cells of the cochlea at adult ages. Additionally, we plan to examine both embryonic and different postnatal ages with respect to the EGFP staining pattern as well as in conjunction with cell specific cochlear markers.

DETERMINATION OF GENETIC LOCI IN BXD MOUSE MODEL GLAUCOMA. *Maegan Lytle**, *Allen Vantrease, and Monica Jablonski, Christian Brothers University, Memphis, Tennessee (ML), and University of Tennessee Health Science Center, Memphis, Tennessee (AV, MJ).* Although the anatomical relationship between iris atrophy/pigment dispersion and pigmentary glaucoma is well known, the genetic predecessors of this glaucoma have yet to be fully explored. It is thought that separate genes play a role in controlling the glaucomatous phenotype. Using DBA/2J mice, which develop age-related glaucoma due to mutations in *Tryp1* and *Gpnmb* genes, and

breeding them extensively with healthy C57BL/6J mice, we were able to generate multiple BXD strains that express the diseases along a wide spectrum. The mice were subjected to tests to measure intraocular pressure, corneal clouding, iris degeneration, as well as histological analysis of the optic nerves to determine damage to the microanatomy. Some results that have already been examined indicate that genes unrelated to *Tryp1* and *Gpnmb* serve to increase or decrease receptiveness to glaucoma. For example, BXD strains that have the most severe form of pigment dispersion syndrome do not exhibit optic nerve atrophy. Also there are strains that have normal *Tryp1* and *Gpnmb* genes, but an elevated IOP or vice-versa.

SESSION FOUR

CHEMISTRY AND BIOCHEMISTRY

DR. SANDRA THOMPSON-JAEGER, MODERATOR

ORBIFOLD EULER CHARACTERISTICS. *Ryan A. Carroll**, *Rhodes College, Memphis, Tennessee.* Imagine that you have a pineapple that weighs around 2 pounds, a watermelon that weighs around 30 pounds, and a scale with a capacity of 10 pounds. The scale finds the exact weight of the pineapple with no problem, but the greater weight of the watermelon complicates finding its true weight. One option is to break the watermelon apart into pieces that can be weighed on the scale and then added together. A similar predicament occurs while trying to find a number called the Euler characteristic for geometric objects known as orbifolds such as a sphere or doughnut with cusps and edges on their surface. In order to find useful information about these spaces we must break them into pieces and then sum their "weights". In this presentation, I will discuss a concept known as the Gamma-Euler-Satake characteristic, which uses this method and its application.

A NOVEL, NIRS BASED APPROACH TO CHYTRID (*BATRACHOCHYTRIUM DENDROBATIDIS*) DETECTION IN THE TOAD *ANAXYRUS FOWLERI*. *Daniel Eastlack**, *Jon Davis, Andrew Kouba, and Carrie Vance, Memphis Zoological Society, Memphis, Tennessee (DE, JD, AK, CV), Rhodes College, Memphis, Tennessee (DE, JD), and Mississippi State University, Starkville, Mississippi (CV).* Amphibian populations are declining globally due to, in part, the rapid spread of the pathogenic chytrid fungus, *Batrachochytrium dendrobatidis* (*Bd*). The goals of our study were to determine if *Bd* is present in Fowler's toad (*Anaxyrus fowleri*) populations around Memphis, Tennessee, and to use the toads as a model species to develop a novel, and rapid method of *Bd* screening based on Near Infrared Reflectance Spectroscopy (NIRS) both *in-situ* and *ex-situ*. We used Taqman quantitative PCR to confirm *Bd* infection at 7 of 11 study locations in 11 of 159 sampled individuals; however, populations are thriving at these sites without evidence of widespread mortality, perhaps indicating *Bd* resistance in *A. fowleri*. Our library size of *A. fowleri* *Bd*-positive NIRS spectra is very small ($n = 2$), yet these spectra are visibly discernable from *Bd*-negative spectra and may provide a NIRS-based diagnostic method for determination of *Bd*-status in *A. fowleri*.

EVALUATION OF NOVEL COMPOUNDS AS ANTINEOPLASTIC AGENTS AGAINST SOLID TUMORS. *Sania*

Sayani*, Ammaar Abidi, and Andrea Elberger. *Christian Brothers University, Memphis, Tennessee (SS), and The University of Tennessee Health Science Center, Memphis, Tennessee (AA, AE).* This study was performed to evaluate the effectiveness of eighteen novel drugs to inhibit the growth of, and/or kill, human tumor cells. Experiments were conducted on the following three established cell lines: U-87 (human glioblastoma multiforme), HCT-15 (human colon carcinoma), and DU-145 (human prostate cancer). All cells were treated with eleven serial dilutions of each drug investigated to obtain accurate EC₅₀ values (concentration at which 50% of the effects are observed). Results show that the most effective drugs on HCT-15 cells were SNG-II-198 and Δ^8 -THC; on U-87 cells were SNG-II-196 and SNG-II-224; and on DU-145 cells were SMM-I-97 and SNG-II-198. Some drugs were excluded from analysis due to insolubility under assay conditions. These experiments provided preliminary results to demonstrate new drugs that could potentially be used against these types of tumors.

