

STEROLS OF THE GREEN-PIGMENTED, FRESHWATER RAPHDOPHYTE,  
*GONYOSTOMUM SEMEN*, FROM SCANDINAVIAN LAKES

Aaron Dahmen, Undergraduate, Biology; Jeff Leblond, Faculty, Biology; Jeff Leblond (Faculty Sponsor), Biology

Sterols are a class of membrane-reinforcing, ringed lipids that have a long history of examination in algae as a means of deriving chemotaxonomic relationships and as potential lipidic biomarkers. The *Raphidophyceae* represent a class of harmful, bloom-forming marine and freshwater algae. To date, there have been four published examinations of their sterol composition, focusing primarily on brown-pigmented, marine species within the genera, *Chattonella*, *Fibrocapsa*, and *Heterosigma*. Lacking in these examinations has been the species *Gonyostomum semen* Ehrenb., which is a green-pigmented, freshwater raphidophyte with a world-wide distribution. In this study, we have examined twenty-one isolates of *G. semen* from a number of Scandinavian lakes, and all were found to produce two major sterols, 24-ethylcholesta-5,22E-dien-3 $\beta$ -ol and 24-ethylcholest-5-en-3 $\beta$ -ol, and 24-methylcholest-5-en-3 $\beta$ -ol as a minor sterol. The results of this study indicate that geographically separate isolates of *G. semen* appear to have the same sterol biosynthetic pathway, and that there is no evolutionary divergence between the isolates with regard to sterol composition. The sterols of *G. semen* are not considered to be useful biomarkers for this particular organism because they are commonly found in other algae and plants.

## UTERINE REGENERATION IN THE POSTPARTUM MARE

Anna Caruso, Undergraduate, Agribusiness and Agriscience (URECA); Dr. John Haffner (Faculty Sponsor), ABAS/Horse Science

The purpose of this experiment is to analyze the proteins present in a mare's uterus as she undergoes post-foaling uterine healing. Mares are unique in their uterus's ability to undergo a dynamic transformation from an environment that is able to support and subsequently deliver a foal, to being prepared to accept another embryo within nine to ten days. No other animal displays such rapid recovery rates, nor has thorough research been performed to analyze why mares are able to undergo such swift uterine healing. Studies in humans have shown that certain proteins play a significant role in uterine regeneration; yet, it remains to be demonstrated if there is a quantifiable rise in secretions specifically of vascular endothelial growth factor receptor and inflammatory proteins in postpartum mares. If there is indeed a measurable rise in proteins in the post-foaling mare as predicted, then this knowledge may be used to help predict which mares are suitable candidates to rebreed during this early period so that a desirable 12-month foaling calendar is maintained.

## LOOP FILTERS AS RESONANT ELEMENTS FOR ACOUSTIC METAMATERIALS AND STOP BAND STRUCTURES

Jonathan Herlan, Undergraduate, Physics and Astronomy (URECA, Honors College); Sean LePard, Undergraduate, Physics and Astronomy; William Robertson (Faculty Sponsor), Physics and Astronomy

Two geometries of loop filters side-loaded onto an acoustic waveguide are explored using audio-frequency impulse response methods. Finite element analysis is used to elucidate the interference mechanisms in each loop filter configuration. These simulations yield transmission spectrum data in good agreement with those obtained experimentally. The ability to broaden forbidden frequency transmission regions is demonstrated by the use of a sub-wavelength spaced array of slightly detuned loop filters. The phase data from the impulse response measurements is analyzed to show that regions of negative bulk modulus exist due to anomalous dispersion at frequencies in the vicinity of the transmission minima due to loop interference mechanisms.

## A CASE STUDY ON GESTATIONAL DIABETES MELLITUS

Mackenzie Campbell, Undergraduate, Human Sciences; Ginny Bogle (Faculty Sponsor), Human Sciences

Each year a significant number of women are faced with Gestational Diabetes Mellitus (GDM), largely due to impaired insulin sensitivity found during pregnancy. Without proper treatment and control of blood glucose levels these women are at risk for fetal macrosomia, neonatal hypoglycemia, maternal hypertensive disorder, need for cesarean delivery, and development of Type 2 diabetes mellitus post-pregnancy. This research covers an overview of GDM and a case study evaluating a 31-year-old Hispanic female who has been diagnosed with GDM at 22 weeks gestational age. Early detection of GDM decreases the associated risks. Diagnosis takes place when plasma glucose levels exceed set amounts after a 75-gram Oral Glucose Tolerance Test done at 24-28 weeks of pregnancy. Treatment aims at regulating blood glucose through monitoring at least four-times per day along with urine ketone monitoring, surveillance of blood pressure and urine protein, medical nutrition therapy, and possible insulin therapy. Medical Nutrition Therapy focuses on adequate caloric intake for healthy pregnancy weight gain and a carbohydrate controlled meal plan. Possible methods for carbohydrate controlled meal plans include the plate method, carbohydrate exchanges or choices, and carbohydrate gram counting. Registered Dietitians offering medical nutrition therapy for women with GDM should encourage regular physical activity for better regulation of blood glucose levels. The patient plan in this case study includes insulin therapy along with a carbohydrate gram counting for meal planning. The patient has also been encouraged to participate in regular physical activity. It is anticipated that the patient will have a favorable outcome post-pregnancy.

## SPECIFIC MUTATION EFFECTS ON ENCODED PROTEINS ASSOCIATED WITH THE MTHFR GENE

Alissa Ruggle, Undergraduate, Biology; Rebecca Seipelt-Thiemann (Faculty Sponsor), Biology

The gene methylenetetrahydrofolate reductase (MTHFR) functions as an instructional method for producing an enzyme that assists in chemical reactions involving the vitamin-B folate. The enzyme produced is responsible for a multiple-step process that converts the amino acid homocysteine to another amino acid, methionine. There are many mutations associated with this gene, most of which involve the altering of a single amino acid and can cause impairment of the enzyme function or enzyme inactivation. Mutations may also produce a small, nonfunctional version of the enzyme that allows homocysteine to build up in the bloodstream, ultimately leading to homocystinuria. Many polymorphisms are also associated with this gene, commonly seen in cases of multiple miscarriages, anencephaly, and spina bifida. This research display was created using current human genome databases to investigate the MTHFR gene including its function, domains, possible structure, and all known associated mutations. Bioinformatics tools were then used to analyze how those mutations may affect the structure and function of the encoded protein.

## COMPARISON OF COMMERCIAL GRADE TRYPSIN

Alissa Ruggle, Undergraduate, Chemistry (Honors College); Paul Kline (Faculty Sponsor), Chemistry

Proteolytic digestion plays a central role in the identification of proteins through the technique of peptide mapping. In this technique a new protein is cleaved with a proteolytic enzyme and the peptides produced are analyzed by mass spectrometry. The resulting “peptide fingerprint” of the protein is identified by comparison to a database. The enzyme trypsin is the most widely used proteolytic enzyme. The purpose of this study was to examine the variability of trypsin preparations from various commercial suppliers. Trypsin preparations were subjected to analysis by mass spectrometry and the presence of impurities and autolysis products determined. Second the completeness of tryptic digestion on a model protein using different commercial preparations of trypsin was examined.

## CELERIAC IS AN ACCEPTABLE REPLACEMENT FOR POTATOES AT 50% IN A STANDARD MASHED POTATO RECIPE

Bobbie Marie Gregg, Undergraduate, Human Sciences; Kerstyn Motter, Undergraduate, Human Sciences; Laci Walling, Undergraduate, Human Sciences; Lauren Cromer (Faculty Sponsor), Human Sciences - Nutrition and Food Science

This study determined the acceptability and nutrient content of mashed potatoes using celeriac as a replacement for potatoes. A recent Harvard study found that for every additional serving of white potatoes that subjects added to their daily diet, regardless of how they were prepared, contributed to a pound of weight gain over four years (1). To test for an acceptable potato substitute, celeriac was used to replace 50% of the potatoes in a standard mashed potato recipe. Thirteen consumers participated in a triangle test and eleven of the thirteen consumers could tell a difference between the celeriac-mashed potatoes and the standard mashed potato recipe. Twelve consumers participated in a preference test and of those seven preferred the experimental group over the control. Analysis of the nutrient content shows that per 100 grams celeriac has 35 fewer kilocalories and almost half the amount of carbohydrates as compared to a baking potato. This study demonstrates that celeriac can replace 50% of potatoes in a standard mashed potato recipe and still produce an acceptable product.

## ACIDIC DEEP EUTECTIC SOLVENTS IN ORGANIC SYNTHESIS

Stephanie Grant, Undergraduate, Chemistry; Scott Handy (Faculty Sponsor), Chemistry

Deep Eutectic Solvents are ionic solvents comprised of a mixture of two solids. When mixed, the result is a liquid, in some cases with a very large decrease in melting point (more than 300 °C). Many different deep eutectic solvents can be prepared. In the present case, the combination of choline chloride and tosic acid (CC/TA) is the goal as it should create an inexpensive, recyclable liquid acid catalyst. This material could be applied to many organic reactions, but the current focus is the dehydration of alcohols to form alkenes. Several different aspects are being studied, including the amount of CC/TA required to promote the reaction, the number of times the CC/TA layer can be recycled, and the reaction conditions required for more and less reactive alcohols (cyclic versus linear and degree of substitution). The results of these studies have been promising so far and will be discussed.



## IMPROVING SURFACE CHARACTERISTICS OF ROLLER COMPACTED CONCRETE BY SCANNED IMAGERY ANALYSIS

Adam White, Undergraduate, Concrete Industry Management; Branson Hammrich, Undergraduate, Concrete Industry Management; Ben Menefee, Undergraduate, Concrete Industry Management; Ben Dunn, Undergraduate, Concrete Industry Management; Heather Brown (Faculty Sponsor), Concrete Industry Management

The Roller Compacted Concrete (RCC) market is vastly growing due to the cost competitiveness of RCC over its asphalt counterpart. Its durability and strength more than triple the life cycle of the pavement. The end use of the product has been large parking lots and interstate shoulders. Texture and surface imperfections have not been a primary concern in past applications of RCC. However, with increased visibility of the product mix optimization a new focus has become a new focus. With the support of the technical community, ASTM C09.44 committee, CIM students are utilizing scanned images of prepared samples to determine what mixtures create a void free surface impervious to environmental damage.

## DIFFERENCES IN PHENOTYPE, GROWTH, AND MATURATION AMONG FIVE ACCESSIONS OF *MUCUNA PRURIENS* (VELVET BEAN) GROWN IN MIDDLE TENNESSEE

Ethan Swiggart, Undergraduate, Agribusiness and Agriscience (URECA); Bryan Sallman, Undergraduate, Agribusiness and Agriscience; Nathan Phillips, Faculty, Agribusiness and Agriscience; Nathan Phillips (Faculty Sponsor), Agribusiness and Agriscience

*Mucuna pruriens* (Velvet Bean) is largely unknown in the Middle Tennessee growing region but has the potential to benefit organic and conventional growers alike. In this study, we investigated *M. pruriens* growth, maturation, and seed viability in our local growing region. Seeds were obtained from the Germplasm Resources Information Network (GRIN) and grown for a period of 205 days. Dry weights were recorded for the foliage, stems, and fruit for each of the 5 accessions. Only accessions with seed counts allowing for 100 per treatment were used for germination test. They were separated into 4 replications consisting of 25 seeds each, rolled in moist paper towels and checked daily for radicle emergence (designated at 5mm in total length). T50 and T10-90 counts were analyzed. Germination ranged from 27% to 50%. The rates of germination (T50) did not differ significantly between accessions, while the uniformity of germination (T10-90) varied significantly between accessions c (Mozambique: Osceola) (2.78) and b (Mozambique: Branco) (4.84). All accessions were separately tested for viability. Seeds were allowed to imbibe water for 24 hours before being submersed in 1.0% tetrazolium solution. Seeds were evaluated based on degree of staining consistent with the International Seed Testing Association Tetrazolium Committee. Seed viability ranged from 4.0% to 43.0%.

## THE IMPORTANCE OF REGISTERED DIETITIANS IN LIFESTYLE INTERVENTIONS FOR POLYCYSTIC OVARY SYNDROME

Amber Payne, Undergraduate, Human Sciences - Food and Nutrition; Ginny Bogle (Faculty Sponsor), Human Sciences - Food and Nutrition

Polycystic ovary syndrome (PCOS) is a common yet poorly understood metabolic and endocrine disorder that affects up to 10% of women of reproductive age. It is currently thought that there are at least ten different phenotypes of the disorder, but it is most commonly characterized by hyperandrogenism, hirsutism, menstrual irregularity, acne, and fertility problems. The afflicted are usually overweight, with high risk of developing metabolic syndrome, cardiovascular disease, and insulin resistance that can lead to type II diabetes. These complications cause emotional distress and decreased quality of life, as well as rising health care costs as the syndrome progresses to disease. This study sought to examine the current medical literature to determine nutrition and lifestyle interventions registered dietitians can make to improve quality of life and disease progression. The most commonly prescribed interventions include reduced energy or low glycemic diets, as well as increased physical activity and pharmaceuticals to promote insulin sensitivity and reduction in androgens. Unfortunately, many challenges still remain: women suffering from PCOS do not regularly seek advice from dietitians, even though they are the most appropriate source of professional advice for nutrition. In addition, the current Nutrition Care Manual used by registered dietitians lacks evidence-based practice guidelines specific to treatment of PCOS. Although dietitians can be effective with these patients by using intervention strategies for the symptoms of PCOS, further research must be done to establish interventions specifically for the syndrome, and more must be done to encourage women to seek nutritional advice from credible sources.

## THE PREVALENCE OF LATIN AMERICAN FOLK HEALTH PRACTICES IN MURFREESBORO, TENNESSEE

Caleb Hayes, Undergraduate, Sociology and Anthropology (URECA); Oscar Diaz-Ortiz (Faculty Sponsor), Foreign Languages and Literatures

This study pursued topics of alternative health practices and their prevalence among a sample of Latin Americans. Qualitative data were collected through interviews with participants at the Primary Care and Hope Clinic of Murfreesboro over an eleven week period. Methodology in the investigation followed what is called processual analysis in anthropology or grounded theory in sociology, this enabled the researcher to let the interviews unfold across several subjects of interest to the study. Informants were capable of progressing through pertinent health topics without prompting by the investigator. This method analyzed sociodemographic characteristics of the Latino American sample's sex, time spent in the US, preferential language, type of work pre and post migration, health insurance status, as well as unique features to each participant such as their health behaviors, all of which are encompassed in figures and graphs which were coded for based on recorded responses of the participants themselves. The conclusion is that some health preventative behaviors trump other alternate folk practices among the sample as seen in the graphs; however, the resulting data are valuable for the uniqueness of each participant's responses which they preserve, and which can be compared to the trends seen across the whole sample.

COMMUNICATION EXPERIENCES OF INTERNATIONAL STUDENTS IN THE  
U.S.A. COMPARISON STUDY OF CROSS-CULTURAL ADAPTATION BETWEEN  
EUROPEAN AND ASIAN STUDENTS

Rita Jones, Undergraduate, Speech and Theatre (URECA); Yang Soo Kim (Faculty Sponsor), Speech and Theatre

The purpose of the present study is to examine the communication experiences of international students on American campuses. Y. Y. Kim's (1988, 2001) Cross-cultural Adaptation Theory provides the basis for offering an explanation of the linkage between the communication competence and psychological health of international students vis-à-vis the American sociocultural milieu. In addition, the study analyzed the level of ethnic proximity and its effect on the individual adaptation experiences of European and Asian international students on American university campuses. The analysis uses portions of verbal transcripts obtained through 24 in-depth personal interviews between October and December, 2012. Participants of the interview were international students from European and Asian backgrounds who were attending universities in the central Tennessee area. The results show that host language competence and cultural similarities/differences reflected in verbal and nonverbal behaviors are important sources of psychological challenges/success for international students. European and Asian student groups are involved in different levels of communication activities with host nationals, based on their ethnic proximity and their degree of difficulty in adapting to the host culture. Nonetheless, as Kim's theory predicts, the overall outcome of the study affirms that communication is the central force in the adaptation of international students, as it promotes psychological health in an unfamiliar host cultural environment.

## IMPROVING THE FLAVOR AND HEALTH BENEFITS OF ALCOHOLIC BEVERAGES

Adam Banach, Undergraduate, Chemistry; Beng Guat Ooi, Faculty, Chemistry; Beng Ooi (Faculty Sponsor), Chemistry

Tyrosol, tryptophol and phenylethanol are phenolic compounds or fusel alcohols formed via the Ehrlich pathway by yeast metabolism. These compounds have health benefits as well as contribute to the flavors and aromas of fermented food and beverages. A particular strain of yeast, *Saccharomyces cerevisiae* strain 96581 was found to produce high amounts of these compounds. The aim of this research is to determine the optimal conditions under which the highest yield of these compounds can be achieved.

Chardonnay concentrate each supplemented with tyrosine, tryptophan, or phenylalanine, was fermented by *S. cerevisiae* 96581 and compared with the control sample prepared without the three supplementary amino acids. Malt concentrate for brewing English Ale, supplemented with the three amino acids and fermented by either *S. cerevisiae* 96581 or Ale yeast WLP002 from White Labs Inc. were also analyzed. The fusel alcohol components in the fermentation samples were purified and concentrated using the solid phase extraction technique and analyzed by gas chromatography coupled with mass spectrometry.

## TO DYE FOR: SYNTHESIS AND CHARACTERIZATION OF 5-(4-JULOLIDINYL)-2,4-PENTADIENAL AND DERIVATIVES

Honorio Gonzalez, Undergraduate, Chemistry; Andrienne Friedli, Faculty, Chemistry;  
Andrienne Friedli (Faculty Sponsor), Chemistry

Donor-acceptor polyene (D- $\pi$ -A) dyes have nonlinear responses to electric fields, including those encountered in UV and NMR spectroscopy. One of the strongest amine donors was combined with a strong acceptor in 5-(4-julolidin-4-yl)-2,4-pentadienyl N,N-diethyl thiobarbituric acid (**1**). A three-step procedure, based on modification of literature procedures for individual steps was used to synthesize **1**. Julolidine was brominated using N-bromosuccinimide to give 4-bromojulolidine. To add a pentadienyl side chain, lithium-halogen exchange was performed with t-butyl lithium, followed by nucleophilic addition to N, N-diethylamino-2,4-pentadienal. This resulted in the dark red solid 5-(4-julolidin-4-yl)-2,4-pentadienal (**2**). Finally, a Knoevenagel condensation between **1** and diethylthiobarbituric acid gave **2**. The completion of each step was confirmed by NMR spectroscopy and the intermediate products were purified using column chromatography. Compound **1**, which has a weak acceptor was purified by recrystallization and characterized with NMR and UV in a variety of solvents. Compound **2** was characterized with NMR and UV in a variety of solvents and compared that in **1**. Ionization potential calculations and bromination regioselectivity modeling were performed for three aromatic amines using Hartree-Fock and density functional theory with the 6-31G\*\* basis set.

## ANALYSIS OF MISSISSIPPIAN SHELL DEPOSITS AT SITE 40DV7 ON THE CUMBERLAND RIVER IN MIDDLE TENNESSEE

JoBeth Simon, Undergraduate, Sociology/Anthropology (URECA); Tanya Peres, Faculty, Sociology/Anthropology; Tanya Peres (Faculty Sponsor), Sociology/Anthropology

Since 2010, the Middle Cumberland Archaeology Project (MCAP) has collected data on more than a dozen shell-bearing sites along the middle portion of the Cumberland River in Tennessee. The majority of these sites date to the middle Archaic and Woodland periods; however, several of the sites have shell deposits that date to the Mississippian Period. Zooarchaeological analyses of survey data indicate that the Mississippian shell-bearing deposits are different from the Archaic and Woodland deposits in terms of species diversity and equitability. During May and June 2012, Peres and students from MTSU returned to one of these sites for further investigations. The entire horizontal extent of the shell-bearing deposits was excavated. In this paper, we present a preliminary summary of the composition of the upper Mississippian shell-bearing deposits, and compare them to the previously analyzed samples from the Archaic and Woodland components.



## DESIGNING, BUILDING, AND TESTING A LOW-COST AUTONOMOUS SEARCH AND RESCUE ROBOT FEATURING SMARTPHONE SURVEILLANCE AND CONTROL

Cody Hazelwood, Undergraduate, Computer Science and Engineering Technology (URECA); Saleh Sbenaty (Faculty Sponsor), Engineering Technology

Search and rescue is a dangerous field. Robots can greatly decrease the risks involved to rescuers; however, they are in most cases cost-prohibitive and difficult to operate. The goal of this research is to demonstrate that with inexpensive, currently available, and user-friendly technology, it is possible to design a cost-effective robot that can assist in search and rescue missions. The prototype under development will result in a fully autonomous robot capable of searching one floor of a building for hot spots. This is accomplished by using commonly available parts such as a USB webcam, wireless router, open source miniature computer, and a smartphone. As the robot automatically searches the building, it will display a video feed on a remote computer, tablet, or Android-powered smartphone. If a hot spot is detected, a notification will show up as the robot stops and focuses the camera on that location. Should the operator prefer to have complete control over the robot, the Android application will allow drive operation or camera control using the phone's accelerometer. Using a simple smartphone interface, we will demonstrate the feasibility of an operator controlling the robot with little or no training. It is our hope that in the very near future, many law enforcement, emergency management, and firefighting teams will use remotely operated assisting robots.

