

ABSTRACTS OF PAPERS PRESENTED AT THE 2007 COLLEGIATE MEETINGS

EASTERN REGION

SOUTHERN ADVENTIST UNIVERSITY
COLLEGEDALE, TENNESSEE

GROUP-STRUCTURED GENETICS IN A SOLITARY CARNIVORE. *Popoh Atairu, Amjad Nasir, John Hisey, Jacqueline Famuyide, Chechi Nwosu-Abanum, and Michael Kennedy, Lee University, Cleveland, Tennessee and University of Memphis, Memphis, Tennessee.* Both group-living and solitary mammalian species often violate the assumptions of the generally used island model of population genetics by displaying non-random mating and sexual differences in dispersal. Variations in these two factors are accommodated by recent models that incorporate clusters of kin and have been applied to the group-living, but not the solitary mammalian species, which are more abundant. Raccoon data support the hypothesis that solitary mammals may commonly display kin-clustered genetics. The degree of genetic differentiation among female kin clusters and the departure from random breeding of individuals within a kin cluster appear to be substantial and to vary with measures not incorporated into the island model. These outcomes are similar in magnitude to those for more social species and are greater than the equivalent measures for larger groups of raccoons. Genetic structure of groups should be analyzed at the smallest scale at which nonrandom dispersion is detected.

IMPROVING BEAM QUALITY AND POWER OUTPUT IN OPTICAL TWEEZERS. *Matthew L. Knecht and Chris Hansen, Southern Adventist University, Collegedale, Tennessee.* Our group recently demonstrated the ability to trap bacteria using optical tweezers, but low laser power limited trapping ability. I report improvements made to both laser power and beam quality, which led to improved trapping ability. Initial results provided an increase in laser intensity at the sample, but the beam quality was severely degraded. The solution was to better shape the laser beam using an anamorphic prism pair. This process was repeated for a higher power laser diode. We were able to maintain a high quality beam while more than doubling laser power at the sample. Finally, work is being done to add a newly designed flow-cell to the apparatus.

PRESENCE OF *STAPHYLOCOCCUS AUREUS* AND METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* CARRIAGE OF FIRST YEAR NURSING STUDENTS OF SOUTHERN ADVENTIST UNIVERSITY UPON ENTRANCE INTO CLINICAL ENVIRONMENTS. *Chad Kurzynske and L. Ann Foster, Southern Adventist University, Collegedale, Tennessee.* Nasal swabs were taken from first year nursing students and plated on microbial media selective for *Staphylococcus aureus* and methicillin-resistant *S. aureus* (MRSA). Positive samples for *S. aureus* were tested for antibiotic resistance. Three different samples were collected to determine

increase in *S. aureus* and MRSA carriage in the students. Results showed a noticeable increase in *S. aureus* and MRSA carriage after students started their clinical laboratories. The findings suggest there is a correlation to clinical environment exposure and carriage of *S. aureus* and MRSA in the external nares of nursing students. Currently, work is being done to calculate the statistical correlation of the results found in this study.

VENEZUELAN RATTLESNAKE PHYLOGENY. *Carl Person, Southern Adventist University, Collegedale, Tennessee.* The taxonomy of the South American Rattlesnakes, *Crotalus durissus*, has been a frequent subject of debate, especially concerning the various supposed subspecific designations. Within Venezuela (not including the island population of Aruba), there have been claims of up to four different subspecies. Since Venezuela is the main gateway for the southern dispersion of the *durissus* clade, the proper resolution of their phylogenetic relationships is necessary for an understanding of their route of invasion. We compare the mtDNA sequences from four separate populations, representing much of the country. The sequences examined were ATPase 6 and 8 and a ~750 bp region of Cytochrome *b*. The phylogenetic tree seems to indicate there are indeed at least three different evolutionary trajectories present within Venezuela.

MIDDLE REGION

TENNESSEE STATE UNIVERSITY
NASHVILLE, TENNESSEE

ETHANOL EFFECT ON PROTEIN KINASE C EXPRESSION IN HYPERTENSIVE VASCULAR SMOOTH MUSCLE. *Crisanto Torres, Ashiya Johnson, Brittany Washington, Jassica Jordan, Charlie Mtshali, and Benny Washington, Tennessee State University, Nashville, Tennessee.* Protein kinase C (PKC) has been shown to regulate ethanol sensitivity. There are three classes of PKC: conventional, novel, and atypical PKCs. Protein kinase C activity is altered in a variety of cell systems by acute or chronic ethanol exposure. The goal of the present study was to ascertain whether chronic ethanol treatment could affect PKC isoforms in hypertensive vascular smooth muscle cells. We measured the level of PKC isoforms following chronic ethanol treatment using reverse transcriptase polymerase chain reaction (RT-PCR) in both hypertensive and normotensive vascular smooth muscle cells (VSMCs). The results showed that conventional and novel PKCs are altered with 24 and 48 h ethanol treatment in hypertensive VSMCs. The expression levels of PKC- α/β II and PKC- δ isoforms increased significantly, whereas PKC- ϵ decreased. Also we observed no significant changes in the atypical PKCs. These findings suggest that both

conventional and novel PKCs may play a substantial role in the mediated effects of ethanol in hypertension.

INVESTIGATIONS OF ANTI-CANCER COMPOUNDS FROM ESSIAC EXTRACT. *Cherylann Lyons, Jeralyn Powell, Todd Gary, and E. Lewis Myles, Tennessee State University, Nashville, Tennessee.* Many compounds found in plants have anti-bacterial, anti-fungal, and anti-cancer activities. Over 25% of our common medicines contain at least some compounds obtained from plants. In the United States approximately 10% of our major drugs have plant extracts as their active ingredient. In less developed countries the World Health Organization estimates that 75–80% of the people rely on plant-based medicines for primary health care. Essiac is composed of 4 different herbs: burdock root (*Arctium lappa*), Indian rhubarb (*Rheum palmatum*) also known as turkey rhubarb, sheep sorrel (*Rumex acetosella*), and slippery elm (*Ulmus fulva* or *Ulmus rubra*). Preliminary results show that the aqueous extract has no effect on cancerous metabolic activity while the crude extract reduces metabolic activity.

TOTAL ANTIOXIDANTS IN CHOCOLATE BY THE CUPRIC ION REDUCING POWER ASSAY. *Ben Kendrick, Elena Lopez, Crystal Snyder, Megan Sprinkle, Autumn Marshall, and Kent Clinger, Lipscomb University, Nashville, Tennessee.* Antioxidants prevent free radicals from damaging cells. These damaged cells are believed to be the cause of heart disease and cancer, which are the top two killers in America. Chocolate contains high levels of antioxidants. We tested the antioxidant levels in different cocoas using the cupric reducing antioxidant capacity (CUPRAC) method. Cocoa (10 g) was mixed with 70% methanol (150 mL) and the solution was vacuum filtered. The cocoa extract (60 μ L), copper (II) chloride (1 mL), neocuproine alcohol (1 mL), ammonium acetate buffer at pH 7 (1 mL), and deionized water (1 mL) were combined in a test tube. After one h, the absorbance was measured in a spectrophotometer at 450 nm. Ideally, the readings should be between 0.2–0.4 absorbance units. After several trials, the CUPRAC results revealed that the antioxidant concentration in the cocoa extract was too high so the amount of cocoa in the initial extraction was lowered to 1.0 g. The absorbance proves higher concentrations of antioxidants in cocoa than white cocoa.