CONTRIBUTION OF CYTOCHROME P450 (CYP) 3A4/3A5 GENETIC POLYMORPHISMS TO THE INTER-PATIENT VARIABILITY IN VANDETANIB PHARMOCOKINETICS IN PEDIATRIC DIFFUSE BRAINSTEM GLIOMAS. **Rachel Escue*, Clinton Stewart, Mike Tagen, Laura Miller, and Stacy Throm,** *Christian Brother's University, Memphis, Tennessee, and St. Jude's Children's Research Hospital, Memphis, Tennessee.* Diffuse brain stem gliomas account for a serious percentage of death in pediatric cancer patients. A new chemotherapy drug (vandetanib) is being tested that targets both VEGFR and EGFR expression and function, both of which are overactive in cancer. In this study, the role of single-nucleotide polymorphisms (snp) in affecting the metabolism of vandetanib was tested.

EFFECT OF HIGH-CHOLESTEROL DIET ON CHOLESTEROL LEVELS IN ARTERIAL SMOOTH MUSCLE. **Supriya Ponnappula*, Maria Asuncion-Chin, Anna N. Bukiya, and Alejandro M. Dopico,** *Christian Brothers University, Memphis, Tennessee (SP), and University of Tennessee Health Science Center, Memphis, Tennessee (MA-C, AB, AD).* High-cholesterol diet prevails in Western societies and may play a pathophysiological role in human diseases, including arteriosclerosis, coronary artery disease, stroke and systemic hypertension. High cholesterol-driven vascular pathology is usually linked to cholesterol (CHS) accumulation in endothelial cells. Whether high-cholesterol intake leads to abnormal cholesterol levels in the arterial smooth muscle itself, however, has not been systematically explored. In this work, Sprague-Dawley rats were fed with a hypercholesterolemic (2% CHS) or an isocaloric (control) diet for a total of 24 weeks. Starting at week 8 of dietary treatment, samples of de-endothelized aorta, cerebral, mesenteric and pulmonary arteries were obtained every 2 weeks for CHS determination. Remarkably, resistance-size cerebral and mesenteric arteries showed CHS accumulation \approx 10 weeks earlier than their elastic counterparts (aorta and pulmonary arteries). CHS early accumulation in resistance-size arteries may lead to significant impairment of vessel function and contribute to the pathophysiology of prevalent human diseases.

DERMACENTOR VARIABILIS: THE ALTERATION OF THE WOUND HEALING MECHANISM. **Xiong B. Lin*, Caroline Kramer, Nina M. Poole-Mitchell, Lewis B. Coons, and Judith A. Cole,** *Christian Brothers University, Memphis, Tennessee (XL),*

and The University of Memphis, Memphis, Tennessee (CK, NP-M, JC, LC). To successfully complete a blood meal, the American dog tick, *Dermacentor variabilis* must penetrate the host, establish a feeding lesion and evade the host's defense mechanisms such as wound healing. During wound healing, fibroblasts migrate, proliferate, deposit collagen, and secrete growth factors (chemoattractants) for other cells involved in injury repair. We have previously shown tick saliva inhibits repair of injured monolayers and fibroblast migration *in vitro*. Here we examine the saliva-induced effects on fibroblast genes involved in host wound healing response. We hypothesize tick saliva will down regulate expression of genes critical to wound healing. Our data from PCR arrays show a down-regulation of several integrin and matrix metalloproteinase genes as well as two collagen genes. In contrast, our data show a 4-fold up-regulation of the gene for collagen, type 1, alpha 1. We conclude, as observed in other systems, ticks balance pro and anti-inflammatory mechanisms to regulate wound healing.

POSTER PRESENTATIONS

CHEMISTRY AND ANIMAL BEHAVIOR

Bro. Edward Salgado, Moderator

ASSEMBLY OF COPPER AND PALLADIUM SUPRAMOLECULES USING TWO DIFFERENT BIFUNCTIONAL LIGANDS. **Elizabeth Calabretta*, Andrew W. Maverick, and Chandi Pariya,** *Christian Brothers University, Memphis, Tennessee (EC), and Louisiana State University, Baton Rouge, Louisiana (AM,CP).* The purpose of this research was to assemble new supramolecules by attaching pyridine and terpyridine ligand groups to copper and palladium. By attaching more complicated pyridine and terpyridine groups to the metal, information can be learned to create a cyclic metal complex with two bifunctional ligands. Previous work in the group has been done to create "molecular square" supramolecules using β -diketonates. My method was different from this work, because I attached two different ligands to the metal in order to make the supramolecule. It is believed that the target supramolecule was created based on elemental analysis; however, no crystals were produced and the structure of the molecule is still unknown.