## EFFECTS OF THE PRE-WORKOUT SUPPLEMENT ASSAULT ON MUSCULAR FITNESS, SPEED, AND AEROBIC ENDURANCE

Carlee Daniel, Undergraduate, Health and Human Performance; Ashley Henley, Undergraduate, Health and Human Performance; Nik Mula, Undergraduate, Health and Human Performance; Dustin Hepburn, Undergraduate, Health and Human Performance; Brittany, McGowan, Undergraduate, Health and Human Performance; Joel Reece (Faculty Sponsor), Health and Human Performance

With so many individuals wanting to increase their performance in speed, strength, and endurance, the demand and use of pre-workout supplements is drastically rising. While some believe that hydration and training should maintain these factors, others tend to lean more towards supplements and other performance-enhancing products to quickly show results. **PURPOSE:** The purpose of the current study is to test and record CrossFit athletes across several components of fitness in order to analyze whether or not consuming Assault will improve performance more than consuming caffeine alone. **METHODS:** A total of 30 participants, 15 males and 15 females, were given ID numbers and randomized into a trial order. The randomized trial order determined in which order the participant would receive caffeine, Assault, or a placebo before being tested. The participants were then asked to perform a 40-yard dash to measure speed, a one mile run to assess cardiovascular endurance, and maximum repetitions of a shoulder press to measure muscular endurance. Each participant was tested three times so that they could receive all three trials. The participants waited one week between each trial. The results of each test during each trial were recorded. **RESULTS AND CONCLUSIONS:** It is hypothesized that the pre-workout supplement will show greater results in exercise performance than caffeine alone. Results and conclusions will be presented at Scholars Week.

## PRICE PREMIUMS FOR CERTIFIED ANGUS BEEF

Keith Boone, Undergraduate, Agribusiness and Agriscience; Justin Gardner (Faculty Sponsor), Agribusiness and Agriscience

Certified Angus Beef is marketed to consumers as a high quality beef product. In order to qualify for this certification beef must be sourced from cattle with a hide that is at least 51 percent black and the carcass must meet USDA standards for prime or choice grades, which are the two grades with the highest intramuscular fat. We conduct a hedonic price analysis using data from local feeder cattle sales to determine if farmers in the Middle Tennessee area receive a price premium for cattle that are likely to qualify as Certified Angus. We include variables in the model to control for the weight of the animal and the animal's gender in addition to the variables of interest, color and quality. Specifically, we found that cattle that were solid black sold for an additional seven cents per pound, and choice grade cattle sold for an additional 6 cents per pound. Both of these results are statically significant at the ten percent level. This suggests a thirteen cent per pound premium for cattle that are likely to yield Certified Angus Beef.

## MUSCULAR ENDURANCE OUTCOMES OF SOLO VERSUS PARTNER EXERCISE; DOES HAVING ANOTHER PRESENT MAKE A DIFFERENCE?

Jamie Smith, Undergraduate, Health and Human Performance; Mary Coleman, Undergraduate, Health and Human Performance; Stephon Echols, Undergraduate, Health and Human Performance; Ryan Martin, Undergraduate, Health and Human Performance; Taylor, Rhode, Health and Human Performance; Vaughn Barry (Faculty Sponsor), Health and Human Performance

Background: The many options and personal preferences for workout routines are continuously changing. One option that has been presented to the public for a longstanding term is group workout sessions. However, it is unclear if there is an inherent “competitive” aspect to the group sessions that causes a participant to perform better than they would if they were to exercise alone. The purpose of this study was to compare participants’ muscular endurance during both solo and group exercises sessions.

Methods: Twelve untrained male college students (ages 18-25) engaged in three callisthenic muscular endurance exercises in two different sessions. First, each participant performed a solo exercise. On a later date, the participants performed the exercises as a group. An instructor was present to demonstrate and collect all data from workouts by participants. The true purpose of the study was withheld from the participants in order to discern any competitive mannerisms as well as to prevent a Hawthorne Effect. The mock purpose was that we would be assessing muscular endurance between different college aged students. Results: During the poster presentation, comparison between solo and group exercise results will be discussed.

## IS THERE A SENSATION SEEKING GENE? EXAMINING THE RELATIONSHIPS AMONG FAMILY HISTORY, THE COMT VAL158MET SNP, AND SENSATION SEEKING

Ashlee Moore-Lovitt, Undergraduate, Psychology & Biology (URECA); Donald Kendrick, Faculty, Psychology; Bruce Cahoon, Faculty, Biology; Donald Kendrick (Faculty Sponsor), Psychology

Sensation-seeking is defined as “the seeking of varied, novel, complex, and intense sensations, and the willingness to take physical, social, legal and financial risks for the sake of such experience” (Zuckerman, 1994). Studies involving monozygotic & dizygotic twins have shown that 40-63% of sensation seeking is determined by heredity (De Geus, & Boomsma, 2006). The catechol-O-methyltransferase (COMT) Val158Met single nucleotide polymorphism (SNP) has been shown to affect sensation-seeking behaviors (e.g., Yacubian, et al., 2007); however, conflicting results have been reported. The present study examines the relationships among sensation-seeking, family history of sensation seeking behaviors, and the COMT Val158Met SNP. Ninety-six participants were recruited using MTSU's undergraduate research pool. Each participant completed a demographic questionnaire, the Sensation Seeking Scale (SSS-V; Zuckerman, Eysenck, & Eysenck, 1978), as well as a family history questionnaire developed for this study. Participants also provided buccal swabs for DNA analysis. Analysis of variance will be used to compare levels of sensation seeking (high, medium, and low) with family history of sensation seeking behaviors. Analysis of variance will also be used to compare level of sensation seeking on the four SSS subscales (thrill and adventure seeking, experience seeking, disinhibition, and boredom susceptibility) with family history of behaviors related to each subscale. Data regarding the Val158Met SNP, sensation seeking, and sex will be analyzed using a 3x2 factorial analysis of variance, using allele group (Val/Val, Val/Met, or Met/Met) and sex as the independent variables. These analyses will be completed for total SSS score, as well as for individual subscale scores. To the authors' knowledge, the present study will be the first to examine the relationship between family history and sensation seeking. This study will also add to the limited data regarding sensation seeking and the Val158Met SNP, and may help elucidate previously conflicting findings.

## PERCEIVED REASONS FOR SELF-INJURY: COMPARING THOSE WHO SELF-INJURE TO PEERS

Ashlee Moore-Lovitt, Undergraduate, Psychology; LaToya Favre, Graduate student, Psychology; Megan Williams, Graduate student, Psychology; Mary Ellen Fromuth, Faculty, Psychology; Angel Simmons, Psychology; Mary Ellen Fromuth (Faculty Sponsor), Psychology

The current study examined the differences in perceived functions of nonsuicidal self-injury (NSSI) between those who self-injure and peers who do not self-injure. Data from 219 participants (62% female, 60% Caucasian) were included in this analysis. In groups, participants completed the Inventory of Statements About Self-Injury (ISAS; Klonsky & Glenn, 2009), which included functions of self-injury (for those who self-injured in the last 12 months) and perceived functions of self-injury (for those who had not self-injured in the last 12 months). Ratings for NSSI functions were analyzed using independent samples t tests. The nonNSSI group rated 10 of the 13 functions statistically significantly higher than the NSSI group. Rank order of NSSI functions was compared between the NSSI group and nonNSSI group using the Wilcoxon rank-sum test. No statistically significant difference was found in the rankings of the 13 functions. Results are discussed in terms of the increased media attention paid to NSSI.

## EFFECT OF ANKLE & KNEE FLEXIBILITY & FOOT SIZE ON FLUTTER KICK TIMES OF COMPETITIVE YOUTH SWIMMERS

Elizabeth Smith, Undergraduate, Health and Human Performance; Kelvin Bennett, Undergraduate, Health and Human Performance; Dakota Logan, Undergraduate, Health and Human Performance; Matthew McColloch, Undergraduate, Health and Human Performance; Jordan, Runions, Undergraduate, Health and Human Performance; Vaughn Barry (Faculty Sponsor), Health and Human Performance

**Background:** Flexibility has been suggested as a way to enhance swimming performance; however, the literature on the flexibility of specific joints and its effect on swimming speed has contradictory results. The purpose of our study is to determine if a greater range of motion in ankle plantar flexion and dorsiflexion, range of motion for knee extension, foot width, and foot length will decrease the 20-yd flutter kick time in youth competitive swimmers.

**Methods:** Competitive youth swimmers, ages 10-18 years old, were recruited for this study. After filling out the proper consent forms and completing a thorough warm-up, swimmers completed two 20-yard flutter kick sprints with a rest period of two minutes between each trial. During the flutter kick testing, swimmers used a kickboard, holding it with their hands at the top. After a whistle, swimmers pushed off the wall, and the time was measured with a stopwatch from the first flag to the end wall. The average of the two trials was used for statistical analysis. Recorded anthropometric data included the gender, weight, height, age, and foot size of each participant. Length measurements were taken in centimeters, and weight was measured in kilograms. Each participant's degrees of flexibility for the plantar flexion and dorsiflexion of the ankle as well as knee extension were also measured. **Results/Conclusion:** During this poster presentation, the relationship between youth swimmers' anthropometric and flexibility measures versus flutter kick speed will be discussed.

## EFFECTIVENESS OF BLOOD FLOW RESTRICTION TRAINING ON MUSCULAR SIZE AND STRENGTH OF THE LATISSIMUS DORSI AND BICEPS BRACHII.

Ellen Carrillo, Undergraduate, Health and Human Performance; Adam Cranford, Undergraduate, Health and Human Performance; Alexander Zingale, Undergraduate, Health and Human Performance; Clint Henley, Undergraduate, Health and Human Performance; Byron Gregory, Student, Health and Human Performance; Vaughan Barry, Health and Human Performance; Vaughan Barry (Faculty Sponsor), Health and Human Performance

**Abstract:** Recent studies indicated low intensity (30% 1RM) resistive exercises with blood flow restriction (BFR training) are an effective way to increasing muscular size and shape. Hypertrophy adaptations achieved by utilizing this novel technique have shown significant results in as little as 6 days. Due to the low mechanical stress, a twice a-day regime can be utilized. Our research postulates that increasing recovery time would continue to demonstrate positive outcomes. The aim of our study was to assess muscle adaptations of the latissimus dorsi and the bicep brachii utilizing college-age men following low intensity resistive training.

**Methods:** Twelve college-aged men volunteered to participate in this study. During an initial assessment meeting, subjects were randomly divided into the experimental (with blood flow restriction bands) or control groups (without), filled out pre-screening questionnaire, signed informed consent forms and were assessed for baseline measurements of muscle girths and 1RM's for lat-pull down and the T-row exercises. For the next 3 weeks, participants in the experimental group performed an initial warm-up set then 4 sets of 12 reps for each exercise with the BFR band, four days a week. The control group followed the exact protocol without the BFR band. Muscle girth measurements and 1RM for each exercise were assessed two days post the last workout. **Results:** During this poster presentation we will discuss the positive adaptations of muscle size and strength utilizing blood flow restriction during low intensity (30% 1RM) resistance training. The practical applications of this unique training mode could benefit multiple populations including athletes, postoperative patients, cardiac rehabilitation patients, elderly and even astronauts to combat atrophy or enhance muscle hypertrophy and strength.



## A FACILE ROUTE TO HIGHLY TRIAZOLATED HETEROAROMATICS

Shikha Patel, Undergraduate, Chemistry; Scott Handy (Faculty Sponsor), Chemistry

Triazoles are heteroaromatic compounds of great current interest in a variety of contexts. One potential application is in the field of energetics due to the large amount of kinetic energy stored in their system and their high nitrogen content. In an effort to further enhance the energy and nitrogen content, we have investigated the synthesis of polytriazolated heteroaromatics. There are remarkably few such compounds known, likely due to the challenge in synthesizing the necessary hetroaryl azides. Using chemistry recently developed in our group, we have been able to conduct one-pot azide formation/cycloaddition on a range of brominated compounds, with particular emphasis on thiophenes. The results of these studies and a comparison of microwave and conventional heating will be discussed.

## CROSSING BOUNDARIES ALONG THE CUMBERLAND

Joey Keasler, Undergraduate, Sociology and Anthropology (URECA); Tanya Peres, Faculty, Department of Sociology and Anthropology; Aaron Deter-Wolf, Community Member, Tennessee Division of Archaeology; Dave Baluha, Community Member, Brockington and Associates Inc.; Niki Mills, Community Member, Brockington and Associates Inc.; Inna Moore, Community Member, Brockington and Associates Inc.; Ryan Robinson, Community Member, MCAP Geomorphologist; Tanya Peres (Faculty Sponsor), Sociology and Anthropology

The MTSU Middle Cumberland Archaeology Project (MCAP) investigated a multi-component shell-bearing site occupied between 7000 BC and AD 1400, along a terrace of the Cumberland River west of Nashville in May and June, 2012. The primary goals of the project were to: determine site boundaries, depth, and nature of deposits; locate the edge of the shell deposits; and train MTSU students in field survey and excavation techniques. Through the use of deep testing with bucket augers, ground penetrating radar, and excavation units and collaborations between academics, state and federal archaeologists, and Cultural Resource Management firms these goals were achieved.

## VALIDATING STEP COUNT OF THE BODYMEDIA SENSEWEAR ARMBAND PRO

Melissa Morehouse, Undergraduate, Health & Human Performance/Exercise Science; Haleigh Stafford, Undergraduate, Health & Human Performance/Exercise Science; Haley Pine, Undergraduate, Health & Human Performance/Exercise Science; Nick Steiner, Undergraduate, Health & Human Performance/Exercise Science; Vaughn Barry (Faculty Sponsor), Health & Human Performance/Exercise Science

Background: Several research articles have been written regarding the accuracy of the Sensewear Armband. Most of the research has been done on the energy expenditure, resting energy expenditure and sleep patterns. This research was conducted to validate the Sensewear Armband Pro 2's step count accuracy. Counting steps is an efficient way to assess quantity of exercise (ACSM, 2010) and can serve as motivation to be more physically active. Methods: Thirty participants were recruited. All of the subjects were not required to have a specific fitness level. Male and female subjects were recruited between the ages of 18-25. All of the subjects spent one day in the lab for this study. All participants signed a consent form and PAR-Q. Any subject with major health issues and deemed high risk according to the ACSM risk stratification guidelines were excluded. Each participant wore a New Lifestyle NL2000 pedometer (New Lifestyle, Lees Summit, MO) as well as the SenseWear Armband Mini Pro (BodyMedia, Pittsburgh, PA). SenseWear Armband Mini Pro was worn on the left arm and set individually with the person's height, weight, and physical activity. A designated researcher directly observed and counted steps with a clicker. The clicker is considered the gold standard. Subjects walked at 1.0 miles per hour (MPH) for two minutes as a warmup. Subjects then began experiment at a speed of 2.0 MPH and increased to 3.0 MPH, then 4.0 MPH, and jogged at 5.0 mph spending three minutes at each speed. When speeds were altered, subject stepped off treadmill until treadmill was at desired speed and then subject stepped back on the treadmill. The NL2000 pedometer and Sensewear armband were reset before each speed change and results were recorded after each phase. Results and Conclusion: During this poster presentation the relationship between the Sensewear Armband, the NL 2000 pedometer and the gold standard clicker will be discussed.

## A COMPARISON OF TWO TREATMENT PLANNING PROGRAMS FOR LUNG CANCER RADIATION THERAPY

Lauren Rigsby, Undergraduate, Physics and Astronomy (Honors College); George Ding, Vanderbilt Ingram Cancer Center; Victor Montemayor (Faculty Sponsor), Physics and Astronomy

Questions have arisen over the difference in the dose calculated using iPlan's pencil beam kernel algorithm and Eclipse's AAA point kernel algorithm. Eclipse's dose calculations are reliable in both homogeneous and inhomogeneous media, but iPlan's algorithm does not account for the difference in photon and electron fluence in air equivalent media. This could prove a problem when using iPlan to plan radiation treatment in the lungs. Twelve existing static beam stereotactic body radiotherapy (SBRT) lung plans from Eclipse were optimized in iPlan. Dose data for these twelve plans were taken in iPlan with the heterogeneity correction turned both on and off. These plan setups were then transferred back to Eclipse with matching monitor units (MU), gantry angles, table angles, jaw size, and multi-leaf collimator (MLC) margins. The dose data plans were compared between the corresponding plans in iPlan and Eclipse. The non-corrected plans in iPlan agreed with Eclipse within the accepted 10%. However, the heterogeneously corrected plans in iPlan differed from Eclipse by more than 25% in some cases because the pencil beam kernel algorithm does not account for dose build-up regions and scattering correctly. This is important information for anyone working in iPlan, since the heterogeneity correction actually skews the results greatly. The dose discrepancy is within the accepted allowance of 10% if the heterogeneity correction is not turned on; that is, if the lung tissue is treated as water equivalent instead of air equivalent.

This project was funded by the American Association of Physicists in Medicine (AAPM) and was carried out at the Vanderbilt-Ingram Cancer Center under the mentorship of Dr. George Ding.

## NMR AND UV SOLVATOCHROMISM IN PENTADIENYL DYES WITH AROMATIC AMINE DONORS AND THIOBARBITURIC ACID ACCEPTORS

Angela Gootee, Undergraduate, Chemistry; Andrienne Friedli, Faculty, Chemistry; Patrick Greco, Graduate Student, Chemistry; Matthew Robinson, Graduate Student, Chemistry; Andrienne Friedli (Faculty Sponsor), Chemistry

To determine effects of aromatic amine donor groups on conjugation in donor-acceptor polyene dyes, we compared experimental data for four donor moieties: N, N-dimethylaminophenyl, N-methyl indolin-5-yl, N-methyl-2,3,4-trihydroquinolin-6-yl and julolidin-4-yl in systems with pentadienyl bridges and thiobarbituric acid acceptors. The dyes were characterized by analyzing their  $^1\text{H}$  NMR,  $^{13}\text{C}$  NMR, IR, and UV spectra taken in solvents with a range of polarities. NMR assignments were made using 2-D techniques and ChemDraw modeling.  $^1\text{H}$  NMR coupling constants reflect the degree of alternation between single and double bonds in the polyene chain. Coupling constants and chemical shifts were correlated with solvent polarity. The bathochromic shift in the intramolecular charge transfer band in the UV correlates with energy of the excited state, and increases with increased solvent polarity. Since the acceptor and polyene remained constant in all four molecules, the trends were used to compare donor conjugation and strength.

## THE JOINT EFFECTS OF AROMATHERAPY AND EXERCISE AND HOW IT REDUCES ANXIETY LEVELS IN COLLEGE AGE INDIVIDUALS.

Angela Hicks, Undergraduate, Health and Human Performance; Dustin Jones, Undergraduate, Health and Human Performance; Amber Sevier-Hunt, Undergraduate, Health and Human Performance; Shayla Reynolds, Undergraduate, Health and Human Performance; Kristi Marquez, Undergraduate, Health and Human Performance; Vaughn Barry (Faculty Sponsor), Health and Human Performance

Background: Research suggests that exercise and aromatherapy independently reduce anxiety levels. Based on the literature, it is hypothesized that the independent and joint effects of exercise and aromatherapy will have a significant improvement on the symptoms of anxiety. The purpose of this study is to introduce a prescription of both treatments to observe their effects on anxiety. Methods: In this experiment a method of recording anxiety levels was determined by participants completing a survey evaluating their current anxiety status. The experiment consisted of three groups, one being prescribed exercise, one being exposed to aromatherapy treatments, and one being exposed to both regimens. This experiment was given with the intent of measuring the independent and joint effects of aromatherapy and exercise and their effects on anxiety levels. Results: During this poster presentation the relationship between exercise and aromatherapy on anxiety levels in college aged individuals will be discussed.

## DECODING THE TRANSCRIPTOME OF THE RAINBOW TROUT PINEAL GLAND USING RNA-SEQ

Suzanne Caum, Undergraduate, Biology; Jesse Chambers, Undergraduate, Biology; Mohamed Salem (Faculty Sponsor), Biology

The pineal gland is an endocrine gland found in all vertebrate species. Its significance lies in maintaining the circadian rhythm through the secretion of melatonin, a hormone known to control sleep cycles and other various behaviors. In rainbow trout (*Oncorhynchus mykiss*) and other fish, the pineal gland regulates seasonal behavior such as feeding habits and reproduction. The genome, or mapping of all genes in DNA, of rainbow trout has not been sequenced for use as a reference tool. To study genes in a species with no reference genome, a transcriptome is compiled from RNA. The transcriptome is then analyzed to identify genes that are being actively expressed in an organism or even in particular tissue cells, such as the pineal gland. Digital gene expression, known as RNA-Seq, allows sequencing the transcriptome as well as quantitative measurement of expression levels of all genes in a biological sample. To better understand the function of the pineal gland in rainbow trout, we have used the RNA-Seq to characterize the transcriptome and measure gene expression of the rainbow trout pineal gland in comparison to a transcriptome sequenced from 13 other tissues. This allowed us to distinguish genes that are specifically expressed in the pineal gland from genes that are ubiquitously expressed in all other 13 tissues sampled. Gene pathway analysis has allowed us to identify for the first time in rainbow trout genes belonging to important gene pathways including phototransduction and circadian rhythm. Insights gained from transcriptome comparisons could potentially have application in aquaculture, agriculture, and medicine.

