NINTH ANNUAL UNION UNIVERSITY SCHOLARSHIP SYMPOSIUM

TUESDAY, MAY 1, 2012

Reception for Participants, Faculty & Outside Guests
Grant Events Center 12:00-12:30 p.m.

**Afternoon Concurrent Sessions**

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<th>Dept.</th>
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<tr>
<td>Poster</td>
<td>Grant Events</td>
<td>Amanda Ellis, Adam Griffith, Michael Lewis, &amp; Jeana Pratt (BIO)</td>
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<td>Displays</td>
<td>Center</td>
<td>Hunter Price (BIO)</td>
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<td>BIO WH 102</td>
<td>Beth Lee</td>
<td>1:20 p.m.</td>
<td>Session 2 Chair: James Kerfoot</td>
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<td>CSC PAC D-52</td>
<td>Kevin Reed</td>
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<td>DMS JEN 225</td>
<td>Antoine Hall</td>
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<td>Session Chairs: Cam Tracy</td>
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<td>ENG Theatre</td>
<td>Alex Rhoades, Amanda Bennett, Cale Little, Courtney Olson, DeShunti Sanders, Healthier Franks, Holly Owens, Jonathan Boyd, Jordan Sharp, Julia Appleton, Logan Smith, Mary Laar, Michael O’Malley, Sara Tate, Savannah Mealor &amp; Whitney Williams</td>
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<td>Session Chair: Gavin Richardson</td>
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<td>Mark Waite, DeShuni Sanders, Courtney Olson, Chris Rowland, Ellen Cline, Kate Benedetti, Lindsay Olford, Rebecca Farrell, Megan Pinckard, Morgan Riekeman, Rebecca Edgren &amp; Mary Davis</td>
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<td>ENGHIS/PSC</td>
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<td>Whitney Williams (ENG)</td>
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<td>EGR/MAT/PHY</td>
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<td>Karl Magnuson, Nate Peterson, Rob Calvert &amp; John Hall (EGR)</td>
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<td>Jon Vunk, Joshua Grant, Rebecca Sharpe &amp; Brady Sheppard (EGR)</td>
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<td>Rachel Quinn, Aaron Porterfield (EGR)</td>
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<td>Joel Ingram &amp; Grace Morris (EGR)</td>
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<td>Ryan Spencer (PHY)</td>
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<td>Emilie Huffman (MAT)</td>
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<td>Kimberly Lukens (MAT)</td>
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<td>ICS/SOC</td>
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<td>Session Chair:</td>
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<td>Kelsey Reeder (ICS)</td>
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<td>Mallory Cupples (ICS)</td>
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<td>Katherine Pullen (ICS)</td>
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<td>Thomas Willis, Jeremy Osborn &amp; Kayla Ellingsworth (BUS)</td>
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<td>Meredith Gunn, Ryan Cronin &amp; Spencer Thomas (BUS)</td>
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<td>Shane Jacobs (EDU)</td>
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The Response and Kinematics of *Pimephales promelas* to Pyridine-N-Oxide

**Presenters:** Amanda Ellis, Adam Griffith, Michael Lewis, and Jeana Pratt  
**Faculty Advisor:** J.R. Kerfoot

To better understand the predator/prey interactions of *Pimephales promelas* the alarm pheromone Pyridine-N-Oxide was used to elicit a startle response. When attacked and the epidermis is punctured, these minnows passively release this pheromone that contains a Pyridine-N-Oxide analog. This alarm cue acts to alert conspecifics of nearby predators. It is not known how varying concentrations of this alarm pheromone affect the kinematics of startle response in the prey. It was hypothesized that the startle response of *Pimephales promelas* is dependent on the alarm cue concentration. This hypothesis was tested by measuring startle responses using a high-speed camera after exposing twelve fish to a random sequence of four concentrations (0.355 g/mL, 0.105 g/mL, 0.034 g/mL, and 0 g/mL). Measured kinematic events included C bend, S curve, and velocity of startle response. Preliminary results indicate a weakly positive correlation between startle response and chemical concentration, suggesting the startle response is not homogenous.