PSYCHOLOGICAL ABUSE, MARRIAGE AND FATHERLESSNESS. *Deidra Middleton, Tennessee State University, Nashville, Tennessee.* Aims were to determine a correlation between fatherlessness and psychological abuse, and marriage and psychological abuse. Forty-six African American women from a historically Black university in the mid-south participated. Psychological abuse was measured using the Abuse Risk Inventory. There were no significant differences between women reared in intact homes and women reared in fatherless homes. There also were no significant differences between married and single women.

KNEE INJURIES AND ESTROGEN LEVELS IN FEMALE ATHLETES. *M. M. Engberg and J. T. Thomas, Belmont University, Nashville, Tennessee.* Studies suggest that women who participate in sports are 4 to 6 times more likely than their male counterparts to sustain some type of knee injury. Injuries such as ACL tears, torn menisci, and patellar tendon problems are extremely common in female athletes. Because hormonal

differences are thought to contribute to the discrepancy of injury incidence between men and women, we examined the estrogen levels of female athletes at Belmont to identify a possible correlation. A survey was distributed to female athletes at Belmont to collect a history of knee injuries and other estrogen related background information, such as regularity of periods and use of birth control medication. A saliva sample was collected on the first or second day of the athlete's menstrual cycle. The sample was analyzed using an EIA assay to determine the basal estrogen level. Of the 64 female athletes surveyed, 22 sustained at least one knee injury that required surgery. Preliminary analysis of injured versus non-injured athletes indicates no correlation between basal estrogen levels and risk for knee injury. However, the role hormones play in knee injuries of female athletes should be investigated.

POTENTIAL INHIBITION OF CANCER CELL GROWTH INDUCED BY GREEN TEA EXTRACTS. *Eve Niles, Yvonne Myles, Todd Gary, and E. Lewis Myles, Tennessee State University, Nashville, Tennessee.* The goal was to determine if various concentrations of tea extracts inhibit cancer cell growth. Due to the growing wave of breast cancer and its prevalence in women, there is a need for a safe, reliable, and effective drug. Green tea was our toxin, both an aqueous extraction and an alcohol (crude) extraction. The goal was to determine if this tea had a medicinal effect on breast cancer cells and would inhibit cell growth in the breast cancer cell line BT20. Green tea is isolated from the plant *Camellia sinensis* and is rich in antioxidants. While perfecting the experiment design, the primary experiment was conducted using a 96 well plate and consisted of mixtures of: 1) the 60 ng/ μ L extract plus the media, 2) the 120 ng/ μ L extract plus the media, 3) both concentrations of extract, media, and cells, 4) media plus cells 5), and two concentrations of DMSO and cells. Alamar Blue and media (1:10 ratio) was used to determine cell viability. The reduction of Alamar Blue indicates the metabolic activity of living cells. After testing various concentrations of the toxins, it was determined that low concentrations of the crude extract (60 ng/L) also inhibit the metabolic activity of our cell line. The crude green tea extract inhibited cancer cell growth. However, the aqueous extract had no visible effect. Further studies will test the toxins on colon, prostate, and other breast cancer cell lines, and ultimately identify the cell cycle stage inhibited by these toxins.

EFFECT OF PENTACHLOROPHENOL ON ATP LEVELS IN HUMAN NATURAL KILLER CELLS. *Ugochukwu Nnodu and Margaret M. Whalen, Tennessee State University, Nashville, Tennessee.* Pentachlorophenol (PCP) is an organochlorine compound that has been used as an insecticide and a fungicide. PCP use has been restricted in the United States; it is mainly used as a wood preservative for power-line and fence poles. Pentachlorophenol has been detected in human tissues through inhalation and consumption of contaminated food and water. Human natural killer (NK) lymphocytes play a central role in immune defense against viral infection and tumor development. In previous studies we have shown that exposure to 10–0.5 μ M PCP decreases the tumor-killing function of NK cells. We evaluated NK cell ATP levels after exposure to PCP at concentrations of 10 μ M to 0.5 μ M for 24 h and 48 h. Exposure of NK cells to 10 μ M PCP for 24 h decreased the ATP levels by 23% compared to the control, while 5 μ M PCP for 24 h had no effect. Exposure of NK cells to 5 μ M and 2.5 μ M PCP for 48 h

decreased the ATP level by 50% and 23%, respectively. Exposure to 10 μ M PCP for 24 h and 48 h decreased the cytotoxic function by 90% and 99% respectively. Exposure of NK cells to 5 μ M PCP for 24 h decreased lytic function by about 75% and by 96% after 48 h. These data indicate that PCP exposure decreases ATP levels in NK cells but that significant decreases in cytotoxic function occur even when there is no decrease in ATP levels.

CAENORHABDITIS ELEGANS AS A MODEL FOR NICOTINE ADDICTION. *M. Corey Winfree, Sergei Temkin, Glenn Acree, and Lori McGrew, Belmont University, Nashville, Tennessee.* The National Institute of Medicine reports that nicotine is the most addictive substance known. Nicotine binds to endogenous nicotinic cholinergic receptors (nACh) in the nervous systems of vertebrates and invertebrates. Tobacco use is a major contributor to several types of cancer, lung disease and heart disease. Treatments for nicotine addiction thus represent an important field of research. Because the nematode *Caenorhabditis elegans* has long been used as a model system in genetics, development and neuroscience, we explored the use of *C. elegans* as a model system for nicotine. The *C. elegans* genome has been sequenced and published. We obtained *C. elegans* N2 wildtype worms from the Caenorhabditis Genetics Center. In collaboration with the computer science department, we used image capture and analysis to evaluate body length and locomotion in *C. elegans*. Following characterization of control N2 animals, we treated the nematodes with increasing concentrations of nicotine and evaluated the effect on body length, locomotion and chemotaxis. Half of the worms also were also treated with neostigmine, a partial agonist for nACh receptors. Our hypothesis was that a partial agonist could provide treatment for the symptoms of nicotine withdrawal without causing desensitization of nACh receptors. Our data suggest that nicotine causes a dose-dependent decrease in body length which is consistent with previous reports. We also found that nicotine withdrawal caused a decrease in mean velocity. Neostigmine treatment did not restore wildtype locomotion. Future studies will explore the effects of nicotine on egg-laying.

IDENTIFICATION OF ANTIOXIDANTS IN CHOCOLATE BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY. *Amy Boren, Jay Ramsey, Emily Bloemer, Kaylee Hamar, Autumn Marshall, and Kent Clinger, Lipscomb University, Nashville, Tennessee.* Many health benefits have been attributed to cacao, including lowering blood pressure, raising HDL, and preventing oxidation of free radicals. These benefits have been traced to the amount of antioxidants, often polyphenols, found in cacao. We measured the concentration of polyphenols per 10 g of various chocolates through Reversed Phase High Performance Liquid Chromatography (RP-HPLC). The first step was to triturate a sample of chocolate three times with n-hexane to remove fats. The sample was extracted three times with 80% acetone to obtain polyphenols. Finally, 10 μ L of sample was analyzed by RP-HPLC using eluents of 0.1% trifluoroacetic acid (TFA) in acetonitrile and 0.1% TFA in water. Peaks were observed at 2, 3.5, 5.5, 11, and 18.5 min for dark chocolate, only at 7 min for white chocolate, and at 7, 21, and 29 min for normal cocoa. To date, these peaks have not been identified. Future work will compare the results against known standards of antioxidants to confirm that dark chocolate does indeed have a high polyphenol content.