## RNA-SEQ IDENTIFIES SNP GENETIC MARKERS AND DIFFERENTIAL GENE EXPRESSION ASSOCIATED WITH INCREASED MUSCLE YIELD IN RAINBOW TROUT

Ashlin Harris, Undergraduate, (Honors College); Rhett Layman, Graduate student; Mohamed Salem, Faculty; Mohamed Salem (Faculty Sponsor),

Background: Rainbow trout is an important food animal, making high muscle mass a desired trait. Muscle traits are complex, polygenic and difficult to improve by conventional selection. In addition, genetic marker assisted selection for desired phenotypes can be accomplished in fewer generations than traditional selection, allowing for quicker improvement in commercial populations. Single nucleotide polymorphisms (SNPs), which account for 90% of genetic differences among individuals, are ideal for marker assisted selection of desired phenotypic traits. The objective of this project is utilization of state-of-the-art RNA-Seq (whole-transcriptome sequencing) analysis to identify SNP genetic markers and characterize genes controlling muscle yield. Results: Phenotypic variations in muscle yield were measured in 100 families from the USDA rainbow trout breeding program. Variations in muscle yield were correlated to transcriptome-wide SNP allele frequencies and to global patterns of gene expression in families showing extreme phenotypes (4 high-muscle yield families [50.9% of BW  $\pm$  1.8] versus 4 low-muscle yield families [43.2% of BW  $\pm$  2.1]). We identified 127,401 presumptive SNPs; from these we identified 143 SNPs in the “high” group and 96 SNPs in the “low” group, all with a false discovery rate (FDR)  $\leq$  0.1. Currently, these putative SNP markers are being genotyped and evaluated for association with muscle yield in a ~500-fish panel. Differential gene expression between groups “high” and “low” identified 60 genes with a fold change  $\geq$   $\pm$ 2 and a FDR  $\leq$  0.1. Gene pathway analysis identified 239 SNPs and 60 differentially expressed genes responsible for amino acid and sugar metabolism as well as various metabolic pathways. Conclusion: The study identified SNP markers and differentially expressed genes and gene pathways predictive of increased muscle yield in rainbow trout. These SNPs and differentially expressed genes can be used by aquaculture institutions, such as the USDA, to improve the efficiency of trait selection in rainbow trout.



## GENDER IDENTITY AND ATTITUDES ON CAMPUS: BUILDING BRIDGES AND SOLVING PROBLEMS

Brendon Holloway, Undergraduate, Political Science; Mary Evins (Faculty Sponsor), History

Whereas tolerance of sexual orientation and acceptance of same-sex marriage grow nationwide, gender identity often remains undiscussed and unaddressed on our campus and other campuses around the nation. Universities are often ill equipped to deal with the realities and concerns of transgender students. This research investigates how faculty and students at Middle Tennessee State University view gender identity. The objective of the project is to shed light on gender diversity on campus, the importance of gender identity over and above sexual orientation, and how students and faculty view gender identities. My poster presentation will highlight results from an MTSU campus survey and personal interviews. At MTSU, in our work to build bridges, open dialogue, and foster twenty-first century citizens, we find ourselves in a leadership role on these issues on our campus. We would like to carry the conversation to Scholars Week for even wider student and faculty discussion.

## IMPROVING STUDENT ORGANIZATION COOPERATION, COMMUNICATION, AND COLLABORATION THROUGH BETTER DATA COLLECTION: IS TK20 AN ANSWER?

Joshua Moore, Undergraduate, Philosophy; Mary Evins (Faculty Sponsor), History

Middle Tennessee State University is home to over 270 student organizations representing the varied interests of our diverse student body. To further increase civic engagement throughout campus, greater sharing and communication are ongoing challenges. Building on the principles of electronic citizenship and inspired by our campus Civic Health Initiative, the university is working to establish a functioning, effective database of the work of campus organizations that can properly record and detail the efforts, energy, and outreach of MTSU students and student groups. But do the groups overlap, do their purposes coincide? Do some groups work on similar issues and not know that other groups are working on the same? Wouldn't better data collection help with improved collaboration among our student groups and their community outreach activities? Developing accessible data-collection software may be one step in the right direction, and then educating our student organizations toward its usefulness for collaborations will be the next. Will the university's TK20 initiative help in intracampus communication? To attempt to respond to these questions, I am examining Lyon civic engagement software, discussing current campus data collection processes with Student Affairs administrators and student organizations, and evaluating TK20's options with the MTSU TK20 administrator, and working with all parties to develop ways to expand MTSU's data collection and data reporting. Developing a baseline understanding of how civic engagement activities are currently recorded on campus is a starting point toward proposing how MTSU can wisely improve its campus capabilities

## ATTITUDES OF GRADUATES OF TENNESSEE HIGH SCHOOLS TOWARD SEX EDUCATION IN THE PUBLIC SCHOOLS

Amy Lambert, Undergraduate, Psychology; Matthew Harris, Undergraduate, Psychology; Grace Palmer, Undergraduate, Psychology; Shawn Brady, Undergraduate, Psychology; Gloria Hamilton, Faculty, Psychology; Gloria Hamilton (Faculty Sponsor), Psychology

Teen pregnancy and transmission of sexually transmitted diseases continue to be a problem in the state of Tennessee. Assessing attitudes and opinions of those recently graduating from Tennessee high schools could be useful in addressing this problem, moving forward. This study used a survey format to gather information from graduates of Tennessee schools about sex education. Senior level college students were asked their reactions as young adults to the content of Tennessee sex education courses, their suggestions as to what sex education classes should address, and the other sources of information about human sexuality they accessed as teenagers and whether those were trustworthy sources. Most respondents received only information on abstinence from parents and other authority figures, while experiencing pressure to engage in sexual activity, often with inaccurate information concerning risks and safer practices, from peers and media. Nearly all of those filling out the survey indicated that sex education should be taught by at least high school age, containing information concerning both abstinence and contraceptives.

## APPROACHES TO WORKING WITH STUDENTS WITH ASTHMA IN TENNESSEE SCHOOLS

Susan Taylor, Undergraduate, Psychology; Brittney Oliver, Graduate student, Psychology; Gloria Hamilton, Faculty, Psychology; Barbara Turnage, Undergraduate, Psychology; Gloria Hamilton (Faculty Sponsor), Psychology

Approximately 52,000 students in Tennessee schools have been diagnosed with asthma. “Asthma undermines the mental-emotional and physical health of [students in Tennessee schools] and has harmful effects on [their] educational outcomes through multiple pathways” (Basch, 2011, p. 606). The majority of emergency services (91% in 2009-2010) provided in Tennessee schools has involved students with asthma. Pediatric asthma adversely affects students’ educational potential and quality of life. African American students are more likely to be diagnosed with asthma and, in inner-city areas, are more likely to be medically underserved. This study uses epimapping to examine the prevention and intervention strategies used by Tennessee schools to ameliorate the impact of asthma on Tennessee students. The various prevention and intervention activities utilized in the schools and maintenance of these procedures are examined.

STUDY ON CULTIVATION AND THE PUBLIC VIEW ON HEALTH CARE REFORM: A LOOK INTO THE TERMS 'OBAMA CARE' AND 'HEALTH CARE BILL'

Michael Wilson, Undergraduate, Journalism; Ken Blake (Faculty Sponsor), Journalism

This study looks into the cultivation effect with regard to the health care legislation that has been discussed in the media over the past several years. A search was run on Lexis Nexis using the terms 'health care bill' and 'Obama Care' for both FOX News Network and MSNBC. 'Obama Care' is typically used to describe the health care legislation as a negative and 'health care bill' tends to be used when looking at the legislation in a positive way. Fox News Network should show a significantly higher use of the term 'Obama Care' than should on MSNBC. If this is true then it is an indicator that Fox News Network, as a known conservative news station, portrays the health care legislation as something to be disliked. The increased use of the term 'Obama Care' over a long period of time produces a cultivation effect because it is easier to tie the legislation to those who dislike President Obama.

## CLOSING THE SCHOOL TO PRISON PIPELINE

Andrea Boyer, Undergraduate, Psychology; Melinda Miller, Undergraduate, Psychology; Terrance Peete, Undergraduate, Psychology; Philena Haynes, Undergraduate, Psychology (McNair); Brittney Oliver, Graduate student, Psychology; Gloria Hamilton (Faculty Sponsor), Psychology

This study uses a *participatory action model* to examine the responses of Tennessee schools to two of the risk factors for teen drop-outs. More than 32,000 students are diagnosed with Attention Deficit/Hyperactivity Disorder, a heterogeneous spectrum of behaviors often found comorbid with conduct disorder, oppositional defiant disorder and learning disabilities. In addition to risky behaviors that may accompany a diagnosis of ADHD, schools report incidences of physical violence that are handled with zero tolerance and removal from the classroom. Studies have found the trajectories of the above sets of behaviors and school responses can lead to what is termed, the *School-to-Prison pipeline*.

## PREVENTING TEEN PREGNANCY IN TENNESSEE

Rebecca Huddleston, Undergraduate, Psychology; Bobby Goliday, Undergraduate, Psychology; Brittney Oliver, Undergraduate, Psychology; Gloria Hamilton (Faculty Sponsor), Psychology

Across the United States, approximately one third of teens become pregnant. Tennessee is among the states with the highest rates of teen pregnancy. Teen pregnancy correlates with adverse educational and economic outcomes for mother and child. Pregnancy creates major obstacles to educational achievements both for the mother and for the child: A longitudinal survey determined that daughters of teen mothers were 66% more likely to become teen mothers. The majority of teen mothers and their children live in poverty. This study presents data on prevention programs, both abstinence-only and abstinence-centered, designed for prevention of teen pregnancy and provides data on their effectiveness across school districts in Tennessee.

## VETS AT MTSU: ASSESSING MILITARY VETERANS' CIVIC ENGAGEMENT AS UNIVERSITY STUDENTS

Robert Devenish, Undergraduate, History; Mary Evins (Faculty Sponsor), History

As part of Middle Tennessee State University's civic health survey Spring 2013, the university's ex-military student populations are being polled about their levels of civic engagement, both on and off the campus. In order to supplement the campus civic health survey statistics on veterans, as a ROTC member I am conducting one-on-one interviews with willing veterans to ask them greater in-depth questions about their campus and community involvements and participation in local, state, and national political processes. My goal is try to understand the impacts of military life on civic life, both positively and negatively. How well are MTSU's veterans' programs supporting our vets? How can the university and student organizations better engage vets in civilian life? What can veterans teach our students about civic involvement? Interviews will develop in different directions undoubtedly. My poster presentation will evaluate the data for the benefit of the vets, the campus, and the community.



## THE BUZZ ABOUT HONEY'S USE IN WOUND TREATMENT

Aubrey Davis, Undergraduate, Nursing; Sarah Doyka, Undergraduate, Nursing; Jennifer Riley, Undergraduate, Nursing; Kelci Woodlee, Undergraduate, Nursing; Matthew Worley, Undergraduate, Nursing; Deborah Weatherspoon (Faculty Sponsor), Nursing

There has recently been a resurgence of interest in the medical uses of honey. One of these uses is a treatment for wounds. Upon surveying the current research studies conducted on the use of honey in wound treatment, we found significant results. These results differed depending on the type of honey used and the type of wounds that were treated (pressure ulcers, venous ulcers, burns, skin graft sites). Most of the results were very positive, with only one or two studies stating overall non-significant results using honey. The clinical benefits of honey are due to its antibacterial effects, as well as its ability to promote healing at the cellular level. It has additional benefits that make it an all-around exciting option for wound treatment. The results of the studies suggest that honey may gain a more important role in wound treatment in the near future. There are currently a few honey products in use in the clinical realm. These range from tubes of pure honey, to dressings impregnated with honey.

## A PRESERVICE SECONDARY MATHEMATICS TEACHER'S MODEL FOR SCAFFOLDING THE DEVELOPMENT OF PEDAGOGICAL MATHEMATICAL METACOGNITION THROUGH REFLECTIVE ANALYSIS

Alexander Murphy, Undergraduate, Mathematics (Honors College); Diane Miller (Faculty Sponsor), Mathematics

Across the United States, many teacher preparation programs are adapting to prepare preservice secondary mathematics teachers (PSMT) for increasing demands arising in and out of the classroom. Many university programs such as University of Texas at Austin's UTeach, its replication at MTSU, MTeach, and institutions like the National Science Foundation and the National Council of Teachers of Mathematics are questioning what is an appropriate depth of content knowledge, pedagogical knowledge, clinical training, and what are the characteristics of effective secondary mathematics teachers (NSF; NCTM, 2009; Wilson, Floden & Mundy, 2001). It is commonly accepted among these programs, that reflective qualities are desired within inservice teachers, particularly mathematics teachers. This study briefly references several such reflection-based inservice teacher-training programs. However, little research could be found describing a model for the implementation of meaningful reflective analysis within mathematics teacher preparation programs. Alex Murphy, a PSMT, conducted a case study that reviewed his development of both mathematical and pedagogical metacognition through reflective analysis of student work and classroom observations with the aim of defining a reflective model for scaffolding the development of such metacognition within PSMTs. This is a look into the development of Pedagogical Mathematical Metacognition (PMM) by incorporating reflective analysis of student work, interviews, classroom assessment, and tutoring. Murphy details his process of constructing a model for scaffolding the development of PMM—an interconnected awareness, regulation and exploration of mathematics and teaching, as pertaining to his experience.

## WHY DID I STAY? RELATIONAL TRANSGRESSIONS AND CHILDHOOD

Meghan Griggs, Undergraduate, Speech and Theatre; Jessica Kratzer (Faculty Sponsor),  
Speech and Theatre

The purpose of this study was to focus on people's childhood in relation to how they conduct themselves in a relationship. The research question is, does the decision to remain in an unhealthy relationship after a relational transgression has occurred have any relation to how a person was treated as a child? This paper explores aspects of unhealthy college relationships in relation to the person's relationship with their parents and upbringing as a child. Two qualitative interviews were conducted from adults who have both been and/or still involved in unhealthy relationships. The results indicate 5 themes in relation to the research question that abuse, low self-esteem, denial, sexual dependency, and adolescent neglect.

## FATE OF PENTOBARBITAL

Ki-In Keith, Undergraduate, Chemistry; Amy Pegram, Undergraduate, Environmental Science and Technology; John DiVincenzo, Faculty, Chemistry; John DiVincenzo (Faculty Sponsor), Chemistry

The goal of this study is to determine the fate of pentobarbital, a barbiturate used to euthanize farm animals, within soils. Soils were characterized for particle size, pH, and percentage organic matter. The loss on ignition method (LOI) was used to estimate the amount of organic matter contained within each soil sample. Soils with varying amounts of organic matter, and those with organic matter removed by LOI, were subjected to adsorption studies with pentobarbital. The concentration of pentobarbital in each sample was analyzed by Liquid Chromatography–Mass Spectrometry (LC-MS). Results suggest that soil organic matter levels are not the controlling factor in pentobarbital sorption. Clay content and particle size may play significant roles. However, humic acids suspended with the soil solution do seem to have an affinity for the pentobarbital. There are indications that the pentobarbital may be undergoing chemical degradation. The results from this study are helping to shed light on the fate of pentobarbital in soils and will aid in developing recommendations for the horse industry.

## THE EFFECT OF CALF BOOST® MILK REPLACER SUPPLEMENT ON DAIRY CALF HEALTH AND PERFORMANCE

Victoria Harrison, Undergraduate, Agribusiness and Agriscience (URECA); Boomer Harris, Undergraduate, Agribusiness and Agriscience; Jessica Carter (Faculty Sponsor), Agribusiness and Agriscience

Supplementation of newborn dairy calves is an important part of every dairy operation. Calves are fed colostrum for 2-3 days and then placed on a milk formula diet until they reach 8 weeks of age. The objective of this project was to investigate the role of a probiotic milk supplement (Calf Boost®) in calf development, including health and weight gain. Heifer calves (n = 8) that were born at the MTSU Dairy Farm between January 10, 2012 and October 31, 2012 were placed on the study on day 3 and the study continued until they reached 8 weeks. The Calf Boost® supplement was fed at a rate of 15 mL/calf/day. The calves were randomly assigned to either the control group (receiving normal milk replacement formula) or test group (milk replacer plus a 15 mL dose of Calf Boost® supplement). Calves were weighed on day 3 and then every 2 weeks until they reached week 8 using a digital scale. Calves were observed daily for any signs of illness or scouring and health records were maintained. Calves in the control group exhibited an average daily gain (ADG) of 1.13lbs while the calves who received the probiotic supplement gained an average of 0.93lbs/day. Although it has been documented that increased supplementation of dairy calves has a positive effect on weight gain and increased overall health, we did not see any such results during the course of the experiment. One of the main reasons for this occurrence may have been due to the limited number of heifer calves that were born at the MTSU dairy during the time of the experiment.

## THE IMPACT OF TORT REFORM ON QUERIES TO THE NATIONAL PRACTITIONER DATA BANK

Joshua Horvath, Undergraduate, Department of Economics and Finance (URECA); Stuart Fowler, Faculty, Economics and Finance; Michael Roach, Faculty, Economics and Finance; Stuart Fowler (Faculty Sponsor), Economics and Finance

This study analyzes how tort reforms affect voluntary queries to the National Practitioner Data Bank (NPDB). NPDB collects information, including adverse action reports and malpractice payments, on medical practitioners and allows health care entities to query this data. Some organizations must query the NPDB before hiring someone; for others queries are voluntary. Using voluntary queries to measure liability pressure from tort reforms, we employ Poisson regressions on a state-level panel. We find that collateral source reform and punitive evidence reform significantly reduce voluntary queries; joint and several liability reform significantly increases them. We interpret increased voluntary queries as increased due diligence efforts.

## POLARIZATION CHARACTERISTICS OF IO-RELATED JUPITER 18 MHZ RADIO EMISSIONS

Luke Reves, Undergraduate, Physics and Astronomy (URECA); Chuck Higgins (Faculty Sponsor), Physics and Astronomy

My research in radio emission studies of Jupiter is made up of three parts: The first is analyzing the polarization characteristics of the 18 MHz data. We have 37 recorded observation events from 1997-2003 from the University of Florida Radio Observatory (URFO). We compare the axial-ratio data from two different antennas, a crossed-yagi (18P) and a conical spiral (18TP) and look for any bias that might be present. The second project is the analysis of data on Jupiter radio events where the polarization changes. Here we gather some statistics and discuss models that might explain this phenomenon. The third project is the construction and testing of a square dipole array for measuring the polarization of incoming Jupiter radio storms. This array is a modified version of a regular two dipole array that is specifically designed for recording a radio storm event on the 21.1 MHz, but with separate channels for R.H. and L.H. polarization.

## RELATIVE DEFORMABILITY OF RED BLOOD CELLS IN SICKLE CELL TRAIT AND SICKLE CELL ANEMIA BY TRAPPING AND DRAGGING

Rance Solomon, Undergraduate, Physics and Astronomy; James Cooper, Undergraduate, Physics and Astronomy (URECA); Gabriel Welker, Undergraduate, Physics and Astronomy; Anthony Farone, Faculty, Biology; Mary, Farone, Faculty, Biology; Daniel Erenso (Faculty Sponsor), Physics and Astronomy

Presented in the following is a quantitative investigation into the physical deformabilities of red blood cells carrying sickle cell trait and sickle cell anemia compared to that of normal red blood cells. The measurements were performed using optical tweezers, enabling the capture and displacement of red blood cells suspended in fetal bovine serum over a three-dimensional field of range on the nanometer scale. The viscosity of the bovine serum provided a resisting force on the displacement of the red blood cells. Consequently, the resisting force opposite the motion of the trapped cell causes a deformation of the cell. This deformation, when measured over a sizeable populace of cells, led to the conclusion that sickle cells express higher resistance to deformation than their trait-carrying counterparts.