BEHAVIORAL OBSERVATIONS OF WILD ORPHANED GRIZZLY BEARS IN A NEW CAPTIVE ENVIRONMENT. **Lauren E. Lieb*, Kelly Patton*, Andy Kouba, and Sarah A. Boyle,** *Rhodes College, Memphis, Tennessee (LL, KP, SB), and The Memphis Zoo, Memphis, Tennessee (AK).* We aimed to provide a better understanding of how wild grizzly bear cubs (*Ursus arctos*) adjust to a captive environment. Three bear cubs were orphaned in the wild in July 2009, and subsequently were brought into captivity. The cubs first entered their outdoor exhibit at the Memphis Zoo on September 28, 2009. We documented their initial response to the exhibit, and collected behavioral data for six months. The bears exhibited a range of behaviors, but the greatest proportion of time was spent resting, swimming, and digging. They used all areas of the exhibit, including a sand pit, den, stream, and pool. The cubs also interacted with the public through a glass viewing area, and used enrichment items. No agonistic behaviors were noted. We

conclude that the bears exhibited a range of behaviors and used multiple areas of their exhibit, but we suggest that behavioral monitoring continues as the cubs mature.

DEVELOPMENT OF NON-INVASIVE REPRODUCTIVE MONITORING TECHNIQUES FOR ENDANGERED SNOW LEOPARDS AND AMUR LEOPARDS. *Allison W. Graham**, *Andy J. Kouba*, and *Erin L. Willis*, *Rhodes College, Memphis, Tennessee (AG)*, and *The Memphis Zoo, Memphis, Tennessee (AK, EW)*. An understanding of the reproductive biology of critically endangered Snow and Amur leopards can aid in conservation efforts. We compared combinations of different fecal steroid hormone extraction procedures to determine which method extracted the greatest amount of steroid hormones and to examine whether antibodies for measuring fecal steroids in other felids were also suitable for leopards. The Methanol/Vortex 20 min extraction yielded a greater amount of estrogens compared to other extraction methods. For fecal androgens, a 6.8-fold increase in hormone concentration was found when samples were extracted with methanol compared to extraction with ethanol. Results indicated that a broad scale testosterone antibody and an estrogen metabolite (E1G) antibody can be used to measure fecal androgens and estrogens in snow leopards, and may be applicable to Amur leopards. Results from these studies will improve procedures to characterize the seasonal reproductive profiles of pubertal and adult female and male leopards.

IRON GLYCINE HYDROXO COMPLEXES IN AQUEOUS SOLUTIONS. *Jeremy Branch** and *Yahia Z. Hamada*, *LeMoyné-Owen College, Memphis, Tennessee*. Recently, we have studied a variety of low-molecular-mass ligands with many metal ions using various spectrophotometric and emf measurements [1–3]. Herein, we discovered the presence of two new Hydroxo-complexes for the iron(III)-Glycine system. The new iron-Glycine complexes are: $[\text{Fe}(\text{Gly})(\text{OH})_2]$ and $[\text{Fe}(\text{Gly})(\text{OH})_3]$.

Djurdjevic presented the presence of $\text{Fe}(\text{Gly})$, $\text{Fe}(\text{Gly})(\text{H})$, and the dimer $\text{Fe}_2(\text{Gly})_2(\text{OH})_2$ and their stability constants in a medium with $\mu = 0.5 \text{ M}$ [4-a]. Others, reported the stability constants for the bis- $[\text{Fe}(\text{Gly})_2]$ and the tris- $[\text{Fe}(\text{Gly})_3]$ complexes in $\mu = 0.6 \text{ M}$ using differential pulse cathodic voltammetry [4-b]. The same study presented cyclic voltammetry with one electron reversible behavior [4-b]. The crystal structure for a tri-nuclear iron-Glycine complex was also presented three decades ago [5]. We are reporting the stability constants for newly discovered hydroxo-complexes as well as their spectroscopic absorption spectra in aqueous solution at room temperature.

REACTION OF MALIC ACID WITH MOLYBDENUM(VI) IN AQUEOUS SOLUTIONS. *Alana Antoine** and *Yahia Z. Hamada*, *LeMoyné-Owen College, Memphis, Tennessee*. The chemistry of molybdenum encounters very complex pathways even when reacting with the simplest of ligands (the aqua ligand). Malic acid (Mal) is considered to be a simple ligand that has strong metal binding ability. A detailed literature survey of all American Chemical Society (ACS) Journals indicated lack of reports regarding the aqueous solution chemistry of the Mo^{6+} -Mal system. When the term molybdenum was used in the literature survey, a total of 1,211 hits were returned. When the term molybdenum and aqueous solutions were combined as search-terms, only 22 articles were found. It is obvious that from a thorough literature survey that this investigation on the Mo^{6+} and Mal system is merited. Using potentiometric and spectroscopic tools we are investigating the reaction of this hi-valent metal ion with Malic acid. We will present the potentiometric data collected thus far for this reaction system because this project is a work in progress.

*Student presenter.