TOTAL PHENOL CONTENT OF VARIOUS CHOCOLATES. *Uzma Rahman, Vitaly Chernish, Sam Marcrom, Autumn Marshall, and Kent Clinger, Lipscomb University, Nashville, Tennessee.* Recent studies have indicated antioxidants may help prevent the onset of cardiovascular disease and Alzheimer's disease. Advertisers have claimed chocolates have plentiful supplies of antioxidants. The Folin-Ciocalteu method served as an indicator for the polyphenolic content of antioxidants in specific types of chocolate. This analysis method used chocolate samples, as well as varying concentrations of Gallic acid solids as standards of comparison. Data were collected via absorption readings of the spectrophotometer. Two samples were collected: white cocoa powder and pure dark chocolate. Chocolate purity and precise standards are primary concerns, and further research and analysis are under way. Current research indicates that dark chocolate contains a higher concentration of antioxidants when compared to white chocolate cocoa powder.

ANALYSIS OF ANTIOXIDANTS IN CHOCOLATE BY THE FERRIC REDUCING ANTIOXIDANT POWER ASSAY. *Caitlin Meador, Heather Funderburg, Jonathan Wood, Autumn Marshall, and Kent Clinger, Lipscomb University, Nashville, Tennessee.* The purpose of this experiment was to determine the total antioxidant power contained in various chocolates. The ferric reducing antioxidant power assay (FRAP) method of analysis looks at the total antioxidant power of the material being tested. It makes use of materials commonly found in most chemistry laboratories and is a relatively simple method developed by I. F. F. Benzie and J. J. Strain (Anal. Biochem. 239:70-76, 1996). Chocolate samples were prepared by grinding the solid chocolate with 80% acetone in a mortar and pestle. This mixture was shaken to incorporate the antioxidants completely and vacuum filtered in a Buchner funnel. The solid was discarded and the liquid was considered the extract. Preliminary results show that the 100% cacao has the highest levels of antioxidants and the white chocolate powder has the lowest. These results were expected due to the given amounts of cacao in the separate chocolates. These results are compared to the results of the standard, ferrous sulfate, to determine actual antioxidant amounts in the chocolate.

TOTAL ANTIOXIDANTS IN CHOCOLATE BY THE VITAMIN C EQUIVALENT ASSAY. *Clint Sweitzer, Laura Bailey, Matt Daugherty, Justin Chafin, Autumn Marshall, and Kent Clinger, Lipscomb University, Nashville, Tennessee.* Chocolate is a well known food that can boost the activity of neurotransmitters such as serotonin and other endorphins. In addition, Chocolate contains flavonoids that can slow the aging process. Cacao, the main ingredient in chocolate, also is a source of antioxidants. Antioxidants fight the effects of free-radicals by oxidizing them, preventing the free-radicals from oxidizing with and harming the body. Free-radicals are known to contribute to degenerative human diseases such as cancer, Alzheimer's, and Parkinson's. Many studies have been done on substances known to contain antioxidants, such as gala apples and vitamin C. In this experiment, the antioxidant capacities of various chocolates were measured and compared to those of vitamin C by using a stable radical species, ABTS (2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid)) to measure antioxidant activity. Results with this experiment have varied, so there is still a large amount of work to do.

WESTERN REGION

LEMOYNE-OWEN COLLEGE

MEMPHIS, TENNESSEE

DIABETES PREVALENCE TRENDS AMONG AFRICAN-AMERICANS AND HISPANICS: 2001–2003. **K. Townsend and L. M. Brown**, *Christian Brothers University, Memphis, Tennessee and University of Tennessee Health Science Center, Memphis, Tennessee*. This was a retrospective database study to determine the prevalence of diabetes among African-Americans and Hispanics for the years 2001 to 2003, based on data from the National Health Interview survey. The results showed trends in diabetes prevalence rates from 2001 to 2003 for various genders, regions, age groups, income salaries, and body mass index (BMI). African-American women had the highest prevalence of diabetes, based on race and gender, for all three years (10.9%, 9.9% and 10.3% for 2001 to 2003 respectively). This study fills a gap in the literature in that it shows gender and racial health disparities. Also, although it is known that diabetes health disparities exist between the Caucasians and minority populations, it is not as well known where health disparities exist between the African-American and Hispanic populations based on race and gender. (Supported by Dept. Health Human Services)

AN INVESTIGATION TO DETERMINE WHETHER CRIMINAL JUSTICE PRACTITIONERS BELIEVE BAIL IS A RACIST CONCEPT. **T. L. Manning and L. Settle**, *LeMoyné-Owen College, Memphis, Tennessee*. African-American males are disproportionately represented in the American criminal justice system. As a result of this over-representation, individuals, including those in the courtroom workgroup, may perceive a bias in the manner in which justice is handed down—specifically with the receipt of and amount of bail. This project analyzed the perception of criminal justice professionals and their belief as to whether bail is a racist concept. Defense attorneys, prosecuting attorneys, judges, and bail bondsmen were surveyed. The study utilized a quantitative research design with a face-to-face survey. Respondents were given a questionnaire regarding their views on bail, the race of the offender, and the crime committed. The data collected indicate some defense attorneys, prosecutors, judges, and bail bondsmen do not believe bail is a racist concept.

PHARMACEUTICS AND PHARMACEUTICAL SALES: A HELPING HAND OR A CRIPPLING CRUTCH? **J. Scott, M. Fitzgerald, and C. Foster**, *Christian Brothers University, Memphis, Tennessee (JS, MF) and Forrest Pharmaceuticals Inc., St. Louis, Missouri (CF)*. It would be extremely hard to imagine our world without medicinal drugs. In fact, we as a society have become very dependent on easy access to pharmaceuticals. This study involved research into the history of pharmaceuticals and the guidelines followed for drug development and marketing. In developing countries, the lack of ready access to medicinal drugs has proven to be costly. Individuals have shorter life spans and a higher mortality, particularly in youths. Is it justified to neglect people in the developing world due to the high cost of drug development? We explore this issue and the widespread usage of generic drugs versus brand name drugs relative to drug manufacturing and perception of the pharmaceutical industry. Medicinal pharmaceuticals are costly to develop and there must be a market for them in order for companies to invest in a drug.

This time and cost ensures the safety and health of society as a whole.

GEOGRAPHICAL INFORMATION SYSTEMS AND CRIME MAPPING: EVALUATING DECREASE OF CRIME. **T. L. McIntyre and L. Settle**, *LeMoyné-Owen College, Memphis, Tennessee*. This study evaluated the effectiveness of Geographical Information Systems (GIS) when used in conjunction with crime mapping, on the decrease of crime. Three law enforcement agents who have been trained to work with crime mapping and GIS were surveyed. Data were provided by a participating agency which was analyzed using ArcGIS. This study revealed that law enforcement agents do not believe that GIS use has decreased crime.

DISTRIBUTION OF GLUTAMATE RECEPTORS AND CALCIUM-BINDING PROTEINS IN PURKINJE CELLS OF THE CHICK CEREBELLUM. **B. H. Bach, R. S. Pires, M. E. C. Fitzgerald, and C. A. B. Toledo**, *Christian Brothers University, Memphis, Tennessee (BHB, MECF), Laboratory of Neurosciences, City University of São Paulo, São Paulo, Brazil (RSP, CABT)*. Calcium plays an important role in mediating several intracellular signals. Its cytoplasmic concentration is regulated by calcium-binding proteins (CBP), such as paralbumin (PV) and calbindin (CB). Expression of CBP has explicit developmental and distribution patterns within the CNS. Several subtypes of the glutamate AMPA receptor (GluR) are directly Ca^{2+} permeable (GluR1, 3, 4) and are found in many neurons, including cerebellar Purkinje cells (Pc). In neurons containing the specific AMPA subunit, GluR2, Ca^{2+} influx is blocked. To better understand the functional characteristics of Pc, immunohistochemical fluorescence single- and double-labeling was performed to determine the distribution and abundance of GluR and CBPs. Antibodies against CB, PV and GluR subunits 1, 4 and an antibody that did not distinguish between GluR subunits 2 and 3, were used. CB was observed in almost all Pc neurons. These neurons also labeled with antibodies against all GluR subunits, whereas PV showed less expression among the chick Pc. In some cerebellum locations both CBP were present at different intensities. These results revealed that these two CBP are differentially distributed among chick cerebellum PC with colocalization among AMPA-type glutamate receptors. (Supported by NIH-MHIRT 5T37TW000123-04 and FAPESP 04/11039-6)