Scopolamine Effects on Olfactory Fear Generalization in Mice

**Presenter:** Allison Gooch  
**Mentor:** Max Fletcher, UTHSC Department of Anatomy and Neurobiology

The following research study investigated the neural mechanisms underlying the generalization of learned fear. In some disorders, such as PTSD, affected individuals often display fear to neutral stimuli that do not signal danger. This suggests that these individuals have impaired ability to distinguish among stimuli, a phenomenon known as generalization. Subjects therefore exhibit responses to other stimuli that are similar to the trained stimulus. The cholinergic antagonist, scopolamine, has been shown to reduce learning in murine systems. Therefore, it is expected to increase generalization in similar subjects. Because of this capability, scopolamine served as a means to investigate the mechanisms by which individuals learn and perceive stimuli. Generalization was measured in mice by administering a single systemic scopolamine injection prior to exposure to a single odor (ethyl valerate [E5]) coupled with footshock. Mice were subsequently exposed to an identical odorant (E5) or a similar one (E4 or E6) during a testing phase. Freezing exhibited during testing was measured and compared to freezing during the prior training phase using FreezeFrame software (Coulbourn Instruments). Both control and scopolamine mice generalized their fear to E6 odorant, but not to E4. Although overall freezing amounts were reduced in scopolamine mice, the amount of generalization remained proportional in control and scopolamine mice. These results suggest that while scopolamine appeared to reduce learning of olfactory associations, it did not have any effect on generalization of this learning.

Estimating White-Tailed Deer Populations Using Antler Shed Collectors

**Presenter:** David Hamilton  
**Faculty Advisor:** Andy Madison

Properly managing white-tailed deer (*Odocoileus virginianus*) populations requires accurately assessing population size. We attempted to estimate deer populations in West Tennessee using antler collection stations. We established 2 antler collection stations at a farm in Madison County, Tennessee. The antler collection stations were constructed using cattle fencing and were baited with corn. Two trail cameras were also mounted nearby to photographically assess all animals that used the stations. There were not any antlered deer found (or photographed antlered deer). Therefore, it is expected to increase generalization in similar subjects. Because of this capability, scopolamine served as a means to investigate the mechanisms by which individuals learn and perceive stimuli. Generalization was measured in mice by administering a single systemic scopolamine injection prior to exposure to a single odor (ethyl valerate [E5]) coupled with footshock. Mice were subsequently exposed to an identical odorant (E5) or a similar one (E4 or E6) during a testing phase. Freezing exhibited during testing was measured and compared to freezing during the prior training phase using FreezeFrame software (Coulbourn Instruments). Both control and scopolamine mice generalized their fear to E6 odorant, but not to E4. Although overall freezing amounts were reduced in scopolamine mice, the amount of generalization remained proportional in control and scopolamine mice. These results suggest that while scopolamine appeared to reduce learning of olfactory associations, it did not have any effect on generalization of this learning.

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methods. There may be various reasons; one may be the unusual weather/light patterns during the time of the study. These factors may have caused the deer shed their antlers earlier than anticipated.

Use Of Screech Owl Boxes For Nesting And Protection During Winter And Early Spring
Presenter: Scott Hawley
Faculty Advisor: James Huggins

Sixteen screech owl boxes were set up to determine what animal species would use them for nesting and protection. The boxes were made out of wood with dimensions of 7½ by 5½ by 27 inches; half were of pressure treated wood and half were not. The openings were placed 4 inches from the top and were 3½ inches wide and 5½ inches high. Nest boxes were placed 15 to 20 feet above the ground on mature oak trees. Our study area was on 183 acres of mixed deciduous forest in Chester County, Tennessee. Weather factors and temperature were also recorded to help determine effect, if any, on box use. Knowing the species assemblages that make use of man-made cavities will help in future conservation efforts and will aid wildlife managers make better decisions when managing a forest. Species were observed using an AQUA Snake eye II camera attached to a pole so that animals would not be disturbed when sleeping or in torpor.