## THE EFFECT OF LIVE COMPETITION ON PERFORMANCE AND PHYSIOLOGICAL CHARACTERISTICS

Gabriell Gassaway, Undergraduate, Health and Human Performance; Mary Ramsey, Undergraduate, Health and Human Performance; Malynna Khamken, Undergraduate, Health and Human Performance; Keyonna Newsome, Undergraduate, Health and Human Performance; Joel Reece (Faculty Sponsor), Health and Human Performance

Physical activity through the use of video gaming systems has become significantly popular over the past seven years through advances by Nintendo® and Microsoft. These innovative gaming systems allow players to play against a computer opponent or a human partner. **PURPOSE:** The purpose of this study is to compare how performance and intensity change when challenged by a human opponent versus playing against a computer opponent. **METHODS:** A total of 32 participants, 16 females and 16 males, were used for the experiment. Each person went through a familiarization session where they participated in (3) pre-selected songs on a medium level against the computer (Wii). The following two sessions were randomized and participants were either placed with a human competitor or the default computer opponent. During each session performance score, heart rate, and rate of perceived exertion were measured for each individual. **RESULTS:** It is hypothesized that playing against a human opponent will increase your performance skill level due to live competition and competitiveness; and, competing against a human opponent will elicit a higher physiological response than a computer opponent. Data collection is currently in progress and results will be presented during the poster presentation. **CONCLUSION:** Conclusions will be presented during the poster presentation.

WHY DOES AMERICA HATE SOCIALISM? A RHETORICAL ANALYSIS OF AMERICAN VALUES AND THEIR CONTRAST WITH THE ECONOMIC SYSTEM THAT IS SOCIALISM

Lucas Osborne, Undergraduate, Speech and Theatre; Patrick Richey (Faculty Sponsor), Speech and Theatre

Socialism is a term that often has negative connotations in the United States. This inquiry will analyze American values and influences and how they are rhetorically created. Specifically, how notable figures of mass media outlets have continued to uphold and defend the ideology of the “American Dream” while eradicating any other way of thought that differs from this single rhetorical value. This inquiry will utilize theoretical concepts of Kenneth Burke's God and Devil Terms. Burke's theory investigates the complete idealization of one object while creating utmost negativity of another. The artifact analyzed in this work is mass media's contempt of the term “socialism” developed shortly after the passage of the Affordable Health Care Act as one strategy the Tea Party incorporated to gain political influence.

## LABORATORY-DIRECTED EVOLUTION OF A SALT-TOLERANT LUCIFERASE FOR HALOBACTERIUM SALINARUM

Mayank Patel, Undergraduate, Biology; Maryam Heydari, Graduate student, Biology; James Robertson, Faculty, Biology; James Robertson (Faculty Sponsor), Biology

Extremophiles are microbes that live in extreme environments that are normally too harsh for life, like hydrothermal vents, alkaline lakes, and the Dead Sea. Understanding the capabilities and behaviors for unique survival strategies are important to biologists for several reasons: 1) providing insight into how early life may have originated on earth, 2) demonstrating how life may exist on non-earthlike planets, and 3) providing industry with useful enzymes that work in harsh conditions. Studying extremophiles in the laboratory can be difficult. Not only must their extreme environment be replicated in the lab, but their microscopic size and simple lifestyle provide only a few observable behaviors that can be monitored. One tool we have for observing gene activity in non-extreme microbes is firefly luciferase, an enzyme which gives lightning bugs their distinctive flash and glow. A problem arises, however, if we want to use luciferase to study extremophiles. The luciferase enzyme has naturally evolved to function in the non-extreme firefly, and therefore has only been useful as a tool to study non-extreme microbes. The exotic conditions and physiology of extremophiles destroy proteins (like luciferase) that are not suited to function in the extreme environment. In this investigation, we use Laboratory-Directed Evolution to mimic the process of natural evolution but on a much more rapid timeframe. Our purpose is to develop a luciferase that is more salt-tolerant so that the enzyme will function in the salt-loving extremophile *Halobacterium salinarum*, a microbe that lives in salt water 8 times saltier than the ocean.

## A COMPUTATIONAL INVESTIGATION OF THE ANOMERIC EFFECT

Jordan Dodson, Undergraduate, Chemistry (Honors College); Preston MacDougall (Faculty Sponsor), Chemistry

The anomeric effect can be defined as the preference for an electronegative substituent at the anomeric carbon to favor the axial rather than the equatorial position. Extending previous work on the generalized anomeric effect, which also includes acyclic systems, we show that the alignment of critical points (CPs) in the Laplacian of the electronic charge density,  $\nabla^2 \rho$ , is closely linked to the stability of compounds exhibiting the anomeric effect. Whereas past investigations of this type have focused on the magnitude of these CPs, we find that their alignment and separation is a very consistent indicator of all anomeric interactions. Also, using the theory of atoms in molecules, we show in several species exhibiting the anomeric effect that the atomic energy of the anomeric carbon is strongly correlated to the molecular energy. This atomic-molecular energy trend is unique to the anomeric carbon. Financial support is acknowledged from the Office of Science, U.S. Department of Energy.

## EFFECTS OF MODERATE EXERCISE ON MATH TESTING

Matt Henry, Undergraduate, Health and Human Performance; Kierstin Potts, Undergraduate, Health and Human Performance; Jay Garner, Undergraduate, Health and Human Performance; Jay Strobino, Undergraduate, Health and Human Performance; Ryan Washington, Undergraduate, Health and Human Performance; Joel Reece (Faculty Sponsor), Health and Human Performance

With college students' main focus being on their studies, in combination with the increasing importance of standardized testing, test and exam grades are of the utmost importance. For this reason, it would be extremely beneficial to have a study-confirmed exam preparation technique that was shown to improve test taking. What if something as simple and brief as moderate exercise prior to testing could improve the speed and/or accuracy of those test scores? **PURPOSE:** The purpose of the current study was to determine if acute bouts of moderate intensity exercise prior to mathematic testing would increase test scores and/or accuracy. **METHODS:** A total of 20 individuals, half male and half female, participated in this study. Upon arrival, the participants were randomized into intervention and control trials. The control trial preceded their math testing with no physical activity, but rather sitting and viewing a 12 minute scenic nature video. The intervention trial however, preceded their math test with a 10 minute, moderate intensity walk on a treadmill with a 2 minute cool-down. During this walk, the intervention trial viewed the same video. The participants served as their own control, as they completed both intervention and control trials within a week's time. **RESULTS:** Data collection is currently in progress. However, the hypothesis for this study is that the moderate intensity exercise prior to testing will increase the speed and accuracy, when compared to the non-stimulated control trial. **CONCLUSION:** The conclusion will be presented during the poster presentation.

## PERFORMANCE EVALUATION OF ULTRA-HIGH PERFORMANCE CONCRETE

Robert Holly, Undergraduate, Concrete Industry Management; Matthew McCann, Undergraduate, Concrete Industry Management; Joshua Smith, Undergraduate, Concrete Industry Management; Benjamin Bass, Undergraduate, Concrete Industry Management; Zhifu Yang (Faculty Sponsor), Concrete Industry Management

Advances in cementitious materials resulted in the development of Ultra-High Performance Concrete (UHPC). While this material has demonstrated exceptional performance when used as a grout material in connecting precast concrete panels; careful attention must be paid to the construction and curing practices to achieve enhanced mechanical and durability properties. In particular, when steel fibers are added to improve the toughness of materials, adequate rheological properties are required to assure appropriate mixing and success in filling the hidden voids. As a result, testing of various types of UHPC under similar service conditions is essential to establish the quality and serviceability of materials.

## A STUDY OF THE GAS PHASE REACTION BETWEEN CHLORINE DIOXIDE AND THREE BYPRODUCTS OF MAMMALIAN PUTREFACTION

Anna Love, Undergraduate, Chemistry; Ngee Chong, Faculty, Chemistry; Ngee Chong (Faculty Sponsor), Chemistry

The Environmental Protection Agency has approved liquid chlorine dioxide as a safe and effective treatment for sanitizing municipal water, disinfecting meat, poultry, and produce, bleaching paper pulp and remediating anthrax spores, while gaseous chlorine dioxide has been approved as a sterilizer for use in manufacturing laboratory equipment, environmental surfaces, tools, and clean rooms. This study aims to characterize the products of the gas phase reaction between chlorine dioxide and malodorous compounds produced during mammalian putrefaction. Three model compounds, cadaverine (amine), 2-hexanone (ketone), and cyclohexyl-mercaptan (thiol), were used to probe the reaction kinetics of chlorine dioxide in the gas phase. The identification of reactants and products was carried out using a Fourier transform infrared spectrometer (FT-IR) and a 2.4-meter gas cell. The reaction between cadaverine and chlorine dioxide produced ammonia, which was more readily observed at the spectrometer resolution of  $0.5\text{ cm}^{-1}$  compared to  $4\text{ cm}^{-1}$ . A gas chromatograph-mass spectrometer (GC-MS) has also been used to characterize the intermediate organic compounds resulting from the reactions of the model compounds. Although the GC-MS provides lower detection limits for the products along with more confident identification of the unknown organic intermediates, the chlorine dioxide gives undesired by-products due to reaction with the Tenax sorbent of the pre-concentrator, complicating the interpretation of results. Therefore, the future GC-MS study will be conducted with a glass bead trap in place of the Tenax sorbent material.

## THE USE OF RUMEN TEMPERATURE BOLUSES TO MONITOR DAIRY COW HEALTH AND PRODUCTION IN A COMPOST-BEDDED PACK BARN

Boomer Harris, Undergraduate, Agribusiness and Agriscience; Ellen Lovell, Undergraduate, Agribusiness & Agriscience; Jessica Carter, Faculty, Agribusiness and Agriscience; Jessica Carter (Faculty Sponsor), Agribusiness and Agriscience

A study was conducted at the MTSU Experiential Learning and Research Center to compare milk production, activity levels, and body temperatures across three breeds of milk cows. The breeds monitored in this study were Holstein, Jersey, and Jersey x Holstein crosses. The study was conducted using 82 lactating dairy cows. Of those 82 cows, 35 were Holstein, 32 were Jersey, and 15 were crossbred. Cow production was monitored with an identification band that was equipped with a pedometer on their leg. This identification band monitors daily milk yield, cow activity levels (number of steps taken per day), and conductivity levels in the milk (an indication of somatic cell count). Cows also had a rumen bolus (Bella Ag) that monitored their core body temperature daily. All of these cows were fed the same feed and were milked 2 times per day, 7 days per week. The cows had water readily available 24 hours a day. The daily milk yield, activity levels and conductivity levels are measured when the cows enter the parlor for milking. Body temperature was recorded at random times throughout a 24 hour period and readings were sent to the computer to be downloaded. An average body temperature per day per cow was calculated and compared with production records and activity levels. Data were compiled from October 1, 2012 until December 31, 2012. Results are being compiled and analyzed using SAS 9.2 software.



## DETECTION OF GROUP A STREPTOCOCCUS BY FLUORESCENTLY-LABELED MONOCLONAL ANTIBODY

Logan Smith, Undergraduate, Biology (Honors College); Stephen Wright (Faculty Sponsor), Biology

Despite the ability to identify many microorganisms responsible for disease and respond with appropriate antibiotics, morbidity and mortality due to infectious agents continues to thwart modern medicine. *Streptococcus pyogenes*, also known as Group A *Streptococcus* (GAS) is responsible for a variety of diseases, ranging from Strep throat to necrotizing fasciitis. Because of the virulent nature of this organism, it is estimated that nearly 700 million annual cases of GAS occur worldwide. While rapid-test kits are commonly used in a diagnostic setting, these kits frequently lack adequate sensitivity and specificity. This project was undertaken to evaluate GAS for detection through fluorescence-based monoclonal antibody binding to the bacteria. Suspected GAS samples were provided by the Murfreesboro Medical Clinic. Organisms were isolated on blood agar plates; verification of beta hemolysis and bacitracin sensitivity confirmed GAS. Dilutions were prepared from overnight broth cultures in order to evaluate the limit of detection by fluorescent antibody for sensitivity studies. The long term goal of this investigation is to compare fluorescence-based detection with developing technology based on Surface Electromagnetic Wave shifts which does not require labels for detection of antibody-antigen binding.

A COMPARATIVE ANALYSIS OF WASTE DISPOSAL PATTERNS AT THE  
HEALTH, WELLNESS, AND RECREATION CENTER ON THE MIDDLE  
TENNESSEE STATE UNIVERSITY CAMPUS, MURFREESBORO, TENNESSEE

Rachel Tyree, Undergraduate, Anthropology; William McCrary, Undergraduate, Forensic  
Science; Tanya Peres (Faculty Sponsor), Anthropology

This study conducted on the Middle Tennessee State University campus during Fall 2012 is an attempt to utilize the archaeological discipline of garbology to determine the influence of the Health, Wellness, and Recreation Center on student, faculty, and visitor food and drink choices by comparing waste found at this facility to other sites located in the interior of the campus. The researchers sought to determine whether or not healthier food items were found in proximity to the auxiliary recreation center or to the interior campus, if any deviation existed at all. The data collected from ground litter surveys and one hundred percent sample garbage collections were interpreted to find that, while a similar variety of food and drink items are found throughout the MTSU campus, the ratios of healthy items to unhealthy items found near the Health, Wellness, and Recreation Center were higher than those found at sample sites elsewhere on campus.

## ASSESSING THE BASELINE AWARENESS LEVEL OF WOMEN IN SCIENCE ROLE MODELS IN TENNESSEE

Rachel Davies, Undergraduate, Chemistry (URECA); Marleya Daughters, Community Member, Political Science; Elizabeth Sharp, Undergraduate, Sociology and Anthropology; Angel Talamantes, Undergraduate, Psychology; Judith, Iriarte-Gross, Faculty, Chemistry; Judith Iriarte-Gross (Faculty Sponsor), Chemistry

Tennessee women are currently underrepresented in many STEM fields, including chemistry. In Tennessee, possibly due to a more conservative culture, the history of women in science is especially inaccessible. Recognizing that role models, especially those that share similar backgrounds, are a major influence on the career choices of women and girls, we have created The Bio Project, an effort to promote women role models in STEM from Tennessee. For this project, we have identified and researched Tennessee women in STEM, focusing on their achievements and challenges. We then conducted a survey to ascertain the baseline awareness level of these women among Tennesseans, and found that there was little to no awareness of their names, let alone their achievements. Using this data, we will be able to assess our progress and efficacy as we promote these role models in the future.

## THE EFFECT OF PHAGE THERAPY ON *ESCHERICHIA COLI*: POTENTIAL USE AS AN ANTIBIOTIC ALTERNATIVE

Kristen Tithof, Undergraduate, Biology; Stephen Wright (Faculty Sponsor), Biology

Since earliest recorded history, humans have been plagued by the ubiquitous presence of bacteria. While the development of antibiotics has helped control the spread of bacterial diseases, there is growing concern over antibiotic resistance. A promising alternative to antibiotics may be the use of phage therapy. Phages are viruses that infect and kill bacteria, yet theoretically pose no threat to humans. Due to specificity between the phage attachment protein and the bacterial host receptor, the use of phage as therapeutic agents can be tailored against specific bacteria of concern, leaving helpful normal flora bacteria intact. While it would be unlikely for a single phage to eradicate all its host bacteria, the use of multiple phage infecting the same host simultaneously may reduce the offending organism to low levels. For this project, in vitro experiments were conducted to test the effectiveness of four different phages (T4, MW, SW,  $\phi$ X174) against two host strains of *Escherichia coli* (HB101, C). After using different combinations of phage with their bacterial host, the experimental data suggests that phage therapy may be an effective biocontrol agent against *E. coli* infections.

## THE EFFECTS OF FIVE HOUR ENERGY ON MUSCULAR STRENGTH IN THE LOWER BODY

Kasie Meeks, Undergraduate, Health and Human Performance; Amy Burns, Undergraduate, Health and Human Performance; Andrew Murray, Undergraduate, Health and Human Performance; Matthew McCaghren, Undergraduate, Health and Human Performance; Vaughn Barry (Faculty Sponsor), Health and Human Performance

**Background:** Previous research articles have determined a positive effect on muscular strength from the consumption of caffeine via energy drinks. However, little research has been done to accurately show at what dosage the effects take place. The purpose of this study is to determine if there is a dose response relationship between the amount of caffeine via 5 Hour Energy ingested and its effect on lower body muscular strength. **Methods:** Participants came into the lab and their weight and height were taken. A demonstration of the back squat was performed to familiarize the participants with the proper technique. On the three testing days, participants consumed 0mg, 3mg, or 6mg of caffeine via 5 Hour Energy mixed with flavored water. An hour later participants performed a 1 repetition maximum back squat exercise and data was recorded. This was a double blind, counterbalanced study design, and neither the researchers nor the participants knew the dose was being given. The purpose of the study was disguised to avoid bias, and participants thought the effects of 5 Hour Energy on muscular soreness were being studied. **Results/Conclusion:** During this poster presentation the dose response relationship between caffeine via 5 Hour Energy and lower body muscular strength will be discussed.

## MENSWEAR MERCHANDISING

Tabitha Vinson, Undergraduate, Human Sciences; DeMarcus Jackson, Undergraduate, Human Sciences; Lauren Rudd (Faculty Sponsor), Human Sciences

The Textiles, Merchandising, and Design (TXMD) students in the Computer Aided Apparel Design (CAD 1) class researched men's clothing preferences and purchasing behaviors. The students created a general questionnaire that was used by each student to interview friends or family members. Each student interviewed one man in each of the following three categories: Pre-Professional, Professional, and Retired. The men were queried regarding clothing fit and wearing preferences, and purchasing behavior and frequency. The students discussed their questionnaire responses and developed "style boards" to recommend clothing styles appropriate for the men who they interviewed in each of the three categories. The style boards entailed researching available clothing and companies to match the needs of the menswear target markets. The CAD students then created a sample display window on the computer to merchandise product to one of the three menswear target market categories. The students were required to address the preferences of the interviewee and to develop a display which would attract his attention, keep his interest in the product, and encourage purchase of the product. The poster shows the best student window displays.

## THE EFFECTS OF COMPLEMENTARY AND ALTERNATIVE MEDICINE ON PAIN MANAGEMENT

Jamie Leach, Undergraduate, Nursing; Lisa Lewis, Undergraduate, Nursing; Kiersten Bible, Undergraduate, Nursing; Sarah Smith, Undergraduate, Nursing; Emily Grissom, Undergraduate, Nursing; Ashlyn Pickett, Undergraduate, Nursing; Deborah Weatherspoon (Faculty Sponsor), Nursing

Research has shown that complementary and alternative medicines (CAM) are adequately effective in easing the suffering of patients with chronic pain. The goal is to inform individuals that CAM is beneficial for pain management along with conventional treatment. The research of specific methods such as acupuncture, yoga, hypnosis, massage therapy, meditation, and healing touch, revealed evidence of effective pain relief. In other cases it was thought to be the relaxation and cognitive changes that provided relief. Participants were put through several sessions involving each of the specific methods to evaluate each individual experience and changes in pain. In these studies it was obvious that it was a whole body experience that made such a great difference in dealing with chronic pain. The participants experienced a sense of relaxation, understanding of their body, increased emotional strength, made it possible for persons to live life to the fullest.

RATIONALIZED SCRIPT THEORY: INTERSECTING THE THEORIES OF WEBER, MEAD, AND GOFFMAN TO DEFINE A NEW THEORETICAL FRAMEWORK OF RATIONALIZED SCRIPTS.

Timothy Edgemon, Undergraduate, Sociology and Anthropology (Honors College);  
Meredith Dye (Faculty Sponsor), Sociology and Anthropology

The purpose of this project is to define and develop a proposed rationalized script theory and support this theory through a critical content analysis of social interaction rituals. This theory is a synthesis of Weber's rationalization theory, Goffman's script theory, and Mead's significant meaning theory. After these three major theories are defined, I intersect them to define rationalized script theory as the process by which the amount of social scripts present in the social environment is being continually reduced. I provide a critical content analysis of political rhetoric discourse to demonstrate and utilize the political binary present in American society as a vehicle to the theoretical application of rationalized scripts. This allows me to demonstrate the effects that rationalized scripts have upon the larger framework of society. By doing this, I demonstrate how rationalized script theory can provide a framework for understanding why there is a communication breakdown between the binaries present in American society. I conclude by finding and asserting that rationalized scripts make it impossible for dominate groups in society to have meaningful, significant communication between each other due to the rationalization of each group's respective scripts.



## EFFECTS OF GOSSYPOL ON YEAST CELL MEIOSIS

Lema Sbenaty, Undergraduate, Chemistry (Honors College); Andrew Burden (Faculty Sponsor), Chemistry

Topoisomerases are enzymes that are involved in the regulation of DNA topology. They act by passing DNA strands or double helices through one another and resealing the break once the strand has passed through. Topoisomerase II cuts both strands of the DNA helix simultaneously and passes a second double helix through the break in order to untangle and relax DNA supercoils. This enzyme exists in every organism and plays an essential role in DNA replication, metabolism, recombination, and chromosome segregation; it has also been proven to be clinically important as a target for certain anti-cancer drugs due to its critical functions in the cell. There are two types of drugs that are able to affect topoisomerase II activity, inhibitors and poisons. While inhibitors interfere with the overall catalytic activity of the enzyme, poisons increase the level of cleaved DNA intermediates, which leads to permanent breaks in chromosomes. These breaks, which are made permanent by DNA helicase, often cause a cell to die when they become too great in number for a cell to repair. If topoisomerase II is not active or is completely absent from the cell, recombined chromosomes cannot be segregated in meiosis I, which means the last step of meiosis I cannot be completed. This would imply that the obstruction of meiosis I by topoisomerase II inhibiting drugs would stop meiosis and, by extension, germ cell development. Gossypol, an inhibitor found in cotton plants, has been shown to be a possible anti-cancer drug. The purpose of this research is to better understand whether or not gossypol can inhibit topoisomerase II in yeast and thereby inhibit meiosis I. If it does, then this would suggest the possibility that the antifertility effects of gossypol may be facilitated, at least in part, by its inhibition of topoisomerase II.