THE EFFECT OF CARBON NANOFIBERS ON NIH 3T3 FIBROBLAST PROLIFERATION. **B. Kim, E. Fitzpatrick, and E. Geisert**, *Christian Brothers University, Memphis, Tennessee (BK) and University of Tennessee Health Science Center, Memphis, Tennessee (EF, EG)*. The field of nanotechnology has many potential biomedical applications, including the development of medical implants. The purpose of this investigation was to determine whether carbon nanofibers would affect cell proliferation and therefore prevent their use in biomedical applications. The carbon nanofibers are attached to silicone chips, a biomaterial. The effect of carbon nanofibers on the proliferation of NIH 3T3 fibroblasts was measured using the MTT assay and a BrDu incorporation assay. The results from the MTT assay demonstrate that fibroblast proliferation on silicone chips coated with carbon nanofibers is not significantly different compared with fibroblasts grown on bare silicone chips. These results suggest that the carbon nanofibers did not

stimulate cell proliferation or inhibit growth. Using the BrDu proliferation assay, fibroblasts were observed growing on top of chips containing carbon nanofibers. These results suggest that carbon nanofibers will not affect cell proliferation. (Supported by the Crane Vision Fellowship)

PRE-HATCHING EXPRESSION OF AMPA-TYPE GLUTAMATE RECEPTORS IN THE NUCLEUS OF THE EDINGER-WESTPHAL OF CHICKS. *J. M. Klein, C. A. B. Toledo, R. S. Patel, B. J. Dalsania, A. Wilkinson, A. Reiner, and M. E. C. Fitzgerald, Universidade Cidade de São Paulo, São Paulo, SP, Brazil (CABT), Christian Brothers University, Memphis, Tennessee (JMK, RSP, BJD, AW, MECF), and University of Tennessee Health Science Center, Memphis, Tennessee (AR).* The Edinger-Westphal nucleus (EW) in birds is responsible for controlling pupilloconstriction, accommodation, and choroidal blood flow in the eye. The activation of EW neurons by its afferent input occurs by the neurotransmitter glutamate through ionotropic AMPA-type glutamate receptors (GluRs). We examined the developmental expression of GluR subunits on embryonic days 10 through 20 (E10-E20) in the EW of chicks (*Gallus gallus*). We used antisera against GluR1 or GluR4, as well as an antiserum that was selective for, but did not distinguish between, GluR2 and GluR3 (GluR2/3). The GluR subunit expression was first observed in EW at E12, with 3% of neurons labeling for GluR1 and 2% for GluR2/3 or GluR4. By E14, the GluR labeling had increased to 13.6% for GluR1, 47% for GluR2/3 and 33% for GluR4. By E16, the labeling had changed to 3% for GluR1, 28% for GluR 2/3 and 43% for GluR4. After E16, these GluR subunit-labeling percentages remained fairly consistent in EW through E20. These results demonstrate the differential expression of the GluR subunits in the embryonic chicken EW, which may reflect synaptic maturation during development. (Supported by FAPESP 04/11039-6 to CT; NIH EY-05298 to AR; and NIH-MIRT award 5T37TW000123-04 to MECF)

POLYMORPHISMS IN MACROPHAGE ENDOTOXIN RECEPTORS MAY PREDISPOSE PATIENTS TO PERI-IMPLANT OSTEOLYSIS. *B. Lawrence, L. P. Schwab, and R. Smith, Christian Brothers University, Memphis, Tennessee (BL) and The University of Tennessee-Campbell Clinic, Memphis, Tennessee (LPS, RS).* Wear debris generated by hip and knee implants is taken up by local macrophages and is thought to play a major role in periprosthetic osteolysis. Endotoxin adhering to wear debris also may play a role in activating the macrophage cytokine response leading to osteolysis. We examined monocytes isolated from normal volunteers (those without joint replacements) for two specific single nucleotide polymorphisms (SNPs) in the endotoxin Toll-Like Receptor-4 (TLR-4). Monocytes from each subject were cultured and exposed to different concentrations of clean and endotoxin (LPS) bound titanium particles. Cytokine (TNF- α or PGE₂) release in response to differing concentrations of clean or LPS-bound particles was measured. The SNP data showed three donors (one, three, and five) with heterozygous mutations for the A/G mutation, and donors one and five heterozygous for the C/T mutation. Donor two was homozygous for the C/T mutation. Cells from donors 1 and 3 showed very little TNF α response to LPS bound particles compared to a moderate response for donors 4, 5 and 6 and a high response from donor 2. These very preliminary data suggest that the homozygous (C/T) mutation found in TLR-4 may

determine the macrophage response to periprosthetic endotoxin bound wear debris. (Supported by The Campbell Clinic)

CHARACTERIZATION OF THE DIOCTYLGLYCEROL PYROPHOSPHATE-BINDING POCKET OF LYSOPHOSPHATIDIC ACID 3 RECEPTOR. *S. Mujahid, Y. Fujiwara, R. Tsukahara, W. J. Valentine, and G. J. Tigyi, Christian Brothers University, Memphis, Tennessee (SM) and University of Tennessee Health Science Center, Memphis, Tennessee (YF, RT, WJV, GJT).* Dioctylglycerol pyrophosphate (DGPP) is a selective antagonist of lysophosphatidic acid (LPA) receptor LPA3. Although LPA2 shares a high degree of sequence homology with LPA3, DGPP is not an antagonist for LPA2. The purpose of this study was to identify the amino acid residues in LPA3 that mediate binding to DGPP. Computational modeling utilizing a validated molecular model of LPA3 was used to evaluate the interaction with DGPP by docking the compound into the LPA-binding pocket. Site-directed mutagenesis was performed on LPA2 and LPA3 to mutate residues predicted to be critical for DGPP binding. Rat hepatoma 7777 cells were transfected with the mutated receptor constructs and treated with LPA and DGPP, and the calcium response was measured. We have evaluated the effect of mutations of R36, K95, R114, N172 and L281 residues of LPA3 on the antagonist activity of DGPP. (Supported by summer Research Scholar Program, College Grad. Health Sciences, UTHSC)

FOS EXPRESSION IN BRAINSTEM NUCLEI AFTER CONDITIONED TASTE AVERSION. *M. Reed and J. Boughter, Christian Brothers University, Memphis, Tennessee and University of Tennessee Health Science Center, Memphis, Tennessee.* The purpose of this study was to determine if the same subset of neurons encodes gustatory learning in two inbred strains of mice (C57BL/6J and DBA/2J). Patterns of expression of the immediately early gene c-FOS were examined after forming a conditioned taste aversion (CTA) to a salty-tasting stimulus. We hypothesized there would be strain differences in number and location of FOS-positive neurons, corresponding to different behavioral activity in these strains. Following a CTA, a greater level of FOS-like immunoreactivity was expected in the reticular formation, nucleus of solitary tract, and parabrachial nucleus. After performing the experiments, several correlations were observed. Following CTA, a greater level of FOS-like immunoreactivity showed up in the area postrema and the nucleus of the solitary tract, which provide input to oromotor nuclei. Overall, mice treated with lithium chloride had more FOS positive neurons as expected.