Red-Eared Slider Turtle (Trachemys scripta) Orientation Capabilities After Short-Distance Relocation
Presenter: Jordan Hughey
Faculty Advisor: James Huggins

This study focuses on the orientation ability of the red-eared slider (Trachemys scripta). The work was conducted in the bottomland at the West Tennessee Research and Education Center (WTREC) in Jackson, Tennessee, throughout the summer of 2012. For the study, nine red-eared sliders were captured and released ~350 m from the capture site. The thread and spool method was used to track movements. Temperature and precipitation were also recorded based on WTREC information. Global positioning systems (GPS) and geographic information systems (GIS) were used to plot coordinates of the individuals movements. Statistically, the individuals did not orient directly toward their capture site. Some pairs of individuals, however, did orient in the same direction. It was impossible to determine if temperature or precipitation affected orientation due to lack of data. More work is needed to determine red-eared sliders orientation mechanism and what role it plays in relocation and conservation.

Vulture And Coyote Distribution By Habitat Type At The Milan Army Ammunition Plant
Presenter: Joshua Jellema
Faculty Advisor: Andy Madison

An assessment of the distribution of black vultures (Coragyps atratus), turkey vultures (Cathartes aura), and coyotes (Canis latrans) on the Milan Army Ammunition Plant (MAAP) relative to habitat type was performed in December 2011. Eight sites (2 sites of each habitat type) were baited with deer gut piles and monitored with 2 motion-sensitive cameras at each site for 2 weeks. We collected 6,777 pictures. Black vultures were most often observed in the pasture/grassland habitat, while turkey vultures and coyotes were generally present in equal numbers at all 4 habitat types. The cameras were also tested to determine if longer delays between triggering events caused less useful data to be collected. The cameras set to a 5-minute delay between triggered events recorded 3 times as many pictures and 50 more individual animals than the cameras set to an 8-minute delay.

Fecal Analysis of Endoparasites in Damara Zebras
Presenter: Stefanie King, Luke Foshee, and Chris Gant
Research Advisor: J.R. Kerfoot & James Mahan

This study is designed to examine the efficiency of both diatomaceous earth and safe-guard equine vaccine on endoparasite load in zebras. Zoos and farmers wish
to prevent diseases caused by endoparasites in the most economical and efficient way possible. Zebras were divided into the following three groups: a control without diatomaceous earth or vaccines, a group fed normally and given a safeguard vaccine, and a group given feed supplemented with diatomaceous earth and not given a vaccine. A zinc flotation method was used to examine the number of endoparasites in fecal samples from each of the three groups. The preliminary results of this study indicate that diatomaceous earth is more effective than the vaccine used at reducing the amount of endoparasites. In light of this study, zoos and farms may choose to use diatomaceous earth to prevent endoparasites rather than the traditional use of vaccines.

**Determination of Growth Regulators in the Regeneration of Khaya senegalensis**  
**Presenter:** David Koh  
**Faculty Advisor:** Mark Bolyard

This research focused on developing a protocol for the micropropagation of African mahogany, specifically the stage of shoot proliferation following callus formation. Although no shoot proliferation was observed, several hormone combinations for inducing high callus formation percentages and healthy calluses based on size and color were identified. High frequency of callus formation was observed on media containing the combination of 6-benzyladenine (BA) and 2,4-dichlorophenoxyacetic acid (2,4-D). In the second experiment, 100% callus formation was observed on 5 μM Kinetin, 5 μM Zeatin, 5 μM thidiazuron (TDZ), and 5 μM TDZ+1 μM Zeatin, all of which were combined with 1 μM 2,4-D. Green calluses with relatively large size were obtained on media containing 5 μM TDZ+5 μM 2,4-D. Green calluses in the second experiment were generally produced on media containing 1 μM TDZ with or without Zeatin and Kinetin. In a few cases, root formation was observed.