## EXAMINING THE RELATIONSHIP BETWEEN SIGNS AND SYMPTOMS OF DEPRESSION AND SUICIDAL TENDENCIES AMONG HIGH SCHOOL STUDENTS IN TENNESSEE

Laura Arner, Undergraduate, Health and Human Performance; Andrew Owusu, Faculty, Health and Human Performance; Brittney Oliver, Graduate student, Health and Human Performance; Andrew Owusu, (Faculty Sponsor), Health and Human Performance

Introduction: According to the CDC, 12% of deaths among adolescents ranging from 10 to 24 years of age are attributed to suicide. In Tennessee, suicide is the third leading cause of death among those ages 10 to 24. The rate of suicide in Tennessee is 14.4 per 100,000 individuals which is higher than the national average of 10.8 per 100,000 individuals. The ideation and attempt of suicide is a widespread problem that can be associated with signs and symptoms of depression. Since adolescence can be an emotionally difficult time for teens, this study examines the relationship between depression and suicide status among adolescents in Tennessee in order to better understand suicide related issues among high school students in Tennessee. Methods: Data from the self-administered 2011 Tennessee Youth Risk Behavior Survey was examined using questions regarding signs and symptoms of depression as well as suicide. The selected independent variable was signs of depression. The dependent variables were; suicide ideation, suicide planning, and suicide attempt. Results: Odds ratios were calculated for 2 X 2 complex samples cross-tabulations. Significant relationships existed between signs of depression and suicide ideation, (OR= 10.4 [7.6-14.3]), signs of depression and suicide planning (OR= 9.0 [6.6-12.1]), signs of depression and suicide attempt one or more times (OR=13.9 [7.7-25.2]). Conclusions: Significant relationships between students' reports of depression and suicide related behavior indicate the need for further investigation into mental health issues among Tennessee adolescents. Practitioners and health educators working with Tennessee adolescents experiencing depression should be aware of this relationship and should tailor interventions to consider, and as needed address, both depression and suicidal issues simultaneously.

## GRATING ENHANCED ELECTROMAGNETIC FIELDS IN PHOTONIC BAND-GAP MULTILAYERS

Robert Daniel Murphy, Undergraduate, Physics and Astronomy (URECA); William Robertson (Faculty Sponsor), Physics and Astronomy

This poster presents a computational study of a unique dielectric structure capable of dramatically enhancing linear and non-linear optical effects. The enhancement results from localizing light from a three dimensional beam into a two dimensional Surface Electromagnetic Wave (SEW) in a Photonic Band-gap (PBG) multilayer. This process leads to the amplification of the electromagnetic field of light by several orders of magnitude. Coupling light into a SEW is typically performed using a prism arrangement to overcome the phase mismatch between light and SEWs. Through COMSOL simulations, it was determined that SEWs can be efficiently generated by coupling light with a diffraction grating. COMSOL is a commercial platform implementing the finite element method of solving systems described by differential equations. This grating-based approach allows more layers to be added to the PBG multilayer while still allowing light to sharply couple into SEWs. The sensitivity and efficiency of such coupling was investigated as a function of the wavelength of light, the height of the diffraction grating, and the number of layers in the PBG multilayer configuration. In optimal configurations, a simulated amplification in the field intensity orders of magnitudes above that of the incident light is achieved.

## ACUTE BOUTS OF EXERCISE AND TESTING PERFORMANCE

Anna Jackson, Undergraduate, Health and Human Performance; Lucretia Williams, Undergraduate, Health and Human Performance; Sharnika Thomas, Undergraduate, Health and Human Performance; Andrew Ellsworth, Undergraduate, Health and Human Performance; Kara Jones, Undergraduate, Health and Human Performance; Joel Reece (Faculty Sponsor), Health and Human Performance

Exercise is known to improve cardiovascular disease, obesity, and overall health. While health is important, exercise can also improve brain cognition. Brain cognition goes hand in hand with performance in school. While exercise has been shown to improve brain cognition, it may also prove to improve testing performances in math, reading, and vocabulary. **PURPOSE:** The purpose of the current study is to determine whether an acute bout of exercise just prior to testing will improve testing performance in math, reading, and vocabulary. **METHODS:** A total of 30 participants were randomly assigned to an exercise trial or non-exercise trial. The Non-exercise trial will remain sedentary 30 minutes prior to testing, as the exercise trial will exercise for 30 minutes prior to the test. The exercise trial will perform lightweight dumbbell sets and cardio. The test taken will involve 10 questions of simple algebra, 10 reading comprehension questions, and 5 vocabulary questions. **RESULTS:** It is hypothesized that one acute bout of strength and cardio prior to testing will improve testing performance. Data collection is currently in process. Results will be presented during the poster presentation. **CONCLUSION:** Conclusions will be presented at the end on the poster.

## EFFECTS OF GOSSYPOL ON TOPOISOMERASE II BINDING TO DNA

Justice Courtney, Undergraduate, Chemistry; Andrew Burden (Faculty Sponsor),  
Chemistry

DNA topoisomerase II is an enzyme that alters the supercoiled state of DNA, and is likely involved in most processes involving DNA. Gossypol, a toxin found in cotton, has been previously shown to inhibit the catalytic activity of topoisomerase II, in part by inhibiting binding of the enzyme to DNA (at very high gossypol concentration). Electrophoretic mobility shift assays using agarose gel electrophoresis was used to confirm the effects of gossypol on binding of topoisomerase II to DNA, and to establish a concentration range over which this effect varies. The amount of enzyme required to completely bind the plasmid DNA was first determined. This was done by incubating increasing amounts of enzyme with DNA to establish a binding equilibrium, followed by agarose gel electrophoresis (under nondenaturing conditions). The effects of varying gossypol concentration on the binding of the enzyme to DNA will next be determined at the optimal concentration of enzyme.

## VISUAL RHETORIC: ROAD TO REDEMPTION

Kendra Campbell, Undergraduate, Speech and Theatre (Honors College); Patrick Richey (Faculty Sponsor), Speech and Theatre

There are many federal and state prison art programs designed to help in the reparation process of inmates. A close visual rhetorical analysis of prison paintings may be one method of explaining the success in such programs. An example could be when an individual convicted of murder begins painting. The colors are often dark and the lines are very blurred. This could be evidence of a psychological deficiency such as a hardening of conscience that is unable to distinguish right from wrong. However, after time in a correctional institution, inmates begin to experiment with color. The paintings become brighter and the lines become sharper and more defined. This study rhetorically analyzes pieces of artwork created by individuals in correctional facilities and identifies the common themes that may be found among them to create a better understanding of the rhetorical meaning of prison art.

## A COMPARISON OF SINGLE PILOT EFFICIENCY IN A DIVERSION SITUATION USING ELECTRONIC AND TRADITIONAL AERONAUTICAL PUBLICATIONS

Cody Malone, Undergraduate, Aerospace (URECA, Honors College); Wendy Beckman (Faculty Sponsor), Aerospace

In the aviation industry, several airlines and many general aviation pilots are beginning to transition from using traditional paper aeronautical charts to electronic flight bags (EFBs). EFBs provide the pilot with the required reference documents and flight information in an electronic display. One EFB in particular has become increasingly popular, the Apple iPad. The iPad produces several benefits for pilots, including increased efficiency in the cockpit, financial savings, and increased safety. Despite the fact that many airlines are eliminating paper charts all together and switching to iPads, very few studies have been conducted to compare the effectiveness of EFBs to paper. This study used Microsoft Flight Simulator X (MFS) to simulate a flight diversion situation. Two groups of private pilot certificate holders, one using traditional paper charts and the other using the iPad, were utilized to test the effectiveness of the EFB in a high workload situation. The study gathered data on six parameters of pilot performance during the simulation. It was found that the iPad group performed significantly better in two of the pilot performance parameters, equally well in three of the parameters, and worse in the remaining parameter.

## ICD-10: THE NEXT Y2K FOR HEALTHCARE?

AnneElizabeth Gintzig, Undergraduate, Biology (Honors College); John DuBois (Faculty Sponsor), Biology

The United States is in the process of switching to a new and updated version of the International Statistical Classification of Diseases and Related Health Problems (ICD). The ICD is a universal system used in the healthcare field to code for specific diseases, symptoms, complaints, and any abnormal findings in connection with a particular patient. This transition in itself is a huge undertaking, as it will require health systems to update their computer software, paperwork and filing systems, as well as to train staff members and physicians in the use of the new ICD system.

There is a gap in the public knowledge, as even those with a future in the healthcare field (including current pre-medical and medical students) are unaware of this massive transition. The objective of my project was to bridge this gap and provide insight into the task that lies ahead for our country's medical community as it transitions from ICD-9 to ICD-10. It is important that those with a future in healthcare are well informed regarding this particular aspect of healthcare because the business side is often not discussed in the undergraduate stage of education.

The project focus is on the advantages and disadvantages of the ICD-10 and the implementation of this newest version of ICD, as well as how the United States is preparing for the switch. The acceptance and/or concerns of our physicians and healthcare executives with regard to this transition were gauged in order to gain an understanding of the overall perception among healthcare workers concerning ICD-10.



**ADVERTISING CAMPAIGN CREATED BY NATURAL SOLUTIONS**

Kachina Killburn, Denise MacPherson, Mary-Margert Henris, Lauren Foley, Anna Sisavad, Corey DuBose, D'Ariss Sowell, Kristina Adkins, Lance Wagner, Lauren O'Conner, Lauren Sherry, Talor Burns, Taylor Eckert, Victoria England, Angie Claire Sellers, Brittany Moyers, Jackson Tyler Burke, Kaela Armbrister, Lillie Von Cannon, Undergraduates, Journalism; Tricia Farwell (Faculty Sponsor), Journalism

This project is an integrated marketing campaign sponsored by Edventure Partners and created, designed and implemented by students in a MTSU advertising and public relations course to educate and inform college-age youth of the benefits of the client's product. As part of this project, students have created an advertising agency by the name of Natural Solutions under which they operate. Students are conducting research; including target audience, market assessments, competition analysis, and a SWOT analysis on the client to determine a direction for the campaign. Based on research results, the student agency will present the client with options for an on-campus promotional event designed to promote the key message. Upon client approval, the students will implement the event. Following the event, a post campaign evaluation will be conducted to determine the effectiveness of the students' efforts. At the conclusion of the post-campaign, research students will be presenting their findings to the client and entering the submission into a national competition.

## AN ANALYSIS OF REGULATED EXPRESSION IN GENES LDL-R AND APOA1 THROUGH ALTERNATIVE GENE SPLICING

Rachel Hart, Undergraduate, Biology (Honors College); Rebecca Seipelt-Thiemann (Faculty Sponsor), Biology

Both low-density lipoprotein receptor (LDL-R) and apolipoprotein A1 (ApoA1) are each associated with LDL and HDL cholesterol, respectively. LDL-R and ApoA1 expression levels respond to the cholesterol level and metabolism within that organism. Regulated alternative mRNA splicing is one mechanism that can regulate gene expression. Therefore, this regulatory event, alternative gene splicing, is estimated to occur in 99% of human genes. First, computational analyses were performed to determine the full extent of known alternative splicing for these genes and the effects on functional domain presence within the proteins. And finally, since gene expression within tumor cells is generally unregulated, alternative splicing of the RNAs encoded by these genes was compared in normal and tumor cells. As experimental research and data are not yet completely processed, results from in silico domain analysis of known alternative splicing forms, as well as specific differences between normal and tumor RNAs will be presented.

## MANAGERIAL AVERSION TO VROOM'S EXPECTANCY THEORY

Juan Zelaya, Undergraduate, Business Communication and Entrepreneurship (Honors College); Joe Thomas (Faculty Sponsor), Management and Marketing

Victor Vroom's expectancy theory is a well-known theory of motivation. This theory states that motivation depends on the interaction of three factors: expectancy, instrumentality, and valence. Expectancy is the confidence individuals have that increasing their effort will improve their performance, instrumentality is the perceived connection between increased performance and rewards, and valence is the value placed on rewards. According to expectancy theory, since these factors jointly determine motivation, all of them must be high in order for an individual to feel motivated. Even though expectancy theory seems plausible and is broadly researched, studies suggest that managers do not use it. Through secondary research, I found that managers do not use Vroom's expectancy theory because it is difficult to test, has faulty supporting research, is based on flawed assumptions, is hard to implement, and disagrees with other motivation model analyses.

## JUPITER'S RADIO SOURCES CHANGING OVER TIME

John Griffith, Undergraduate, Physics and Astronomy; Chuck Higgins (Faculty Sponsor), Physics and Astronomy

We will analyze 50 years of Jovian decametric radio emission data from the University of Florida Radio Observatory to investigate possible changes over time. As a result of Jupiter's magnetic field lines interacting with its moon, Io, the spatial location of radio sources A, B, and C can be determined. It should be possible to plot yearly changes in occurrence probabilities at 18MHz, 20MHz, and 22MHz as a function of time. We are interested in seeing how the positions, intensity, and shapes of these sources change over time. By analyzing these data, it is also possible to determine whether an unknown phenomenon is responsible for long term changes in occurrence probabilities at different frequencies, or if known phenomena can be used to account for these changes. By using this research, it is possible to work towards a better understanding of the interaction of Jupiter's magnetic field and its radio sources, leading to better models to describe the behavior.

IMPACTS OF THE KINGSTON FLY ASH SPILL ON *TETRAGNATHIDAE* SPIDERS:  
A BIOACCUMULATION STUDY WITH FOOD WEB IMPLICATIONS

Mary Hayden, Undergraduate, Biology (URECA, Honors College); Frank Bailey,  
Faculty, Biology; Ryan Otter, Faculty, Biology; Ryan Otter (Faculty Sponsor), Biology

On December 22, 2008 a dike containing coal fly ash from the Tennessee Valley Authority Kingston Fossil Plant near Kingston, Tennessee USA failed and resulted in the largest coal ash spill in United States history. Coal ash, a by-product of coal combustion, is known to contain multiple contaminants of concern, including selenium. The purpose of this study was to investigate the bioaccumulation of selenium in *tetragnathidae* spiders residing along the Emory River where the fly ash spill occurred. Trophic dynamics were also studied and considered when analyzing selenium concentrations and bioaccumulation. At spill locations *tetragnathidae* spiders were observed to have bioaccumulated selenium while spiders at reference locations had significantly lower concentrations of selenium. In addition, spiders from coal ash-associated sites showed enrichment of  $\delta^{15}\text{N}$  compared to spiders from reference sites, indicating differences in food web dynamics between sites. No significant differences in  $\delta^{13}\text{C}$  enrichment were shown between ash-affected and reference sites. These results imply a shift in diet at ash sites of the spiders or the spiders' prey compared to spiders and prey at no-ash reference sites. Further investigation into a broader food web at ash-associated sites is warranted.

## ASSESSING THE BENEFITS OF LEED GOLD CERTIFICATION FOR AN ASSISTED LIVING FACILITY

Alan Shrive, Undergraduate, Engineering Technology; Sean Burk, Undergraduate, Engineering Technology; Katherine McKee, Undergraduate, Engineering Technology/Environmental Science and Technology; Kathy Mathis (Faculty Sponsor), Engineering Technology

The Sustainable Construction class consisting of Construction management and Environmental Science majors will compare two sets of apartments constructed for an assisted living facility in Murfreesboro, Tennessee. The first bank of apartments was built in 2009 and occupied in 2010 and used the conventional construction protocols. The second group was constructed in 2011 and occupied in 2012 using the Leadership in Energy and Environmental Design (LEED) criteria established by the US Green Building Council (USGBC). The apartments merited a Gold certification. The students will assess the energy use data by each bank of apartments for the months available to determine the energy savings realized. The criteria set by the third party verifier will also be reviewed to note the differences in the construction of the apartments. The students will determine the energy savings and potential payback for the added expenses.

## MAKING AN IMPACT FOR TENNESSEE GIRLS IN STEM THROUGH THE EXPANDING YOUR HORIZONS EXPERIENCE

Lauren LaBeff, Undergraduate, Chemistry; Sierra Shipley, Undergraduate, Chemistry; Lorrie Pruett, Undergraduate, Chemistry; Mehreen Fatima, Undergraduate, Biology; Judith, Iriarte-Gross, Professor, Chemistry; Rebecca, Calahan, Professor, Mathematical Sciences; Judith Iriarte-Gross (Faculty Sponsor), Chemistry

MTSU is the home for the first Expanding Your Horizons (EYH) site in Tennessee and has offered EYH conferences since 1997. Society still reinforces traditional beliefs about education and careers for women and these beliefs are very prevalent across the South. STEM education and career choices of girls are clearly affected by negative stereotypes of who scientists are. These perceptions also undermine the self-confidence of girls in pursuing STEM careers. EYH includes hands-on activities where the girls must work together and use problem solving skills. Workshop leaders and mentors are women STEM professionals who lead the workshops. The workshop leaders are asked to “tell their stories,” and the girls are encouraged to ask questions. These questions might include: “What do you do in your job?” “How do you help other people?” “What did you study in college?” and “Do you have a family?” “Near peer” mentors are also a critical component of an EYH. MTSU college students attend an experiential learning course on how to interact with and mentor middle and high school girls. The importance of mentors is unmistakable based on the comments of the girls. Self-reported responses on post EYH surveys from 1200 girls (2007 – 2010) indicate that 74.7% found the EYH conference useful in planning future STEM courses. Fifty-nine percent of the girls were encouraged to take more STEM courses than required by their schools. Over ninety-five percent of the girls agreed that taking more math and science classes are important for a successful career. Although these data are self-reported, the surveys indicate that the EYH conference has had a significant impact on the girls’ attitudes about math and science and careers in STEM. This in turn, positively affects the education and training, as well as improves the economic conditions for a significant number of girls and their families throughout the South.

## ELEMENTARY SCHOOL NUTRITION: DEVELOPMENT OF AN UNTESTED RECIPE UTILIZING COMMODITY FOODS INGREDIENTS

Davina Reinhardt, Undergraduate, Human Sciences; Bobbie Marie Gregg, Undergraduate, Human Sciences; Lisa Sheehan-Smith (Faculty Sponsor), Human Sciences

When considering the implications and feasibility of changes to the federal school lunch programs currently occurring and the upcoming changes that will take effect in 2014, there are multiple factors to consider. This research focused on implementation of a single new recipe to the elementary school level lunch menu. Several factors such as nutrient and calorie content, sodium, and fat guidelines were considered. Recent implementations have included an increase in produce, both in variety and frequency, a reduction of saturated fat and incorporation of whole grains. Subsequent changes will include reduced sodium and sugar intakes. For this project, the challenges were to introduce a healthy food option while utilizing a commodity food. Consequently, a barbeque pork quesadilla recipe was chosen. The ingredients were commonly available and the item was easy to prepare. Though these criteria appeared to enhance the feasibility of this food item and it was well received based on the information obtained from hedonic surveys completed by participants, through the experiment it was found that the quesadilla did not sufficiently follow the necessary parameters which would make it a good choice for the federal school lunch program. The cost of this recipe outweighed any nutritional benefits this recipe may have had and after analyzing the data using the Food Works program it was found that this recipe exceeded the sodium and fat content guidelines for schools. The task of devising healthy, palatable lunches for these federal programs will increase in difficulty as the regulations become more stringent in the future.



## EYE TRACKING THE COSMOS: ATTENTIONAL DIFFERENCES IN THE CITIZEN SCIENCE VOLUNTEERS OF THE GALAXY ZOO PROJECT

David Hiller, Undergraduate, Physics and Astronomy; Nicole Brunas, Undergraduate, Psychology; John Wallin (Faculty Sponsor), Physics and Astronomy

Astronomers characterize galaxies primarily by color and morphology (their shape). Due to the fact that these factors often identify several internal characteristics of the galaxies themselves, the predominant research in recent years has focused on the population distributions of these parameters in our observable universe. This is a very large data set to analyze, and a growing interest in citizen science projects has emerged to solve problems such as this. Built through the volunteer efforts of numerous individuals, the Galaxy Zoo project is the largest database of classified galactic objects by morphology. Most surprising is the fact that, although these are amateur contributions, the end result is more accurate than what would be accomplished through conventional methods. This leads to several questions. How can we determine the reliability and validity of these volunteer contributions? How can we improve the performance of the contributors themselves? Our study investigates how attentional differences between individuals during this classification task correlate with performance differences across the four morphology domains. We intend to use this research in the future to improve training techniques and data analysis in the citizen science process.