HYPOXIA STIMULATES ELEVATED HEAT SHOCK PROTEIN EXPRESSION IN THE CULTIVATED SHRIMP SPECIES, LITOPENAEUS VANNAMEI. *H. Shackelford, M. R. F. Marques, and M. Henneman, Christian Brothers University, Memphis, Tennessee (HS) and UFSC, Florianopolis, Brazil (MRFM, MH).* Heat-Shock Protein-70 (HSP-70) is among many of the biomarkers associated with exposure to xenobiotics. These proteins are generally used to evaluate the toxic effects substances have on both the organism and the aqueous environment it inhabits. We report the Hsp70 levels in the gills of the shrimp *Litopenaeus vannamei* after exposure to different oxygen concentrations. Western blot analysis with antihuman HSP70Ab was performed to evaluate the response to this hypoxic situation. Cultivated shrimp larvae were collected and

then separated into control and hypoxia-exposed groups. Within the group exposed to low oxygen levels, the organisms were further separated into two groups in which each was exposed to different hypoxia levels. In general, Hsp70 expression was greater in the exposed organisms compared to the controls, but not statistically significant. The HSP-70 level was increased in the groups exposed to lower oxygen levels compared to the shrimp exposed to the environmental stress for less time. The group that was exposed to hypoxia then put in normal conditions did recover from the stress. Even though the data collected showed an increase of HSP-70 in both of the exposed groups compared to the control groups, it was not statistically significant. Studies are in progress to further characterize the threshold of these biomarker responses upon cultivated shrimp species in Santa Catarina, Brazil. (Supported by NIH 9T37MD001378-4)

CELLULAR RETINOL BINDING PROTEIN LEVELS IN RETINAL PIGMENT EPITHELIUM DEPRIVED AND RETINAL PIGMENT EPITHELIUM ATTACHED RETINAS. **M. Jablonski, X. Wang, and C. Engleberg**, Hamilton Eye Institute, University of Tennessee, Memphis, Tennessee and Christian Brothers University, Memphis, Tennessee. The goal of this research was to identify the proteins that aid in the organization of the outer segments of photoreceptors within the retina. When the retinal pigment epithelium (RPE) is detached from the retina the outer segment membranes become highly disorganized. The purpose was to see which proteins were down regulated when the RPE was detached. Based on differential proteomics, the abundance and localization of cellular retinol binding protein (CRBP-1) was examined in *Xenopus laevis* when the RPE is attached and detached. This method, coupled with basic local alignment search tool, conclusively showed that CRBP-1 was found in the retina. It also showed that CRBP-1 was downregulated in RPE deprived versus RPE attached retinas. Western Blots and immunohistochemistry were used to determine (CRPB-1) abundance and localization. The results conclusively determined that CRBP-1 contributes to photoreceptor outer segment assembly. The CRPB-1 is drastically down regulated in retinas without attached RPE versus attached RPE. The CRPB-1 also was localized throughout the retina in Müller cells. The localization of the CRPB-1 in Müller cells also was down regulated in RPE detached retinas versus RPE attached retinas. The data were used to determine if a correlation exists between the structural organization of the photoreceptor outer segment membrane when the RPE is attached versus RPE detached retinas with specific focus on which proteins are present under each condition. (Supported by Ophthalmology Fellowship, Hamilton Eye Institute)

ADENO-ASSOCIATED AND LENTIVIRUS-BASED GENETIC MANIPULATIONS OF HIPPOCAMPAL CA1 NEURONS IN VIVO. **J. Gehrig, R. Richardson, and S. Zakharenko**, Rhodes College, Memphis, Tennessee (JG) and St. Jude Children's Research Hospital, Memphis, Tennessee (RR, SZ). Neurons play important roles in signal processing. Attenuated viral vectors are effective tools for manipulating protein expression in individual neurons. Although recent studies indicate lenti, adeno-associated, rabies, and other viral particles can be used to deliver genes of interest to individual neurons, comparative studies of these viruses have not been done. We chose to test levels and the time courses of GFP expression in CA1 pyramidal neurons in the mouse hippocampus using adeno-associated and

lentiviral vectors with neuron-specific (synapsin and α -calcium/calmodulin-dependent protein kinase II) and ubiquitous cytomegalovirus promoters. Two-photon laser scanning microscopy was used to acquire high resolution images of CA1 neurons in brain slices 2-8 weeks post injection in 6-8 week old mice to characterize the viral expression levels and time course. We found that GFP expression transduced by lentivirus under control of synapsin developed faster and was more robust.

MOLECULAR EXPRESSION OF SIGMA RECEPTORS IN MOUSE SMOOTH MUSCLE. **S. Wilson, S. Vedam, and R. Fifer**, University of Mississippi, Oxford, Mississippi (SW, SV) and Christian Brothers University, Memphis, Tennessee (RF). Sigma receptors are unique receptors distributed throughout the body. There is significant evidence that sigma receptors are present in smooth muscle, but no information regarding their molecular expression. It was hypothesized that the sigma-1 receptor is molecularly expressed in smooth muscle tissues. The molecular expression of sigma receptors in mouse smooth muscle was examined in this experiment. Various tissues were isolated from a C57bl/6 mouse and DNA and RNA were separated. A cDNA was prepared, and quantitative real-time (qt) PCR was performed with forward and reverse primers targeted to murine sigma-1 and a ribosomal gene, 28S. The qt-PCR showed high expression of the sigma gene in the brain, heart, aorta, mesenteric arteries, and kidney. Studying sigma receptor function in smooth muscle is important because sigma receptors may play a fundamental role in blood pressure control. Understanding this role may give us a potential therapeutic avenue for diseases such as hypertension and vascular occlusion. (Supported by NIH AI56442 to SMW)

INCORPORATION OF HA INTO H5N1 VACCINE VIRUS IS INDEPENDENT OF MATRIX GENE ORIGIN. **S. Minhas and R. Webby**, Christian Brothers University, Memphis, Tennessee and St. Jude Children's Research Hospital, Memphis, Tennessee. The manufacture of effective H5N1 influenza vaccine in fertilized chicken eggs has so far been disappointing with manufacturers obtaining only 25% of the yield typically experienced with H1N1 and H3N2 strains. The molecular basis of the poor yield of H5N1 hemagglutinin (HA) was examined using reverse genetics technology. Specifically, we addressed how the origin of matrix (M1) protein might impact HA yields in a H5N1 vaccine strain targeting A/Vietnam/1203/04. In conventional vaccine seed strains the internal viral proteins, including M1, are supplied by a high growth strain, A/PR/8/34. To assess the impact of M1 origin we created an alternative seed virus, rg-xSAM, in which we replaced the M1 of A/PR/8/34 with that of the A/Vietnam/1203/04 strain. The amount of HA incorporated into the conventional and alternative viruses was compared using polyacrylamide gel electrophoresis (PAGE). Our results showed that the inclusion of M1 protein of the A/VN/1203/04 virus did not increase the amount of HA present on the viral envelope. Thus, the study demonstrated that the origin of the M1 protein has little to no effect on the amount of HA incorporated into influenza virions. (Supported by 5R25CA023944 and P30 CA-21765)