**Effects of Cholinergic Receptor Antagonism on Olfactory Fear Learning and Perception in Mice**  
**Presenter:** Beth Lee  
**Faculty Advisors:** Andy Madison and Max Fletcher, University of Tennessee Health Science Center

Fear conditioning has long been used as a powerful model for the study of the neural mechanisms behind learning and memory. Here we use this model to investigate the role of cholinergic neurotransmission in olfactory learning. Under control conditions, mice receiving pairings of an olfactory stimulus with aversive foot shock display robust fear towards the trained odorant as measured by stereotypical freezing behavior. We next applied systemic injections of cholinergic antagonists prior to pairing an odorant with aversive foot shock and measured freezing to the trained odorant as well as similar odorants the following day. Injections of the nonselective nicotinic antagonist mecamylamine before training had no effect of subsequent freezing levels. However, pre-training injections of the muscarinic antagonist scopolamine significantly reduced freezing to the trained odor in a dose-dependent manner. These results suggest that blocking muscarinic neurotransmission during acquisition of olfactory association leads to a general reduction in the learning.

**Effect Of Phytohemagglutinin, Trypsin, Concanavalin A, And Glass Surface Versus Plastic Surface On The Fusion Of Plasma Cells With Myeloma Cells**  
**Presenter:** Lauren Maples  
**Faculty Advisor:** Jennifer Gruenke

Hybridomas are hybrid cell lines created by fusing a B-cell that produces a specific, desired antibody with a myeloma cell that lacks the hypoxanthine-guanine phosphoribosyltransferase (HGPRT) gene. The standard protocol for creating hybridomas is mixing B-cells, usually from the spleen of a mouse, with a myeloma cell line in a fusing agent that makes the cell membrane more permeable such as polyethylene glycol (PEG). It has been shown that this method, although effective, produces low yields of hybridomas. This research investigated several conditions during fusion to determine if any condition significantly enhanced fusion between myeloma and B-cells more than the standard PEG method alone. In this study hybridomas were made by fusing spleen cells harvested from BALB/c mice and tagged with calcinein, a fluorescent marker, with sp2/0-Ag14 myeloma cells. For each experimental condition a control of phosphate buffered saline (PBS) was used for comparison. Cells
from each experimental condition and control were examined and photographed after fusion under a fluorescent microscope to determine if there was a significant increase in fusion versus the control. The conditions tested were phytohemagglutinin (PHA) with PEG, Trypsin with PEG, concanavalin A (ConA) with PEG, and PEG on plastic vs. a glass fusion surface. It was concluded that the only condition that enhanced fusion was PHA with PEG which indicated a slight increase in cell fusion. The other conditions did not indicate any increase in cell-to-cell fusion.

The Effect Of The Immune System On Diet-Induced Fatty Liver Disease In Mice
Presenter: Kayleigh Mitchell
Faculty Advisor: Jennifer Gruenke

Non-alcoholic fatty liver disease is a common problem in western civilizations, affecting between 20 and 30 percent of the populations. Development of the disease is attributed to a diet rich in carbohydrates and saturated fats; however, the immune system is thought to play a part in its development as well. When mice are injected with the inflammatory molecule, TNF, it promotes fat uptake by their liver cells. When they are injected with IL-4, it prevents those cells from taking up fat. TNF is associated with a TH1 response and IL-4 is associated with a TH2 response. This research tested the effect of stimulating a TH1 response or TH2 response on the development of fatty liver disease in mice by feeding a set of 12 mice a high fat diet. Four of the mice were given injections of Freund’s complete adjuvant to stimulate a TH1 response, four were given alum injections to stimulate a TH2 response and the last 4 were only fed the high fat diet. These 12 mice were compared to a set of 4 control mice that received only normal mouse chow. The results were evaluated by dissecting the livers, slicing and staining the slices to look for fat accumulation and blood samples were taken from each mouse to evaluate the level of immune response. The results showed that the TH1 response showed no protective effect, but the TH2 response did slow the accumulation of fat in the liver.