## GENERAL RELATIVISTIC EFFECTS ON ORBITING QUBITS

Daniel Bonior, Undergraduate, Physics and Astronomy; Daniel Erenso, Faculty, Physics and Astronomy; Marco Lanzagorta, Community Member; Keye Martin, Community Member; Daniel Erenso (Faculty Sponsor), Physics and Astronomy

Quantum entanglement is a property of a quantum system of two or more objects in which the quantum states of the constituting objects are linked together in such a way that one object can no longer be adequately described without the full description of its counterpart - even though the individual objects may be spatially separated. Such properties are fundamental to the construction of fast quantum computing and completely secure quantum communication. In order to integrate such modes of communication into modern technologies, such as satellite network systems, effects on orbiting qubits from Earth's gravity will need to be studied and understood. We considered a system of two electrons that are fully entangled in their intrinsic spin with one electron on Earth and another in orbit around the Earth. In this study we conducted an analytical investigation in the gravitational effects on an orbiting quantum qubit. We looked not only at a circular orbit but also elliptical, hyperbolic, and radial orbits. Understanding the gravitational effects on quantum qubits in orbit is one of the many first steps necessary to integrate quantum communications into modern technologies. We modeled the gravitational field due to the Earth with the Schwarzschild Metric, which describes the gravitational field due to a large uncharged, rotating, spherical mass in an otherwise empty spacetime, while describing the electrons with the Dirac Equation. Using Quantum Field Theory we derived the quantum state for two spin-entangled electrons, and assumed full entanglement when the second electron is placed in orbit around the Earth. From our description of the electron we calculated the density operator,  $\rho$ , and from this the degree of entanglement via quantum entropy.

KINETIC ANALYSIS OF NUCLEOSIDE HYDROLASE (RIHC) FROM  
*ESCHERICHIA COLI*

Austin Hoover, Undergraduate, Chemistry; Phuong Nguyen, Undergraduate, Chemistry; Haneen Alhams, Undergraduate, Chemistry; Phillip Pulley, Undergraduate, Chemistry; Lesley, Rawiszer, Undergraduate, Chemistry; Paul Kline (Faculty Sponsor), Chemistry

Nucleoside hydrolase is an enzyme that catalyzes the hydrolysis of selected nucleosides to yield the corresponding base and ribose. Examples include the conversion of inosine to hypoxanthine and ribose and uridine to uracil and ribose. In parasitic protozoans, the enzyme is part of the salvage pathway and is essential for the growth of the parasite. These enzymes from parasitic protozoans have been extensively studied. Little is known about the enzyme from other organisms including *E. coli*. To study the properties of the enzyme from *E. coli* a recombinant form of the enzyme has been cloned and overexpressed in *E. coli*. Nucleoside hydrolase (rihC) has been purified by Ni resin affinity chromatography and its purity verified by SDS-PAGE. The Michaelis constant,  $K_m$ , has been determined for a number of nucleosides including uridine, cytidine, adenosine, and inosine. A comparison of the kinetic properties of the *E. coli* enzyme and the parasitic protozoan enzyme reveals a number of similarities.

## CHARACTERIZATION OF A NOVEL BACTERIAL ORGANISM THAT IS BOTH FREE-LIVING AND AN INTRACELLULAR PARASITE

Jake Ellis, Undergraduate, Biology; Stephen Wright (Faculty Sponsor), Biology

Many different species of microorganisms are restricted to relatively limited environmental conditions in order to survive. Obligate intracellular parasites, such as Chlamydia species, are incapable of growing on laboratory media and are only viable within a living host cell. Others, such as bacteria in the genus *Legionella*, have the ability to be free-living on media as well as survive in the environment within amoebal host cells. Recently, a student researcher at Middle Tennessee State University noticed bacterial contamination in their Vero cells. Vero cells are derived from African green monkey kidney cells and are commonly used to propagate viruses. After observing the contaminant, it was concluded that this microbe has characteristics of both free living microorganisms and obligate intracellular parasites. The purpose of this study is to identify this unknown microorganism. Vero cell culture tests determined that a minimum of four hours were required for the organism to become intracellular. This microorganism is a motile, gram-positive rod that is capable of forming spores. The Biolog multi-test system was used to narrow down the identity of the unknown microbe. These biochemical tests suggested that the unidentified microorganism is most similar to *Bacillus sphaericus*. Amplification of the microorganism's DNA was achieved by the Polymerase Chain Reaction (PCR). The PCR products are to be cloned into *E. coli* following ligation into plasmid pGEM-T. The gene coding for the 16S rRNA will be sequenced and is expected to provide more accurate phylogenetic identity of this novel organism.

## PURIFICATION OF URIDINE PHOSPHORYLASE FROM BEEF LIVER

Kamali Gurung, Undergraduate, Chemistry; Paul Kline (Faculty Sponsor), Chemistry

Uridine phosphorylase is an enzyme that catalyzes the phosphorolysis of uridine to uracil and ribose-1-phosphate. The human enzyme has been the focus of research because of its role in cancer. Inhibition of the enzyme appears to provide normal tissue with some protection against the toxic effects of chemotherapeutic compounds. The purpose of this project is to purify the enzyme from beef liver as a model to design specific inhibitors. Beef liver was homogenized and the resulting extract subjected to a number of techniques including ion exchange chromatography, size exclusion chromatography, and hydroxyapatite chromatography. The purity of the enzyme has been determined by SDS-PAGE and its kinetic properties determined.

## DEMONSTRATING CHEMICAL ADSORPTION AND MOVEMENT IN SOILS

Bryan Sallman, Undergraduate, Agribusiness & Agriscience; Claire Barnett, Undergraduate, Agribusiness & Agriscience; Andrew, Armes, Undergraduate, Agribusiness & Agriscience; Rebecca, Ball, Undergraduate, Agribusiness & Agriscience; John, Caplendor, Undergraduate, Agribusiness & Agriscience; Shelbie, Davidson, Undergraduate, Agribusiness & Agriscience; Funmilayo, Ekundayo, Undergraduate, Agribusiness & Agriscience; Morgan England, Undergraduate, Agribusiness & Agriscience; Jeremy, Fann, Undergraduate, Agribusiness & Agriscience; Tyler, Hand, Undergraduate, Agribusiness & Agriscience; Corey, Jenkins, Undergraduate, Agribusiness & Agriscience; Eric, Limbird, Undergraduate, Agribusiness & Agriscience; Tristan, Malan, Undergraduate, Agribusiness & Agriscience; Carter, Pinkston, Undergraduate, Agribusiness & Agriscience; Anthony, Quatrine, Undergraduate, Agribusiness & Agriscience; Christopher, Smith, Undergraduate, Agribusiness & Agriscience; Dr. Warren Anderson (Faculty Sponsor), Agribusiness & Agriscience

Increased urbanization often results in soil compaction and man-made impervious surfaces such as roadways, rooftops, and parking lots. These surfaces cannot absorb rainfall and often speed up the rate in which surface contaminants enter waterways and groundwater. The purpose of this experiment is to investigate how soil texture and varying lengths of time affect the rate at which soils are able to remove contaminants, using Kool-Aid as a model pollutant. The experiment began with a standard solution of 2g grape Kool-Aid per 1000ml H<sub>2</sub>O with a 7% transparency, as read by spectrophotometer. Two soils were used: Soil A (silty clay loam texture), and Soil B (sandy loam texture). Each soil sample was divided into four different containers – two that were ground into fine particles (which allows for a greater surface area) and two that were left untouched (coarse). A 125ml sample of solution was mixed with 50g of each soil sample and was allowed to settle. One fine and one coarse sample of each soil were tested for transparency after a 20-minute filtration period. The suspension was filtered before being put into a cuvette. The transparency test was then performed on one fine and one coarse sample of each soil after a 48-hour filtration period. The finely ground sample of soil A had the greatest percentage of light transmittance (54%) over a 48-hour period. Our findings demonstrate that soils with a larger overall surface area, suitable infiltration capacity, and exposure to a longer filtration period will have a greater ability to adsorb contaminants effectively.

## NUCLEOSIDE METABOLIZING ENZYMES FROM ALASKA PEA

Tuyen Nguyen, Undergraduate, Chemistry; Paul Kline (Faculty Sponsor), Chemistry

A number of enzymes have been shown to breakdown purine nucleosides such as adenosine, guanosine, and inosine, and pyrimidine nucleosides such as cytidine, and uridine. While the purine metabolizing enzymes have been extensively studied, relatively little is known about the pyrimidine metabolizing enzymes. The purpose of this study is to isolate and characterize a pyrimidine-specific metabolizing enzyme from Alaska pea seeds. After germination of the seeds, an initial extract was prepared by homogenizing the seeds in a 50 mM Tris buffer. After removal of insoluble material the extract was first purified by ammonium sulfate fractionation. After the ammonium sulfate fractionation, a number of chromatographic techniques were used to purify the enzyme. The chromatographic steps used include ion exchange chromatography, size exclusion chromatography, hydroxyapatite chromatography, and aminohexyl chromatography. Assay by HPLC of pooled fractions from the final chromatography step showed the purified enzyme was specific for cytidine and uridine. The purity and molecular weight of the enzyme was determined by SDS-PAGE. The activity of the enzyme against other pyrimidines such as thymidine was also determined.

## ECOMORPHOLOGICAL ANALYSIS OF PREHENSILE TAIL USE IN *ALOUATTA PALLIATA*

Stephen Griffin, Undergraduate, Sociology and Anthropology; Andrew Wyatt (Faculty Sponsor), Sociology and Anthropology

Adaptations allow members of the genus *Alouatta* to have increased sensitivity and better grip in the distal end of their tails. Although *Alouatta* do not use their prehensile tails as frequently as other genera of Atelinae, the tails still play an integral role in their lives. The goal of the study was to take an ecomorphological approach to prehensile tail use in *Alouatta palliata* to understand how the functional morphology of the tail correlates to the behavior and ecology of the mantled howler. The hypothesis was that mantled howler monkeys would use the distal third of their prehensile tail - in comparison to the transitional and proximal thirds - most frequently regardless of substrate or activity. More specifically, it was predicted that the howler monkeys would use their prehensile tail most often during suspensory feeding on smaller substrates. Research took place at La Suerte Biological Station in northeastern Costa Rica from June 28 to July 11, 2012. Data was collected on 4-5 groups of mantled howlers who live in both primary and advanced secondary rainforest. To collect the data, an instantaneous 30-minute focal animal sampling technique with two-minute intervals was used. The results supported the hypotheses in that howlers used their distal end 85% of the time they used their tails. Additionally, the howler monkeys used their prehensile tails to aid them while feeding 78% of the time, suggesting that the specialized traits in the distal end function as a feeding adaptation.



## PURIFICATION OF CYTIDINE METABOLIZING ENZYMES IN CORN

Parinda Patel, Undergraduate, Chemistry; Paul Kline (Faculty Sponsor), Chemistry

Cytidine metabolizing enzymes include enzymes that hydrolyze cytidine to cytosine, and catalyze the deamination of cytidine to yield uridine. This family of enzymes plays a variety of roles in bacteria and in man. The genes for some of these enzymes have been identified as proto-oncogenes. Little is known about the physiological role of these enzymes in plants. In this study cytidine deaminase and other cytidine metabolizing enzymes were purified from the economically important crop corn. Germinated corn seeds were used as the source of the enzyme. A variety of chromatography techniques including ion exchange, hydroxyapatite, size exclusion, and hydrophobic interaction were used to purify the enzymes. Once purified the kinetic properties of the enzymes are determined.

## IDENTIFICATION OF DISACCHARIDES BY HPLC ANALYSIS

Jon Villareal, Undergraduate, Chemistry; Paul Kline (Faculty Sponsor), Chemistry

To determine the structure of a disaccharide the monosaccharides involved must be identified. However for a variety of reasons determining the identity of a monosaccharide can be a problem. These structural similarities between monosaccharides also make their separation difficult. Further because they lack a chromophore, the detection of these compounds can be problematic. The purpose of this project is to determine the feasibility of using HPLC coupled with electrochemical detection to identify three common monosaccharides, glucose, galactose, and fructose. A method using a Rezex RMN carbohydrate column attached to a Dionex 3000 HPLC was developed. To detect these compounds a Corona Charged Aerosol Detector was used in conjunction with the Dionex 3000 HPLC. Results indicate the common monosaccharide and disaccharides can be separated and identified using the method developed.

## FALSE DISCOVERY RATES FOR ITERATIVE DATABASE SEARCHING

Alex Williams, Undergraduate, Computer Science; Anthony Davis, Undergraduate, Computer Science; Hyrum Carroll, Faculty, Computer Science; Hyrum Carroll (Faculty Sponsor), Computer Science

In Bioinformatics, the reliability of a similarity score between a genetic query sequence and a database sequence is represented by an Expectation value, or E-value. Modern homology search algorithms such as BLAST or HMMER, scrutinize the retrieval list with a uniform E-value threshold in order to determine truly significant results. In iterative searching situations, this can be especially problematic because the likelihood of a truly insignificant result being reported as significant (false positive) increases with the number of performed hits.

While many different aspects of homology search algorithms have been rigorously studied, the retrieval threshold has not received the same attention. In order to improve search sensitivity, we propose the use of the false discovery rate (FDR). We introduce PSI-BLAST\_FDR, an extended version of the iterative version of BLAST, PSI-BLAST, that uses a FDR method for the threshold criterion. We evaluated four different multiple testing correction methods on a large training database and chose the best performing one, Benjamini-Hochberg, as the default in PSI-BLAST\_FDR. PSI-BLAST\_FDR achieves 4.90% better retrieval performance than PSI-BLAST on a large test database and a 20.90% better retrieval score for queries belonging to small superfamilies. Furthermore, PSI-BLAST\_FDR retrieved only 4.3 irrelevant sequences per query compared to 28.7 for PSI-BLAST.

EFFECTS OF ACETYLSALICYLIC ACID TREATMENT ON LEUKOCYTES,  
CORTICOSTERONE LEVELS, AND THERMOREGULATION IN MALE FENCE  
LIZARDS, *SCELOPORUS UNDULATUS*

Tiara Rainer, Undergraduate, Biology (URECA); Matt Klukowski, Faculty, Biology;  
Matt Klukowski (Faculty Sponsor), Biology

Prostaglandins are important regulators of the immune system (e.g., fever) and may play an important role in the vertebrate stress response (e.g., the release of cortisol/corticosterone from the adrenal gland) but few studies have been conducted on reptiles. The prostaglandins are synthesized from arachidonic acid by the cyclooxygenase (COX) pathway. Since acetylsalicylic acid is a potent inhibitor of the COX pathway and thus inhibits prostaglandin synthesis, we added acetylsalicylic acid (i.e., aspirin) to the diet of male fence lizards to experimentally lower their circulating prostaglandin levels. The purpose of this experiment was to test for effects of acetylsalicylic acid on thermoregulation, peripheral white blood cell counts, and plasma corticosterone concentrations in fence lizards. A thermal camera was used to quantify lizard body temperatures at three time points following treatment (morning, ~noon, mid-afternoon). Plasma corticosterone levels were measured via enzyme-linked immunosorbant assay (ELISA), and blood smears were scored for heterophils, lymphocytes, basophils, and monocytes, as well as total leukocyte counts per 10,000 erythrocytes. Treatment with acetylsalicylic acid did not significantly affect plasma corticosterone levels. Effects on thermoregulation and leukocytes will be discussed.

## MORPHEME COUNTING: A TASK DEVELOPMENT STUDY

Will Vanderpool, Undergraduate, Psychology; Stuart Bernstein (Faculty Sponsor), Psychology

A new laboratory task to measure morphological knowledge (prefixes, root words, and suffixes) was developed. A pilot test with college students examined how scores for morphological knowledge were correlated with reading comprehension, word knowledge, and spelling knowledge. The study also investigated if accuracy or reaction time was more important. Morphological knowledge was measured with a computer administered morpheme counting task (1-4 morpheme words). Word knowledge was measured with a spoken word recognition test. Spelling knowledge was measured by a test of written spelling. As a measurement of reading comprehension, the participant's high school ACT reading comprehension and science scores were used. Accuracy in morpheme counting was found to be significantly correlated with ACT reading comprehension scores and ACT science scores. Reaction time was not significantly related to either outcome. Word reading and spelling were also correlated with both ACT outcomes, but were also significantly correlated with morphology, requiring a mathematical solution. In a hierarchical regression, word reading scores accounted for significant variance and morpheme knowledge accounted for significant unique variance for both ACT reading and science scores.

THE EFFECTS OF MATERNALLY TRANSFERRED METHYLMERCURY ON LEUKOCYTE DIFFERENTIALS IN NORTHERN WATER SNAKE (*NERODIA SIPEDON*) NEONATES

Victoria Kremer, Undergraduate, Biology (URECA); Cassandra Henry, Undergraduate, Biology (URECA); Patrick Cusaac, Graduate student, Biology; Raymond Wright, Graduate student, Biology; Vincent Cobb, faculty, Biology; Matt Klukowski, faculty, Biology; Frank Bailey, faculty, Biology; Frank Bailey (Faculty Sponsor), Biology

The ability to mount a stress response is essential to the survival of an organism. The effects of mercury toxicity on the stress response have been studied, however studies pertaining to reptilian species are limited. Mercury is a common contaminant in aquatic systems, and tends to accumulate in predators at the top of the food chain, like the Northern Water Snake (*Nerodia sipedon*). Physiological stress results in the release of hormones known as glucocorticoids such as corticosterone (the primary glucocorticoid in reptiles like the northern water snake) which are known to influence leukocyte differentials in vertebrates. Therefore, leukocyte differentials provide a useful endpoint in the assessment of physiological stress. The objective of this study is to determine the effects of maternally transferred methylmercury on the ability of neonate northern water snakes to alter leukocyte differentials in response to stress. 18 gravid females were collected from Lake Erie and dosed in the laboratory at Middle Tennessee State University with one of three concentrations of methylmercury (0, .01, and 10  $\mu\text{g/g}$  body mass). After birth, 10 neonates were randomly selected from each litter and assigned to a stress treatment (5 baseline, 5 stress). Corticosterone levels were analyzed by ELISA (enzyme-linked immunosorbent assay), and blood smears were made and stained with giemsa for leukocyte analysis. Leukocytes were enumerated visually, and classified into 5 categories (heterophils, lymphocytes, monocytes, basophils, and thrombocytes) based on morphological characteristics. The results of ELISA showed an increase in corticosterone levels in stressed snakes of all dose groups ( $F(1,8) = 70.795$ ,  $p < 0.001$ ). Results of the leukocyte analysis indicated a decrease in the H/L ratio of stressed snakes across dose groups ( $F(1, 24) = 5.6284$ ,  $p = 0.0260$ ). The total leukocyte count was not different between treatment groups.

## A LASER TRAP AS A VISCOMETER

James Cooper, Undergraduate, Physics and Astronomy; Rance Solomon, Undergraduate, Physics and Astronomy; Cameron Crawford, Undergraduate, Biology; Josh Evans, Undergraduate, Physics and Astronomy; Daniel Erenso, Faculty, Physics and Astronomy; Anthony Farone, Faculty, Biology; Mary Farone, Faculty, Biology; Daniel Erenso (Faculty Sponsor), Physics and Astronomy

Since the first time a laser trap (LT) was introduced by Ashkin over three decades ago, it has been widely used for the micromanipulation of living objects for both biological and biomedical applications, as well as for nonliving objects to construct specific microstructures for optoelectronic applications. A LT is an intensity gradient trap formed by focusing a highly collimated laser beam used to manipulate dielectric objects as small as an atom and as large as 100 micrometers by creating small forces in the order of piconewtons. Here we present yet another novel application of a LT; the use of a LT for viscosity measurements in a micro cubic volume fluid. We have developed a simple procedure for viscosity measurement of fluids with low viscosities using a laser trap. In this work, we have conducted a series of preliminary measurements that demonstrate how a LT can be used to precisely measure the viscosity of low viscose, biological fluids, as a function of temperature. By using the laser trap described and a micron size dielectric sphere we were able to precisely measure the viscosity of Fetal Bovine Serum (FBS) at a series of temperatures. These measurements are confirmed by measuring the viscosity of the same FBS using an Ostwald viscometer at identical experimental conditions. Since our procedure demonstrates precise measurement of fluids with low viscosities at a variable flow rate in a few micro cubic volume spaces free from contamination, it could have both medical and biological applications.