THE EXPANDABLE ALLOSCUTUM OF THE FEMALE IXODID TICK *DERMACENTOR VARIABILIS*: CHARACTERIZATION OF ITS SOLUBLE PROTEINS. **M. D. Shaw and S. Majumdar**, LeMoyne-Owen College, Memphis, Tennessee. The

goal of this study was to understand the biological properties of the expandable alloscutum of the ixodid tick *Dermacentor variabilis*. Without expansion of the alloscutum the female tick cannot take in enough blood meal to become replete and lay eggs. Three different stages in the life of the adult tick were investigated: unfed, feeding, and ovipositing. Samples were collected from each group as needed. The alloscutum is different in each of these life stages. In the unfed stage it is not capable of expansion. In the feeding stage it becomes fully expanded. In the ovipositing stage it has contracted and is almost transparent. The aim is to characterize the soluble cuticular proteins from the alloscutum of each of the stages sampled. Characterizing and sequencing the soluble proteins in the alloscutum of this tick is a crucial step in understanding how the tick expands the alloscutum. It is hypothesized that additional proteins are sequenced into the alloscutum during the slow feeding stage but not in the rapid engorgement stage, and that proteins are removed from the cuticle during oviposition. To test this hypothesis, we compared the soluble cuticular protein profile. We have identified proteins by 1D-SDS-PAGE analysis that are specific for the partially fed when compared with the unfed and fully fed. These results will be presented and discussed. We also have studied the ultrastructure of the cuticles of the 3 different stages: these micrographs also will be presented. (Supported by NSF HBCU-UP HRD-0411493)

REGULATION OF DUBE3A SUBSTRATES IN THE *DROSOPHILA MELANOGASTER* NERVOUS SYSTEM. *A. Newton and L. Reiter*, Christian Brothers University and University of Tennessee Health Science Center, Memphis, Tennessee. Angelman syndrome and autism are two disorders that may result from changes in UBE3A gene expression. While Angelman syndrome is caused by UBE3A loss of function, autism may be caused by over-expression. Recent studies have shown that UBE3A regulates a Rho-GEF protein in flies called Pebble in neuronal tissues. We studied the effects of Dube3a over-expression on synaptic plasticity and Pbl expression using the *Drosophila* neuromuscular junction as a model of the mammalian synapse. Using the GAL4/UAS system we examined the over-expression phenotype in the larval nervous system. Higher amounts of Dube3a in the synaptic boutons resulted in reduced amounts of Pebble detection. In addition, driving expression of Dube3a in neurons could increase the number of synaptic boutons (or synaptic connections) between the nerve endings and the larval musculature. Conversely, by expressing Dube3a in the muscle we observed a decrease in the number of boutons. These results indicate that Dube3a regulates the level of proteins required for proper synapse formation and that Pbl may be a key protein affected by this regulation. (Supported by Undergraduate Neuroscience Merit Fellowship, Neuroscience Institute/Center of Excellence, UTHSC to AN)

TOWARDS CLONING THE RYANODINE RECEPTOR TYPE 2 FROM RAT CEREBRAL ARTERY MYOCYTES. *J. Nguyen, J. Liu., and A. M. Dopico*, Christian Brothers University, Memphis, Tennessee (JN) and The University of Tennessee Health Science Center, Memphis, Tennessee (JL, AMD). Episodic, heavy to moderate alcohol intake is associated with ischemic stroke. This condition is independent of beverage type and alcohol metabolism, but linked to cerebral arterial constriction caused by ethanol (EtOH) acting on the cerebrovascular myocyte. Studies conducted in rodents demonstrate that acute

EtOH causes cerebral artery constriction, primarily due to a significant reduction of calcium-sparks. These calcium signals are normally mediated by the activity of ryanodine receptors (RyR), the type 2 being the subclass that prevails in cerebral artery myocytes. It is hypothesized that ethanol causes cerebral artery constriction by impairing RyR2 function. To test this, the receptor needs to be reconstituted into lipid bilayers following its cloning from cerebrovascular smooth muscle. Knowing that the RyR open reading frame is ~16 kb, we designed a strategy to construct a high-capacity lambda phage vector (EMBL3) cDNA library that contains the full-length cDNA RyR2. Total mRNA was isolated from rat cerebral artery smooth muscle. Following reverse-transcription, full-length cDNAs were separated by electrophoresis and amplified by PCR. Then, cDNAs larger than 7 kb were inserted into the EMBL3 vector. The whole library contained 10^6 clones, the average inserts in the vectors being larger than 10 kb. In conclusion, we constructed a cDNA library with large inserts, which very likely contains the RyR2 cDNA sequences. This is the first step towards the cloning of full-length rat cerebrovascular myocyte cDNA coding for RyR2, a fundamental pre-requisite to study alcohol action on receptor function. (Supported by NIH grants AA11560 and HL77424 to AMD and an American Heart Association South-East Affiliate Postdoctoral Fellowship to JL)

MULTIFACETED STUDY OF GLUTAMIC ACID WITH Cu^{2+} AND Cr^{3+} METAL IONS IN AQUEOUS SOLUTIONS. *H. Holeyfield and Y. Hamada*, LeMoyne-Owen College, Memphis, Tennessee. This study entails many aspects of Glutamic acid (Glu) with the Copper metal ion (Cu(II)) and the Chromium metal ion (Cr(III)) in aqueous solutions. The acidic ion exchange resin confirmed the concentrations of the Cu(II) ion stock solutions. The potentiometric titrations demonstrated strong metal-Glu interaction which is reflected by the values of the stability constants. The stability constants of complexes for the respective values of Cu(II)-Glu are $\log \beta = 7.64 \pm 0.19$ for the one-to-one complex, $\log \beta = 1.32 \pm 0.73$ for the mono-hydroxo complex, and $\log \beta = 13.63 \pm 0.23$ for the bis-complex. The UV-Vis of the Cr(III)-Glu reflected molar absorptivities with values of 20.2 L/mol cm at 420 nm and of 27.7 L/mol cm at 555 nm for the d-d electronic transition. The NMR experiments for Glu revealed up-field shifts of all protons at pH values varying from 2.4 to 11.2 which match the potentiometric titration pH-values. (Supported by NSF HBCU-UP HRD-0411493)

ACCURATE POTENTIOMETRIC TITRATIONS OF CITRIC ACID AND MOLYBDENUM IN AQUEOUS SOLUTIONS. *T. Greer and Y. Hamada*, LeMoyne-Owen College, Memphis, Tennessee. This presentation will show the experiments that deal with Citric Acid $\text{C}_3\text{H}_4\text{OH}(\text{COOH})_3$ (H_3Cit) and the Molybdenum (Mo(VI)) metal ion in aqueous solutions at room temperature. The accurate potentiometric titrations of each individual titration system are recorded and show novel results. The results for the titration systems of 1:9, 1:8, 1:6, 1:4, and 1:2 $\text{Mo(VI):H}_3\text{Cit}$ molar ratios show evidence for the formation of a combination of dimeric and trimeric species. The accurate data were plotted and the major inflection points were averaged at 37.66, 33.54, 27.55, 21.03, and 14.69, while the minor inflection points were averaged at 11.39, 10.10, 7.35, 11.02, and 11.02 for the 1:9, 1:8, 1:6, 1:4, and 1:2 $\text{Mo(VI):H}_3\text{Cit}$ titration systems, respectively. (Supported by NSF HBCU-UP HRD-0411493)

DETERMINING PEAK FLUXES IN EARTH'S RING CURRENT DUE TO SOLAR ACTIVITY. *S. Barrows and J. M. Jahn, Rhodes College, Memphis, Tennessee and Southwest Research Institute, San Antonio, Texas.* The Earth generates a magnetic field due to the motion of ions in its molten iron core. Away from the Earth's surface, this field dominates particle interactions in what is called the magnetosphere. One feature of Earth's magnetosphere is the formation of a ring current, which is caused by a longitudinal drift around the equator of charged particles trapped between field lines. The strength of the ring current can increase dramatically during geomagnetic storms caused by solar activity. This includes a prolonged intensification of the interplanetary magnetic field (IMF), which is an extension of the Sun's magnetic field out among its planets. Also, an increase in solar wind injects plasma particles into the magnetosphere which increase the ring current flux. The ring current flux will have peak values at various positions around the equator and data from the IMAGE spacecraft is being used to determine reasons for the peaks.