## SYNTHESIS AND TESTING OF CYCLOPROPYL PEPTIDOMIMETICS AS POTENTIAL BACE INHIBITORS

Michael Lampley, Undergraduate, Chemistry (Honors College); Will Shelton, Undergraduate, Chemistry (Honors College); Matthew Wright, Graduate student, Chemistry; Norma Dunlap (Faculty Sponsor), Chemistry

The utility of peptidomimetics as enzyme inhibitors is well documented in the pharmaceutical field. HIV protease inhibitors have been particularly successful, with ten marketed peptidomimetics. Peptidomimetics are also in development as inhibitors of beta-secretase (BACE) for the treatment of Alzheimer's disease. However, relatively few syntheses of semi-rigid cyclopropyl analogs have been reported. A three-step synthesis of a core cyclopropyl-containing peptidomimetic has been developed in our laboratory: Grignard addition to amino acid Weinreb amides provides enones that are substrates for the cyclopropanation, which then affords either cyclopropyl esters or nitrocyclopropanes. Extension of the core cyclopropyl products from three amino acid series has afforded a series of compounds that are currently being assayed for inhibition of beta-secretase (BACE).



## MEASURING PHOTON BUNCHING OF LASER LIGHT

Peter Schwartz, Undergraduate, Physics and Astronomy (URECA); Anton Chernenko, Undergraduate, Physics and Astronomy (URECA); Daniel Erenso (Faculty Sponsor), Physics and Astronomy

In 1956, Robert Hanbury Brown and Richard Q. Twiss constructed two detectors that recorded light particles (photons) arriving from a star. Comparing the data from the two detectors, they discovered that photons tended to arrive at the same time, which is referred to as the photon bunching phenomenon. Our experiment is set up to measure the degree of bunching for photons emitted from a Helium-Neon laser. The laser light is focused into a beam-splitter that separates the photon beam into two perpendicular beams. A sequence of mirrors and lenses then focus the beams into photodetectors. Both of the photodetectors are connected to a computer that analyzes the data using Time-Correlated Single Photon Counting (TCSPC) software. TCSPC software records the time at which a photon is detected, and so photons that are bunched together are revealed by having the same arrival time. The resulting data will be analyzed and compared to theoretical predictions.

## SYNTHESIS OF NITROCYCLOPROPYL PEPTIDOMIMETICS

Jacob Basham, Undergraduate, Chemistry (McNair, Honors College); Matthew Wright, Graduate student, Chemistry; Jihun Hwang, Undergraduate, Chemistry; Omar Chapa, Undergraduate, Chemistry; Yaroslav Yatsky, Undergraduate, Chemistry; Norma Dunlap (Faculty Sponsor), Chemistry

Cyclopropane-containing amino acids are of particular importance in the field of medicinal chemistry because of their use as building blocks for bioactive compounds. Several syntheses of this family of compounds have been reported. These conformationally constrained propane rings show reduced entropy effects and thus improved metabolic stability. One method reported is the addition of bromonitromethane to electrophilic alkenes to yield nitrocyclopropanes. A general approach to the synthesis of cyclopropyl peptidomimetics from various protected amino acids has been developed in our laboratory whereby addition of ethyldimethylsulfuranylidene to amino acid derived enones affords cyclopropyl keto-esters. Building on this approach, addition of bromonitromethane to amino acid derived enones yields nitrocyclopropanes in good yield. Due to the great versatility of the nitro group that may be converted into several other functionalities, the nitrocyclopropanes are considered very important building blocks. Reported here is the general approach for the conversion of various Cbz-protected amino acid derived enones to their respective nitrocyclopropyl analogs.

## USING THE POINT -OF- ZERO CHARGE (PZC) TO OPTIMIZE THE ELECTROCATALYTIC ACTIVITY OF CeO<sub>2</sub>/ZNO-CNT COMPOSITES

Anita Saha, Undergraduate, Chemistry; Anup Deb, Graduate Student, Chemistry; Tuphan Devkota, Graduate student, Chemistry; Charles Chusuei, Faculty, Chemistry; Charles Chusuei (Faculty Sponsor), Chemistry

Electrochemical biosensors made with zinc oxide-carbon nanotube (ZnO-CNT) and cerium oxide carbon nanotube (CeO<sub>2</sub>-CNT) composites are important for monitoring hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) and acetaminophen production in cells, respectively. Asthma, cancer, and patients with cardiovascular disease have elevated levels of H<sub>2</sub>O<sub>2</sub>, which can be detected by these proposed electrochemical biosensors. With CeO<sub>2</sub>-CNT composite, presence of acetaminophen can be detected from blood. The point -of- zero charge (PZC) is the pH value at which the nano particles surface exhibit a net zero charge. The purpose of this experiment is to optimize sensor composite materials (ZnO-CNT, CeO<sub>2</sub>-CNT) for maximum sensitivity that detects H<sub>2</sub>O<sub>2</sub> and acetaminophen. We hypothesize that maximum electrocatalytic activity of ZnO-CNT and CeO<sub>2</sub>-CNT occurs at the PZC. In this study, we measured the PZC of ZnO-CNT and CeO<sub>2</sub>-CNT composites, using a spear tip electrode. The electrocatalytic behavior of the nanocomposites toward reduction of H<sub>2</sub>O<sub>2</sub> and acetaminophen were investigated using cyclic voltammetry. Transmission electron microscopy (TEM) results show incorporation of metal oxide (ZnO-CNT and CeO<sub>2</sub>-CNT) with the carbon nanotube supports for the electrochemically active materials.

## EFFECTS OF CAFFEINE ON MUSCULAR ENDURANCE AND MENTAL FATIGUE IN A MAXIMUM REPETITION BODY SQUAT TEST

Sarah Morgan, Undergraduate, Health and Human Performance; Josh Melchoir, Undergraduate, Health and Human Performance; Reginald Farmer, Undergraduate, Health and Human Performance; Timothy Yarbrough, Undergraduate, Health and Human Performance; Vaughn Barry (Faculty Sponsor), Health and Human Performance

People are continually looking for a way to improve their workouts. This includes supplements, legal and illegal, that can improve strength, endurance, and reduce fatigue. Caffeine, being one of these supplements, has been shown to improve maximal strength (Jacobson, 1992). The study performed was focused on the effects of caffeine on muscular endurance and mental fatigue, which are two areas that have not been studied quite as much as its effects on strength. Twenty physically active females between the ages of 18-25 were recruited for this study. Participants were given a caffeine dose of 3mg per kg of body weight. In most studies, 3-9mg/kg of body weight has been shown to maximize caffeine blood levels (Astornio, 2011). The participants in the present study went through two trials, one of which they were given caffeine and the other placebo, it was performed as a double blind study. They then performed a maximum repetition body squat test. The participants were instructed to keep time with a metronome set at 50 beats per minute - one beat down and one beat up. Participants continued squatting until they reached what they felt was failure, or until they broke form for 3 reps in a row, as determined by the researcher. They were administered a Brunel Mood Scale questionnaire immediately after finishing their test to assess mental fatigue. During this poster presentation the relationship between caffeine, maximal number of squats, and feelings of mental fatigue will be discussed.

## ISLAMIC LAW IN INTERNATIONAL RELATIONS: A CASE STUDY OF IRAN AND THE CONFLICT OVER ITS NUCLEAR PROGRAM

Mahmud Brifkani, Undergraduate, Political Science; Vanessa Lefler (Faculty Sponsor), Political Science

In seeking to understand why countries behave differently towards international law, researchers point to differences in domestic legal systems as one explanation. Domestic legal systems may be categorized into one of four types: common law, civil law, Islamic law and those with mixed systems. Comparing these four types, countries with Islamic law systems tend to have the highest levels of compliance with international agreements. This is because of the importance of commitments in Islam, which emphasizes the principle of *pacta sunt servanda*. The purpose of this paper is to execute a stress test for the theory linking *pacta sunt servanda* and Islamic Law countries, focusing on the critical case of Iran and its conflict with Western democracies and Israel over its nuclear program. Specifically, it asks how Iran's status as an Islamic law country affects its willingness to abide by the Nuclear Non-Proliferation Treaty (NPT) and its subsequent ability to resolve the conflict with the United States and other Western powers. Non-compliance with international law among Islamic law states ought to be rare; Iran's perceived violations of the NPT are counterintuitive to the empirical evidence that shows a correlation between Islamic law countries and treaty compliance. I hypothesize that Iran disregards the NPT and advances its nuclear weapons programs because its security concerns override its external obligations. This case study demonstrates the limits of the theory linking domestic legal regimes to commitment to international law and provides an alternative set of conclusions about nuclear proliferation conflict management.

DEPENDENCE OF THE ENHANCEMENT FACTORS OF RAMAN SPECTROSCOPIC SIGNALS ON THE SUBSTITUENTS OF ANILINE AND THE ANALYTICAL METHODS

Rachel Davies, Undergraduate, Chemistry; Ngee Sing Chong, Faculty, Chemistry; Beng Guat Ooi, Faculty, Chemistry; Beng Guat Ooi (Faculty Sponsor), Chemistry

Surface Enhanced Raman Spectroscopy (SERS) based on the adsorption of various anilines onto silver and gold nanoparticles are studied with a Raman spectrometer with an excitation wavelength of 785 nm. The SERS enhancement factors and detection limits for aniline and eight of its halogenated and non-halogenated derivatives are determined and compared. The effects of the substituents on the anilines are evaluated with respect to their influence on the SERS enhancement factors. The degree of enhancement is also correlated with the methods for preparing the silver and gold colloids used with SERS analysis. The structure of the colloidal particles are analyzed by transmission electron microscopy and correlated with the SERS enhancement factors. Due to interactions between the amine groups and the metal, the spectral peaks generated using SERS are often shifted in wavenumber.

## CAPITALIZING ON MOTHER EARTH: A MARXIST CRITIQUE OF COLONIAL & NEO-COLONIAL HAITI

Dianne Guerrier, Undergraduate, Speech and Theatre; Patrick Richey (Faculty Sponsor), Speech and Theatre

Haiti is a country with a rich culture past but also lingers on a dark colonial past. This project will help explain the economic problems that currently plague Haiti. Haiti continues to be in a state of an emergency despite money received from multiple source of international aid. The land is rich and fertile for farming, yet farmers are not able to grow food to support the indigenous population. This project will focus on environment concerns in Haiti. It will do so by identifying key factors from Haiti's controversial colonial past. The author will specifically focus on the United States presence and "occupation" from 1915 through 1934 and determine if the United States is promoting Haiti's environmental advancement or having a negative effect. The author will utilize post-colonial theory as a lens to examine Haiti's relationship with United States during the 1930s through current environmental discourse. Specifically, the project will examine one key variable of colonialism; keeping a parent country's colonies reliant to the parent country.

## MOLECULAR COMPONENTS OF CERTAIN PLANT EXTRACTS MAY PROVE SIGNIFICANT IN THE TREATMENT OR PREVENTION OF MANY DISEASES

Ashley Lipscomb, Undergraduate, Chemistry; Matt Wright, Graduate student, Chemistry; Prisca Taylor, Graduate student, Chemistry; Norma Dunlap (Faculty Sponsor), Chemistry

The active components of many medications are naturally produced in the world around us. Countless antibiotics, heart medications, cancer drugs, and pain medications have been derived from natural sources such as fungi, marine organisms, and even snails. Penicillin, discovered in 1928, is one of the most well-known examples of this type of naturally derived drug. In the Department of Chemistry at MTSU, the search continues for new, naturally occurring small molecules that can be used to treat and prevent disease, particularly those diseases for which there are few known effective treatments. Students are searching for these medicinally significant compounds in several Chinese and Native American plant extracts that have proven to considerably inhibit some cancers and degenerative diseases, as well as some bacterial, viral, and parasitic infections. In attempting to purify the plant extracts into their active compounds, the crude extracts have been separated into fractions based on their polarity and solubility. With compound isolation guided by the continued assaying of each fraction against disease agents, significant inhibition has been recorded in the cases of Herpes Simplex Virus I, Alzheimer's disease, and some cancer cells thus far. While the search continues for the medicinally active components in these extracts, each step of purification provides further insight into the chemical properties of the compounds that are being isolated. Currently, maximum inhibition appears to be isolated in the chloroform sub-fractions of a plant labeled "Chinese Plant Extract A." Such precise isolation of the plant's inhibiting effects has allowed for the focusing of purification steps on specific fractions. The hopeful discovery of new compounds that not only inhibit the activity of certain fatal diseases, but do so without harming the host, carries with it positive implications for the future of medicine.



## HIV/AIDS INTERVENTION PROGRAM FOR VETERANS IN THE MURFREESBORO AND NASHVILLE AREA

Cynthia Bass, Undergraduate, Health and Human Performance; Amber Dorsey, Graduate student, Health and Human Performance; Andrew Owusu (Faculty Sponsor), Health and Human Performance

Introduction: According to the U.S. Department of Veteran Affairs (VA), the prevalence rate of HIV infection among veterans increased by approximately 4% between 2007 and 2011. The mean age of infected veterans rose from 52 to 54 years of age, and males comprised 97% of the veterans infected with HIV during the same period. When considering HIV infection rates by race, similar to the civilian population, black veterans are more likely to be infected with HIV. However, the rate for white veterans is much higher than the rates for civilian whites; 40% (veterans) versus 29% (civilians). Effective programs focusing on primary and secondary prevention can help reduce the incidence of transmission, prevalence, and better compliance to treatment requirements. Working with the VA Hospital in Murfreesboro, TN, program planners from Middle Tennessee State University will implement an HIV/AIDS awareness program to help combat HIV infection among veterans in the general Murfreesboro/Nashville area. This program will run along-side other VA HIV/AIDS initiatives.

Program Description: Program participants will consist of veterans registered in the VA Substance Abuse Treatment programs in Murfreesboro and Nashville. A pretest will be administered to determine the initial extent of veterans' knowledge concerning HIV/AIDS transmission, prevention and treatment. Participants will then participate in six weekly HIV/AIDS educational sessions. After the sixth educational session, participants will be given a post-test to check the extent of knowledge change due to the program. The results from this program will contribute to existing information about the effectiveness of education-based interventions in addressing HIV/AIDS issues among veterans.

SURVEY OF BOTANICAL EXTRACTS TO IDENTIFY POTENTIAL SOURCES  
FOR NEW DRUGS TO TREAT *ACANTHAMOEBA POLYPHAGA*

Alexis Gross, Undergraduate, Biology; Jeannie Stubblefield, Graduate student, Biology;  
Anthony Newsome, Faculty, Biology; Anthony Newsome (Faculty Sponsor), Biology

*Acanthamoeba polyphaga* is an opportunistic pathogen commonly found in both soil and water environments. It is the causative agent for *Acanthamoeba keratitis* (AK), a disease which can progress from corneal ulcers to blindness. Granulomatous amebic encephalitis (GAE), results when *A. polyphaga* infects brain tissues causing central nervous system damage and often results in death. Species of *Acanthamoeba* may also serve as reservoirs for diverse bacteria including important human pathogens such as MRSA, *Listeria monocytogenes*, *Eschericia coli*, *Helicobacter pylori*, and *Legionella pneumoniae*. Current treatments for *Acanthamoeba keratitis* often involve hospitalization. Even with weeks of follow up treatments, patients may still need a corneal transplant to restore vision. There are few successful treatments recorded for GAE. There is a need to develop more effective treatments for diseases caused by *Acanthamoeba*. In this study, botanical extracts from plants used in traditional Chinese medicine were evaluated using a fluorometric assay to identify potential sources for new chemotherapeutic treatments for diseases caused by *Acanthamoeba*.

**PREFIXES, SUFFIXES, AND COMPREHENSION: A STUDY OF MORPHOLOGY**

Kaitlyn Wallace, Undergraduate, Psychology (Honors College); Stuart Bernstein (Faculty Sponsor), Psychology

Two studies examined the relationship between reading comprehension and morphology (prefix and suffix knowledge). Morpheme knowledge was measured with a newly developed morpheme counting task. The effects of word reading, spelling, and morpheme counting on ACT science scores were examined in a sample of college students. Word reading, spelling, and knowledge of morphemes were all significantly correlated with ACT science scores. A hierarchical regression revealed that word reading and morpheme counting both contribute unique variance to ACT science scores, while spelling does not. A second study was a content analysis of ACT science sample test passages. The number of 1, 2, 3, and 4 morpheme words were counted to give an estimate of the morphological complexity of written material in this test.

## AN EXAMINATION OF THE RELATIONSHIP BETWEEN SCHOOL-BASED VIOLENCE AND MENTAL HEALTH OUTCOMES AMONG TENNESSEE HIGH SCHOOL STUDENTS

Brooke Moton, Undergraduate, Health and Human Performance; Brittney Oliver, Graduate Student, Health and Human Performance; Andrew Owusu, Faculty, Health and Human Performance; Andrew Owusu, Faculty Sponsor, Health and Human Performance

**Introduction:** Existing literature suggests that victims of school-based violence are likely to experience negative mental and physical health outcomes. Less is known about the health outcomes related to threats and other forms of intimidation experienced by high school students. In the current study, relationships between threats or injuries with weapons and concerns about safety, depression, and suicide behaviors among Tennessee adolescents are examined.

**Methods:** Data from the self-administered 2011 Tennessee Youth Risk Behavior Survey were used in analysis of the selected variables. A questionnaire item regarding students' experiences of threats or injuries with weapons served as the independent variable. The dependent variables included skipping school due to concerns about safety at or on the way to school, signs and symptoms of depression, suicide ideation, suicide planning, and suicide attempt.

**Results:** Odds ratios were calculated for 2X2 complex samples cross-tabulations. Significant relationships were found between being threatened or injured with a weapon and concerns about safety at or on the way to school (OR=15.82 [11.79-21.23]), signs and symptoms of depression (OR=3.06 [2.86-3.27]), suicide ideation (OR=3.48 [2.31-5.25]), suicide planning (OR=3.93 [2.49-6.19]), and suicide attempt (OR=5.42 [4.73-6.21]).

**Conclusions:** Results indicate significant relationships between threats or injuries with weapons and several negative behavioral and health-related outcomes—highlighting the importance of addressing non-physical and physical acts of violence and aggression. Administrators and health educators working with adolescents should note such relationships and incorporate positive mental health and suicide prevention strategies into school-based anti-violence programs and interventions.

## DYNAMIC VIBRATION ABSORBER

Linde Breazeale, Undergraduate, Engineering Technology; Sid Sridhara (Faculty Sponsor), Engineering Technology

A dynamic vibration absorber, or sometimes called a vibration neutralizer, is used in vibration analysis. This is a spring-mass system that counteracts a system that is experiencing vibration excitement. Sometimes, systems such as engines and motors often trigger vibration due to something being off balance. A dynamic vibration absorber can be added to the system and fixed to work in such a way that the vibrations are eliminated due to the frequency of the dynamic vibration absorber. By implementing this technology, the possibility of catastrophic failure within the system is reduced. When a dynamic vibration absorber is used properly, the unwanted vibration is neutralized which can lengthen the life of the system. This project involves the design, construction, and demonstration of a working dynamic vibration absorber.

NATURE SPIRIT- RENDERED SELF-PORTRAIT

Alicia Washer, Undergraduate, Art; Robert Durham (Faculty Sponsor), Art

This piece was made for my Drawing II project during my sophomore year as a graphic design major. It is composed of three different images, including a self portrait, rendered to create one whole composition. I chose elements that I felt represented me, my interests and my heritage, the feathers for my Native American roots and the tree and moon to represent my Celtic blood. I enjoy composing works of art that deal with fantastical elements and nature. This work was drawn with 4H, 2H, and 2B graphite pencils and rendered with blending sticks and eraser. This was one of my first self portraits and my first project using graphite pencils.

## SCHOOL NUTRITION RECIPE DEVELOPMENT AND EVALUATION: A SMALL, INFORMAL STUDY OF MIDDLE SCHOOL STUDENTS AND TEACHERS

Amber Payne, Undergraduate, Human Sciences; Laurie Adams, Undergraduate, Human Sciences; Lisa Sheehan-Smith (Faculty Sponsor), Human Sciences

With obesity at epidemic levels and chronic disease risk factors becoming prevalent at younger ages, there is now a novel focus on improving children's nutritional status. The US Department of Agriculture's Food and Nutrition Services updated the national nutrition standards in 2012 to include more fruits and vegetables, replacing refined grains with whole grains, and limits on saturated fat. Meeting the government standards with nutritious options that kids enjoy while making good use of commodity foods is a constant challenge for school nutrition managers. The purpose of this study was to create a recipe that students enjoyed and that met the new government nutrition standards while using a commodity food and ingredients regularly available for purchase by a school nutrition manager. A standard recipe for taco soup was chosen and modified to reduce sodium and include adequate protein, and then prepared and sampled by a group of 50 students and teachers. Evaluation forms were completed to gain feedback on the appearance, aroma, and consistency of the soup, an overall score, and an indication about whether or not the soup should be added to the school menu. The soup received a mean score of 1.39 on a scale of 1 to 5, with 1 being the best ranking. Nutrient analysis revealed that the soup meets the new nutrition guidelines, food cost analysis shows the cost is only \$0.52 per serving, and the recipe was submitted for approval to be added to the school system's menu rotation.

## INFLUENCES OF STUDENTS' BEHAVIORS THAT INFLUENCE THEIR ACADEMICS

Brittany Hardy, Undergraduate, Educational Leadership-Curriculum and Instruction;  
Meghen Sanders (Faculty Sponsor), Educational Leadership-Curriculum and Instruction

This study focuses on the influences of students' behaviors and how it affects their academic performance. The goal of this study is to raise students' awareness that their behaviors do have an impact on their learning and academic performance and that the effect can be positive or negative. This study will examine the following questions: 1) Do students' behaviors affect their academic scores? 2) Students that tend to have positive behaviors do they perform better academically? The population of this study consists of five students: four boys and one girl. Classroom teacher Ms. Hardy, student's parents, and the guidance counselor will be involved in this study. Data will be collected through survey questions about each student, a running record kept by the teacher on a daily basis that records important information such as what assessment were given to students at school that day, what time of the day was the assessment was given, was the student's behavior positive or negative, and what do you think might have impacted the student's behaviors? Teacher will ask students interview questions and the school guidance counselor. The information that it hopefully gained from this study is providing awareness to students and their families that behavior does have an impact on a student's academic performance.



## SOCIAL MEDIA EFFECTS ON WEDDING DRESS PURCHASE PLANNING

Precious Creavalle, Undergraduate, Human Sciences; Daylin Taylor, Undergraduate, Human Sciences; Kerri Painton, Undergraduate, Human Sciences; Lauren Rudd (Faculty Sponsor), Human Sciences

Advanced Computer Aided Apparel Design (CAD) students majoring in Fashion Merchandising and Apparel Design investigated how wedding dress planning is affected by social media in order to improve sales and exposure to appropriate markets. The class was interested to find out if social media, through information, greater exposure and peer pressure, caused wedding dress purchasers to spend more or less on their dress. The class researched what social media sites were being used for wedding planning with particular emphasis on the wedding dress. They then looked at how social media was being used to advertise, locate, and share wedding dress designs and ideas from wedding dress suppliers, designers, and among social media users. The students developed a survey inquiring about demographics, social media use, and wedding dress planning. The results were evaluated and used to formulate recommendations to merchandisers and designers in the Textiles, Merchandising, and Design department (TXMD) to better market their product.

## A MARXIST CRITICAL APPROACH TO COLONIZATION OF SOUTH AMERICA

Renee Adams, Undergraduate, Speech and Theatre; Patrick Richey (Faculty Sponsor),  
Speech and Theatre

Inhabited by indigenous people, South America was untouched by European encroachment until Spanish explorers arrived. The Spanish first explored South America to become wealthy, specifically by accumulating gold. After colonization by the Spanish conquistadors, Latin American cultures were exceedingly transformed from the native culture to a hybrid culture. This essay applies concepts of Marxist critical theory to the cultural changes via the commodity of gold. The essay discusses Spanish cultural programs of religious conversion as one means of extracting and controlling the commodity of gold by controlling native labor populations. It does so by specifically investigating Ecuador and its colonial past. By using a Marxist critical lens, scholars can evaluate how the Spanish altered Ecuador. The Ecuadorian example explains how cultures can change from a native culture to a hybrid culture, for the purpose of economic gain. This presentation can also help explain how modern Latin American cultures beyond Ecuador cope with their brutal colonial past.

**FEMININE EMPOWERMENT WITHIN A MASCULINE FRAMEWORK:  
STRATEGIES EMPLOYED BY AZTEC WOMEN**

Nailah Herbert, Undergraduate, Sociology and Anthropology; Andrew Wyatt, Faculty Sponsor, Sociology and Anthropology

The Aztec empire is often described as a male-dominated, militaristic culture. Most research presents women within the Aztec empire as victims of masculine oppression or as active agents subtly resisting oppression. Was it possible for Aztec women to acquire power, prowess and autonomy in such a male-oriented society without contesting gender norms? Did women's professions and occupations represent a vehicle through which to acquire greater status? How was the sociopolitical position of Aztec women shaped by their roles, occupations, and expectations within society and did they have any agency in attaining this position? In this presentation we report the methods and strategies that Aztec women may have employed, within the masculine framework of their society, to achieve sociopolitical positions of power and influence in ways deemed socially acceptable and 'appropriate' for women.

**MEDEA: PASSION, RAGE, AND REVENGE**

Stephanie Bottum, Undergraduate, Speech and Theatre; Virginia Donnell (Faculty Sponsor), Speech and Theatre

This project illustrates a visual interpretation of the Euripides tragedy Medea set in sixteenth century New England. The interpretation was developed in response to a THEA 3050 assignment in the Fall 2012 semester and included designing all aspects of a production: gathering ideas, sketching, creating a collage, and a finished design. A tattered, worn, overused family Bible was the inspiration for the design process. Impressionism was the designated style choice. The project consisted of creating costume, set, lighting, and make-up designs for Medea with the sixteenth century setting, inspiration, and production style. The environment that was created for this play is one that can be described as lonely, dark, foreboding, structured, sober, and painful.

A COMPUTATIONAL INVESTIGATION OF THE TWELVE-FOOT TELEMMASTER  
UTILIZING 3-D MODELING AND COMPUTATIONAL FLUID DYNAMICS  
SOFTWARE VERIFIED BY WIND TUNNEL TESTING

Brett Bornhoft, Undergraduate, Aerospace (Honors College); Nate Callender (Faculty Sponsor), Aerospace

The Telemaster remote controlled (R/C) aircraft has been used as an Unmanned Aircraft System (UAS), but no direct aerodynamic studies have ever been conducted on the airframe to our knowledge. Without this data, it is difficult to confirm that such a system is airworthy; therefore, it is difficult to receive a Certificate of Authorization (COA) from the Federal Aviation Administration (FAA) to fly in the National Airspace System (NAS). The purpose of the study was to investigate the aerodynamic characteristics of the Telemaster UAS using two methods. The first method has been a wind tunnel study of the Telemaster using a 1:14 scaled model of the aircraft. This model was created by measurements taken from the full scale Telemaster, incorporated into a 3-D computer aided design (CAD) model, and actualized via MTSU's 3-D rapid prototyping machine. Along with the wind tunnel study there will be a CFD study which will be completed using a 3-D CAD model of the Telemaster developed in Autodesk Inventor, a 3D modeling software. A CFD study is essentially a computational virtual wind tunnel that computes the same data as a wind tunnel only through computational methods. The resultant data will encompass a comprehensive aerodynamic study of the system and the data will be used to justify its ability to begin the flight testing phase of its development.

## WISDOM IN WORDS: ONE SCHOOL'S JOURNEY WITH VOCABULARY AND ADULT ENGLISH LANGUAGE LEARNERS

Jonathan Murray, Undergraduate, Educational Leadership; Dorothy Craig (Faculty Sponsor), Educational Leadership

Vocabulary instruction is a subject of hot debate. How can we continue to help our English Language Learners (ELLs) learn, acquire, and retain vocabulary? What methods can we use in this venture? The use of computers to aid instruction is helpful and provides limitless opportunities to enrich the learning experience for adult English learners. New Media, including computers, may help overcome the often-daunting task of learning new vocabulary. This QUAN QUAL Action Research study seeks to combine effective strategies, sound background of pedagogy, and new media to accomplish these goals. Ten students at the International English Institute will participate in this study. Quantitatively, students will take a vocabulary test at the beginning of the study and then use online tools to help them practice and study vocabulary. Qualitatively students will be interviewed on their use of strategies to learn vocabulary. Results from this study will be shared other educators interested in helping their students increase vocabulary acquisition.

## PROJECT ENGAGE

Tyler Mingle, Undergraduate, Elementary and Special Education; Heather Martin, Undergraduate, Elementary and Special Education ; Miguel Equia, Undergraduate, Elementary and Special Education; Raven Booth, Undergraduate, Elementary and Special Education; Hallie Shafer, Undergraduate, Elementary and Special Education; Becky Alexander (Faculty Sponsor), Elementary and Special Education

The purpose of this project is to provide MTSU students (teacher candidates) and elementary school faculty with iPads loaded with specific software that complements instructional strategies in the classroom. The use of iPads addresses the mandates from the Tennessee Board of Regents and the Tennessee Teaching Quality Initiative to cultivate fluency with 21st century technology within the context of the required curriculum. Project Engage addresses innovative ways to collaborate in the classroom through the use of iPads. MTSU students enrolled in the new Digital Learning Course from Middle Tennessee State University partner with the Woodbury Grammar School. Eighty percent of students attending the school are living in poverty and this gives MTSU teacher candidates the opportunity to work with a diverse population. The school recently obtained a grant from Verizon for several iPads and the instructional technology grant will give MTSU teacher candidates and faculty the ability to use iPads loaded with specific iPad applications that support collaboration. By combining the efforts of the Woodbury School and Project Engage, MTSU students and faculty will address standards that infuse technology within an elementary school setting.

**AUNTIE MAME: LIVE, LIVE, LIVE! THE DESIGN PROCESS**

Paige Alcorn, Undergraduate, Human Sciences; Christine Crowson, Undergraduate, Human Sciences; Kasey Hawkins, Undergraduate, Human Sciences; Lauren Hill, Undergraduate, Human Sciences; Elizabeth Kurtz, Undergraduate, Human Sciences; Haifa Mhanna, Undergraduate, Human Sciences; Tyler Neill, Undergraduate, Human Sciences; Federico Gonzalez Rivera, Undergraduate, Human Sciences; Shelby Stone, Undergraduate, Human Sciences; Kaitlin Styer, Undergraduate, Human Sciences; Lindsey Taylor, Undergraduate, Human Sciences; Mary Trombley; Undergraduate, Human Sciences Interior Design; Deborah Belcher (Faculty Sponsor), Human Sciences

Using the design process, the purpose of this project was to develop a program, propose a design concept, create a parti (inspiration) board, and present a presentation board for the renovation of our client's, Auntie Mame, foyer, stair and living areas. The design solution was based on an interpretation of one of six historic styles (Exotic Revival – Oriental, Modern, Neo-classical Revival, Georgian Revival, Danish Modern, and Exotic Revival – Indian) as researched and seen in the 1958 movie version of Auntie Mame starring Rosalind Russell. For the multiple solutions, the areas of No. 3 Beekman Place, Auntie Mame's New York apartment, are inspired by period colors and shapes, objects found in nature and decorative arts or trends from the 1930's through the 1950's. The concept statements describe the design vision while the parti boards show objects that define the overall idea and include the color scheme. Flooring, wall coverings, furniture, accessories and art selections are shown in the presentation boards and based on the needs and expectations determined in the program.



**“BRAS FOR A CAUSE” CREATIVE COMMUNITY SERVICE PROJECT**

Sara Vassar, Undergraduate, Human Sciences; Lisa Wells, Undergraduate, Human Sciences; Victoria Throneberry, Undergraduate, Human Sciences ; Haley Sims, Undergraduate, Human Sciences; Alexandria Shearer, Undergraduate, Human Sciences; Marcelene Rice, Undergraduate, Human Sciences; Felicia Raines, Undergraduate, Human Sciences; Nicole Lynch, Undergraduate, Human Sciences; Sharon Gonzales, Undergraduate, Human Sciences; Deborah Belcher (Faculty Sponsor), Human Sciences

The purpose of this project was to combine creativity, design, environmental consciousness, and social responsibility to develop an original repurposed bra design in a fundraising effort to support cancer research. The design solutions were based on individual inspirations. Parti (inspiration) boards were developed to visually express the design vision through color schemes, use of elements and principles, manmade objects or objects found in nature. Concept statements were written to describe the design vision. Solutions are based on a variety of media such as felt, wire, paint, lace, wood, silk floral components, laminated photographs, beads, buttons, and feathers. One solution, “Diane,” was inspired by natural finishes found in a kitchen such as woven jute, recycled glass tiles and sustainable wood. Another design, “Check Out My Rack,” displays overlapping paint chips with a stir stick and suspended paint brushes. Other solutions range from “Fox in the Garden” to “Rustic Chic: Shingle Style.”

## DEVELOPING A WEB-BASED WEBSITE MANAGEMENT TOOL

Taylor Harvin, Undergraduate, Computer Science; Noah Snell, Undergraduate, Computer Science; Anthony Mills, Graduate student, Computer Science; Rachel Brewington, Undergraduate, Computer Science; Jungsoon Yoo (Faculty Sponsor), Computer Science

During the summer of 2012, we modernized the website for the Old Fort Golf course to handle the dynamic requirements of the golf course. We designed a user friendly web-based management system that allows the responsible personnel to manage and customize various parts of the website. With this new management system, they are now able to manage pictures in the photo galleries and the slide show used in the website, change any information printed on any individual page, post events and update the calendar; all of these changes can now be accomplished without any knowledge of the web programming. To provide the golf staff with this tool, we had to initially convert the original static website to a dynamic website with the use of a database to store most of the information displayed on the site. With this structure, changing the information in the database now results in changes to the website. We also included a user management system that allows the Old Fort administrative staff to add users along with the authorization level of the user such as administrator or association leader. This allows the administration of the golf course the ability to control what each user is able to change on the website. With this new dynamic website, the Old Fort Golf staffs are now able to change most of the website whenever any changes are needed without any assistance from the city IT department, and they are now able to make these changes instantly. This management tool was created using only the open source technology such as PHP, JavaScript, and MySQL.

## AUTOMATING THE BEVERAGE INDUSTRY

Dexter Baker, Undergraduate, Engineering Technology; Chong Chen (Faculty Sponsor), Engineering Technology

Automation is the technique of making an apparatus, a process, or a system operate automatically without human interaction. The application of automation optimizes productivity and efficiency in the production of goods and services with the use of telecommunications, robots, and control systems. Thus, automation has an impact on our everyday life because of its wide range of use in industry. Food and beverage industry professionals estimate that in the next five to ten years, the majority of beverages served to customers will be produced by automated beverage systems. The overall objective of this project is to design and construct an automated drink machine capable of making three separate drinks. The drink machine will consist of a conveyor, three servo motors, three pumps, and an Arduino microcontroller. Another objective is to implement wireless communications between the drink machine and the operator using Bluetooth technology and an infrared sensor module. An Android smart phone app will be created to allow the user to make drink choices without interfacing with the machine directly. A touch screen universal remote will be used for operators without a smart phone. Overall, this project will demonstrate the use of automation of the production of beverages using wireless communications with the user and drink machine.

## LAYERED ORCHESTRAL RECORDING TECHNIQUES FOR CONTEMPORARY MUSIC

Phillip Hartsuiker, Undergraduate, Recording Industry; John Hill (Faculty Sponsor), Recording Industry

Pairing orchestral composition with contemporary music is a practice that has been used for many years. However, with the capabilities afforded by modern recording techniques, the possibilities for creatively engineering such a work are multiplied. This recording project consists of a number of microphone and recording techniques based on layering several partial orchestral performances together in order to form a complete arrangement which will then be mixed into the song. I intend to have a small group of musicians play the parts that a large-sized orchestra might have, only instead of one performance with as many as thirty musicians, the recording will consist of several layered performances consisting of only a few musicians. This allows both for greater control of room ambience as well as greater detail within the recording of the individual instruments. Having greater control of reverberated sound within the ambient space is crucial to providing an appropriate tone to a recording as well as a proper sense of space to the listener. Also, having greater control over the direct sound of the instruments balances that reverberant ambience with focused sonic detail that is crucial to exposing the vital contribution that each instrument supplies. By applying a variety of both original and well-established recording styles and microphone techniques, I anticipate that the result will be very well-balanced but will also give much greater creative control after recording.

## IN-HOUSE DEVELOPMENT OF AN EDUCATIONAL GAS TURBINE LABORATORY MODULE

Eric Guyes, Undergraduate, Aerospace (URECA); Nate Callender (Faculty Sponsor), Aerospace

The Aerospace Technology concentration in the MTSU Department of Aerospace is designed to prepare students for graduate studies and technical careers in the aerospace field. However, the Aerospace Technology program lacks a suitable demonstration aid to educate students about gas turbine theory. Commonly known as the jet engine, the gas turbine is a vital component of the modern aviation industry. A turbine engine test cell would address the shortfall by giving students hands-on testing experience to complement their in-class curriculum. Commercial test cells are available but are cost-prohibitive. The aim of this project is to develop a laboratory module that fills the training aid gap yet costs a fraction of the price of a commercial unit. The module consists of a gas turbine test cell and an accompanying student activity. Test cell construction is being performed in-house with a set of engineering plans and with the aid of Engineering Technology and Aerospace faculty. The student activity is being developed in conjunction with the Aerospace Technology program director and will instruct students in the calculation of engine performance from several measurable parameters. Upon completion of the module, Aerospace Technology students will have access to an educational tool that enhances their understanding of gas turbine propulsion and better prepares them for careers in the industry.

## DESIGNING A MOTION ANALYSIS PROGRAM IN MATLAB

Eric Guyes, Undergraduate, Physics and Astronomy (URECA, Honors College); Eric Klumpe (Faculty Sponsor), Physics and Astronomy

An object detection and motion analysis program is being developed in the MATLAB computing environment. This program is the first step in a sense-and-avoid project with an ultimate goal of creating a collision avoidance system usable in unmanned vehicles. Video frames captured from a webcam are used as experimental data. The program accomplishes object detection by applying a three-step method consisting of background subtraction, edge detection, and centroid location processes. Motion tracking code is under development and will calculate the object's speed, acceleration, and specific kinetic energy (kinetic energy divided by mass). The program will be capable of tracking a single object moving in two-dimensional motion. This study will enable multiple object recognition and three-dimensional motion detection techniques to be developed in the future. Further, the program's flexibility will allow it to be used in motion tracking applications beyond unmanned vehicles.

## AN INNOVATIVE VIRTUAL REALITY DRIVING ENVIRONMENT FOR AUTISM INTERVENTION

Joshua Wade, Undergraduate, Computer Science; Medha Sarkar, Faculty, Computer Science; Medha Sarkar (Faculty Sponsor), Computer Science

We are collaborating with the Vanderbilt School of Engineering and Vanderbilt Kennedy Center to develop a virtual environment that can be used for autism therapy. Teenagers with Autism Spectrum Disorder (ASD) face obstacles that individuals without ASD do not. Developing the skill of operating a vehicle, for example, is challenging enough without the additional level of difficulty that ASD presents. In order to develop the skill of driving in a teenager diagnosed with ASD and to safely and effectively monitor their progress, we have employed the use of a virtual reality (VR) environment. Adopting the Unity game engine and a Logitech G27 controller for vehicle control, we have created an interface for driving simulation. The participant's performance and physical state are measured in a variety of ways, which include eye tracking, physiological signal retrieval, and controller-manipulation analysis. The data collected through these means will be used to provide constructive feedback to the participant as well as help us develop ways in which we can help teenagers with ASD cultivate basic skills like driving. The virtual driving skill training platform is designed around a virtual city. The city environment was constructed using a 3D content creation tool called CityEngine (v. 2011.2). A sample city model – modeled after a downtown area of Philadelphia – was used and expanded significantly to design the city needed for the driving task. The city model was imported into the game engine Unity (v. 3.5.3). The overall system consists of components such as a virtual task presentation simulator, driving interface module, physiological and eye tracking monitoring applications and their associated psychological state and engagement detection modules. The participant's vehicle is controlled by the Logitech G27 steering wheel, pedals, and gears.

**CHOOSE YOUR OWN RELATIONSHIP**

Thomas Bentley, Undergraduate, English; Jennifer Kates (Faculty Sponsor), English

This presentation is a short story written workshopped through Kates' fiction writing class and the Creative Writing Group (University Writing Center) and Jennifer Kates' fiction writing class. This work reads similarly to a "Choose Your Own Adventure" book made popular in the late eighties and early nineties, but with a twist that allows it to be read and performed live. While the theme may seem like an unlikely candidate for live performance, this piece is written and performed in a linear format. The story outlines the last few days of a failing relationship where all choices will inevitably end in a breakup, thus making the story linear as all decisions lead to the relationship's demise. Universal themes include the comedic effect of associating such a tumultuous life event with the gimmicky fantasy formula that made the books popular.



## LIBIDO

Trey Shanks, Undergraduate, Biology; Jennifer Kates (Faculty Sponsor), English

This work is literature, short form fiction, laconic prose descriptions of the opposing sex and interactions with the opposing sex, all written from the male perspective and aimed at roughly sketching or capturing the mysterious confluence of feelings derived from one's desire to find a mate in Western culture. The title is 'Libido,' which indicates the biological imperative to procreate and the sexual desires produced by various kinds of interpersonal interaction. This dichotomy of the term 'libido' is used here in this work as an indication of the rational and irrational thought processes involved in finding a mate or love interest. One procreates because it appears that one must, evolutionarily speaking, but one finds all these confusing social constructs and stratagems standing in one's way. All of this is a very scientific and technical way to describe what are some really fundamental and sometimes silly feelings, which are exemplified in this work.

AUGUST

Lukas Tallent, Undergraduate, English (Honors College); Jennifer Kates (Faculty Sponsor), English

This project is an original short story that was initially presented in Dr. Kates' Fiction Writing course workshop and revised based on feedback from professor and classmates. The narrative follows Dale, an old factory machinist who has been recently laid off. After being let go, the old man takes refuge at a local golf course where his grandson unexpectedly arrives to join him. The story pits young against old with certain classist tendencies, exploring concepts of loss and how we deal with what is left of our lives.