ESTABLISHING ORBITS BETWEEN TWO CHARGED SPHERES IN WEIGHTLESSNESS. *Janeski, K. Andring, S. Banerjee, D. Campbell, D. Keedy, B. Hoffmeister, and S. Quinn, Rhodes College, Memphis, Tennessee.* In August 2006, a team of students from Rhodes College performed an experiment in microgravity aboard NASA's specialized C-9B aircraft known as the "Weightless Wonder". The goal of the experiment was to establish an orbit between two electrically charged spheres. The similar forms of Newton's Law of Gravitation and Coulomb's Law suggest that such electrostatic orbits are possible. However, to our knowledge, an electrostatic orbit has not previously been demonstrated. This presentation will describe our experiment and show video footage of the electrostatic orbits achieved in weightlessness.

DEVELOPMENT OF AN ON-LINE TESTING SYSTEM. *S. Zia and Y. Yu, LeMoyne-Owen College, Memphis, Tennessee.* This project will establish a web-enabled testing system to facilitate a mechanism for students to take tests on-line and support teachers allowing them to manage student information, prepare test problems, and view and analyze test results. Test problem types will include multiple choice, true/false, structured answers, and essay. The system includes three types of modules: core business modules, supporting modules and add-on modules. An overview of the design of the testing system and its functionality will be presented.

WATER QUALITY IN CANE CREEK: AN ORGANIC ANALYSIS. *L. Crowell, D. Larsen, and D. F. Harris, LeMoyne-Owen College, Memphis, Tennessee (LC, DFH) and University of Memphis, Memphis, Tennessee (DL).* It has long been thought that the water in the Memphis Aquifer is approximately two thousand years old due to the depth of the clay layer protecting the aquifer. However, more recent studies indicate there are gaps in the clay layer separating the Memphis Aquifer from shallow aquifers and surface waters, and that some of the water drawn from wells in the city is less than 20 years old. This report is part of an ongoing study of water quality in Nonconnah Creek and its tributaries. Cane Creek includes several industrial areas and cemeteries within its watershed. In addition, permitted industrial discharge occurs along the creek. A liquid-liquid extraction of organic compounds was performed under acidic and basic

conditions. The acidic and base/neutral fractions were pooled before drying, concentrating and analysis using gas chromatography/mass spectrometry. Results are compared for samples collected during dry periods and rainy conditions. (Supported by NSF Grant HBCU-UP HRD-0411493)

EFFECT OF BIOLOGICAL FLUID ABSORPTION ON LAMELLAR STRUCTURE OF ULTRA-HIGH MOLECULAR WEIGHT POLYETHYLENE. *S. Mishra, D. Scott, and A. Viano, Rhodes College, Memphis, Tennessee (DS, AV) and The University of Memphis, Memphis, Tennessee (SM).* Ultra-high molecular weight polyethylene (UHMWPE) is the preferred polymer for use in total hip replacement joints due to its nonreactivity in the body and resistance to wear. Although UHMWPE is very resilient to wear, sub-micron particles may fracture off the prosthesis as a result of extended use. While the exact mechanism behind the production of these particles is not fully known, these particles elicit defensive mechanisms from the body, leading to osteolysis and implant failure. The focus of this project falls upon the lamellae of the polymer, which are long, branching chains of polyethylene molecules that form its crystalline structure. Fluid absorption is monitored for loaded and unloaded samples by recording weight increase. Changes in crystallinity and molecular structure are examined by microscopy, thermal analysis, and infrared spectroscopy to gain an understanding of the effect of biological fluid absorption at a molecular level.

THE EFFECTS OF AGRICULTURAL LAND CLEARING SURROUNDING EMAS NATIONAL PARK, BRAZIL ON THE VIABILITY AND DIET OF THE MANED WOLF. *L. Anglin, A. Ragsdale, C. Vynne, and L. Silveira, Christian Brothers University, Memphis, Tennessee (LA, AR), University of Memphis, Memphis, Tennessee, University of Washington, Seattle, Washington, and Pro Carnivore and University Brazilla, Brazilla, Brazil.* The maned wolf, *Chrysocyon brachyurus*, dwells in the Cerrado of central South America. Emas National Park (ENP) is the largest patch of natural habitat left in central Brazil. The influence of agricultural land clearing of the wolves' natural habitat around ENP, however, is not clearly understood and needs to be examined. Seven different types of habitat were studied in and around ENP. Specially trained dogs were used to find maned wolf scat samples. These samples were collected over a period of twelve weeks and the contents were observed and categorized to determine the diet differences inside versus outside ENP. Using a chi-square test, there was no significant difference in the diets of the wolves living inside versus outside the park. Our hypothesis was rejected; however the results can be used in conjunction with other studies to analyze landscape mosaic effects. (Supported by NIH-MHIRT ST377W0000123-04)

TREE SPECIES SELECTIVITY OF WINTERING BIRDS IN AN URBAN FOREST. *A. Robinson and J. Armacost Jr., Rhodes College, Memphis, Tennessee.* Tree species preferences were investigated by monitoring the foraging behavior of seven wintering bird species in an old growth forest remnant in Memphis, Tennessee. The point quarter method was used to derive importance values for tree species, which were compared to the frequency of tree species use by each bird species to determine preference or avoidance. Previous studies have shown that foliage structure influences tree species preferences of insectivorous birds during the summer. We found that tree

species preferences were related to the diets of the wintering birds. Frugivores preferred tree species that bear fruit and granivores preferred tree species that bear small seeds or fruit. Gleaning insectivores showed no consistent pattern of preference or avoidance during the winter. The two granivores showed a preference for the invasive privet shrub (*Ligustrum*). An understanding of avian tree species preferences provides insights for successful conservation and restoration of urban parks and forests.

SEASONAL STARCH AND SUGAR CONTENT OF BAMBOO CULMS. *B. Prentiss, H. Bissell, and J. Bernard, Christian Brothers University, Memphis Tennessee (BP), Memphis Zoo, Memphis Tennessee (HB), and University of Tennessee School of Veterinary Medicine, Knoxville, Tennessee (JB).* Ninety nine percent of a giant pandas diet consists of bamboo (Wei et al., 1999). Giant pandas exhibit seasonal selection in the part (leaves or culm) of bamboo they consume, both in the wild and in captivity (Memphis Zoo, 2005). In addition, when consuming culm, pandas will often strip it, removing the outer layers and primarily the inner layers. This stripping behavior, and seasonal part selection may be due to changing levels of starch and sugars in bamboo. This experiment examined differences in starch and sugar levels of the inner, outer culms, and nodes of *Phyllostachys aureosulcata* and *Pseudosasa japonica*. Biweekly samples of bamboo were collected between February and July 2006. The samples were separated into inner culm, outer culm and nodes, and tested for starch and sugar concentration. Sugar levels didn't change, but the proportion of starch declined in June and July. This implies that pandas' selection for particular parts of bamboo may be related to changing starch levels. Knowing how pandas select their food source will help in planting species of bamboo in panda habitats that the pandas are more likely to eat, as well as improving panda diets in captivity. (Supported by Biodiversity Fellowship, Memphis Zoo)

NON-INVASIVE METHODS FOR MEASURING BAMBOO INTAKE IN GIANT PANDAS. *W. Heath, H. Bissell, and J. Bernard, Christian Brothers University, Memphis, Tennessee, Memphis Zoological Society, Memphis, Tennessee, and University of Tennessee, College of Veterinary Medicine, Knoxville, Tennessee.* Determining an accurate and practical method of measuring the bamboo intake of wild giant pandas has been elusive due to rough terrain in their natural habitat and the non-uniformity of the bamboo plant, even within species. However, captive pandas provide a unique opportunity to explore techniques for estimating intake that could be applicable to field studies. This study examined which bamboo eating behaviors were well correlated with intake, and whether fecal output could be used to estimate intake. Time spent eating, leaf wadding behaviors, and chewing were correlated with intake, while biting was not. Comparison of total fecal weight with bamboo intake, although not as precise, showed promise. If wild pandas could be consistently observed, such as with GPS-collared animals, these methods may allow researchers to estimate their daily bamboo intake. (Supported by The Memphis Zoological Society Biodiversity Fellowship)

EXPERIMENTAL AND THEORETICAL CHALLENGES OF CREATING ELECTROSTATIC ORBITS IN WEIGHTLESSNESS. *K. Andring, J. Janeski, S. Quinn, D. Keedy, D. Campbell, B. Hoffmeister, and S. Banerjee, Rhodes College, Memphis, Tennessee.* In January 2006, a team of students from Rhodes

College was awarded flight time aboard NASA's specialized C-9B aircraft known as the "Weightless Wonder" to perform an experiment in microgravity. This experiment demonstrated a prediction of Coulomb's Law that two oppositely charged spheres should orbit each other under certain conditions. However a number of issues complicate this demonstration such as polarization effects (which affect the nature of the inverse square law and thus the stability of orbits), fluctuations in the microgravity conditions, and the effects of air pressure and humidity on charge leakage. This poster will illustrate how we resolved these issues to successfully perform our experiment.

CATHEPSIN B-TARGETED SIRNA INHIBITS PROTEASE ACTIVITY AND INVASIVENESS IN ORAL CARCINOMA CELLS. *J. K. Mensah, N. Nagaraj, F. Mukarakate, N. Vigneswaran, and W. Zacharias, James Graham Brown Cancer Center, University of Louisville, Louisville, Kentucky (JKM, NN, WZ), The University of Texas Health Science Center at Houston, Houston, Texas (NV), and Tennessee State University, Nashville, Tennessee (FM).* The lysosomal cysteine protease cathepsin B is often overexpressed and/or secreted in transformed cells of diverse origin. Elevated cathepsin B enzymatic activity frequently correlates with increased malignancy in various cancers. To examine the functional role of this protease in the etiology and progression of oral carcinomas, we used a pool of short interfering RNAs (d-siRNA), generated enzymatically with the Dicer enzyme, to selectively downregulate cathepsin B in a matched pair of primary (686Tu) and metastatic (686Ln) oral squamous cell carcinoma cell lines. Western blots, enzyme activity assays, and real-time PCR were applied after transient transfection of 686Tu and 686Ln cells with cathepsin B specific d-siRNA duplexes. We observed substantially decreased cathepsin B protein expression, enzymatic activity levels and mRNA levels in a dose-, time-, and cell-dependent manner. Other proteins like cathepsin D or b-actin were not affected. Cathepsin B d-siRNA-mediated gene knockdown in 686Tu and 686Ln resulted in a reduced cellular mobility in vitro and an impaired cellular invasiveness through a reconstituted Matrigel. Such gene-specific siRNAs shall be developed into simple and useful molecular tools to dissect the roles of cathepsins in oral carcinoma invasiveness and malignant progression.

ISOLATION AND IDENTIFICATION OF PHOTOBACTERIUM GENES INVOLVED IN CELL COMMUNICATION. *T. Gross, M. Woodall, and R. J. Kuykindoll, LeMoyné-Owen College, Memphis, Tennessee.* Photobacterium of the genus *Vibrio* are gram-negative, curved-rods that are natural inhabitants of the marine environment. *Vibrio* infections cause three major illnesses gastroenteritis, wound infections, and septicemia. Many infections are food borne and are associated with consumption of raw or undercooked fish and shellfish. Luciferase is the enzyme involved in the biological production of light or bioluminescence. Bioluminescence only occurs when photobacteria are at high cell densities in a communication process called quorum sensing. Quorum sensing enables bacteria to communicate using secreted signaling molecules called auto-inducers that belong to a group of microbial hormones that are specific acylated derivatives of homoserine lactone (N-3-oxo-hexanoyl.L-homoserine lactone) designated as AHLs. The *lux* operon found in *Vibrio fischeri* contains five genes, *luxCDABE*, that are required for biological light production. The genes have been cloned in *Escherichia coli* and are on a recombinant plasmid

designated *pVTB*. Our objective was to isolate and identify photobacterium from Indonesian shrimp to identify novel *lux* genes involved in bioluminescence and quorum sensing. Shrimp were de-veined, the shell removed, and approximately 1.5 cm sections were cut and placed into six-well tissue culture plates. Sections were flooded with saline solution and were incubated for 24–48 h at 18 and 24°C. Luminescent bacterial colonies were observed after 24 h of incubation. Colonies were selected and streaked onto Photobacterium agar plates to further isolate pure colonies. Luminescent colonies were selected and inoculated into Photobacterium broth to prepare whole cell lysate for SDS-Polyacrylamide gel electrophoresis. Luminescent colonies also were selected for Genomic DNA purification. Purified genomic DNA will be used for restriction enzyme digestions and isolation and identification of novel *lux* genes. (Supported by NSF Grant HBCU-UP HRD-0411493)

DO FRESHWATER MUSSELS FORM A SINGLE GROWTH RING EVERY YEAR? *W. Sheftal and D. Kesler, Rhodes College, Memphis, Tennessee.* Our objective was to answer the question, “Do freshwater mussels form a single growth ring every year?” While apparently a simple question to answer, previous studies have not rigorously addressed this question. Using Eastern Elliptio (*Elliptio complanata*) shells marked 5–7 years before our study began, we developed criteria for recognizing an annual ring. Shells were thin sectioned and viewed microscopically at 7–40× magnification. Our determination of annual rings in the shells differed from the actual number in 28 out of 76 sections (from 46 individuals). On average, we counted 0.11 ± 0.10 SE rings more than the expected number. We subsequently re-evaluated the 28 sections we had misread and refined our criteria for recognizing true rings. We were able to apply these criteria to

all but one shell. We conclude that, using these criteria, the freshwater mussel *E. complanata* does form growth rings annually.

STUDY OF THE TRACE METAL CONTENT IN THE EXPANDABLE ALLOSCUTUM OF THE FEMALE IXODID TICK: *DERMACENTER VARIABILIS*. *L. Childs, D. Harris, and S. Majumdar, LeMoyne-Owen College, Memphis, Tennessee.* Ticks are the most prevalent vectors of infectious disease in the United States and second to mosquitoes. *Dermacentor variabilis* is one of the main vectors for Rocky Mountain Spotted Fever, a rickettsia. The highest incidence of Rocky Mountain spotted fever is among children 5–9 years old. Determination of the chemical composition of the alloscutum may improve tick disease control. The endo-cuticles under four different stages: unfed; partially fed; fully fed as well as those that have laid their eggs were collected from the host (rabbit). Without expansion of the alloscutum, the female tick cannot take in enough blood to be replete and lay eggs. Ticks must be attached to the body of the host for at least 7 to 14 days. After a blood meal the tick increases in size 200–300 times to accommodate the ingested blood. Since trace metals are critical for normal integument development and maintenance, this study was conducted to unravel possible change/redistribution of some metals as a result of the increase in endocuticle size. The metals estimated by Atomic Absorption Spectrophotometer were: Iron (Fe); Magnesium (Mg); Copper (Cu); Cadmium (Cd); Calcium (Ca); and Zinc (Zn). We recorded an increase in Fe, Zn and Ca in the partially fed cuticles compared to the unfed. The Cadmium content also increased in the cuticles of both partially fed and fully fed ticks compared with the unfed. (Supported by NSF HBCU-UP HRD-0411493)