Inhibition of Tissue Factor Pathway of Blood Coagulation by β2-Glycoprotein 1
Presenter: John Poole
Faculty Advisor: Marc Lockett

β2-glycoprotein 1 is a serum glycoprotein found in the bloodstream. Its function in the body is undefined, but it has a number of postulated functions, including possible inhibition of deep-vein thrombosis and acceleration of anti-phospholipid antibody binding. It has been shown to inhibit the contact pathway of blood coagulation, but no research has been conducted on its inhibition of the tissue factor pathway of coagulation. To study the inhibitory effect of β2-glycoprotein 1 on the tissue factor pathway of coagulation, assays were run to determine its effect on factor Xa activity and formation. Direct inhibition assays revealed no inhibitory effect on factor Xa catalytic activity. Assays run on the effect of β2-glycoprotein 1 on the formation of factor Xa demonstrated an apparent inhibition of the formation of factor Xa at the experimental concentrations of β2-glycoprotein 1.

Efflux Pump Protein Synthesis in Response to Select Antibiotics and Antimicrobials
Presenters: Hunter Price, Andrew Spraggins, Matthew Whistle, Hunt Magee
Faculty Advisor: James Mahan

The increasing use of antibiotics has seen the rise of a variety of defense mechanisms by pathogenic bacteria. A potential method of heightened bacterial resistance to antibiotics is the up-regulation of specific efflux pump proteins in certain bacteria. The synthesis of these proteins in large quantities had led to the hypothesis that bacteria can use these pumps in conjunction with other mechanisms to quickly remove harmful substances from within the bacterial cell and prolong its life. If this hypothesis proves to be correct, these proteins may prove to be targets of drug treatments to enhance the effect of existing antibiotics. To test this hypothesis, reverse-transcription polymerase chain reaction and gel electrophoresis testing has been utilized, to measure the transcription of these proteins. Though testing is ongoing,
initial results indicate that the target protein will be present in the largest quantity when antibiotic concentrations are between 10nM and 1nM.

Psychological Disorders and the Hygiene Hypothesis: Effects of Induced T-cell Mediated Immune Responses on Anxiety in Mice (*Mus musculus*)
Presenter: Hunter Price
Faculty Advisor: Jennifer Gruenke

Higher frequencies of allergic diseases and autoimmune disorders in developed countries has led to the proposal of a hygiene hypothesis, which states that these differences are due to childhood exposure to certain infectious agents. This lack of exposure primes the immune system toward Th2-mediated responses, which becomes overactive without the regulating effect of Th1 immune activation. Beyond allergic and autoimmune disorders, the hygiene hypothesis has seen increasing application to other health problems endemic in the developed world, such as heightened anxiety. To test this application of the hygiene hypothesis, Th1 and Th2-mediated immune responses were triggered in select mouse populations and the treated mice were then subjected to behavioral testing using an elevated plus maze. The results of these tests were then compared with control groups and initial behavioral testing. Early analysis of results has failed to show any appreciable difference in response between Th1 and Th2 groups.

Micropropagation of Khaya senegalensis
Presenter: Jordann Staples
Faculty Adviser: Mark Bolyard

The goal of this research project was to develop a method for the regeneration of Khaya senegalensis. In the first experiment, the best media and media supplements on which to promote callus production were determined using the following media: DKW basal salt mixture, McCown’s Woody Plant Basal
Salt Mixture (WPM), Chu (N6) Basal Salt Mixture, and Murashige and Skoog Basal Medium (MS) containing 1.0 μM and 5.0 μM NAA and 2.5 μM TDZ. The effect of the presence and absence of coconut water in the media was also examined. In the second experiment, combinations of 0.0 μM, 1.0 μM, and 5.0 μM TDZ, CPPU, and 2iP were used to induce shoot formation in the presence of NAA. Callus formation was best achieved on MS media without coconut water (and it was independent of hormone concentrations). Shoot formation was not developed but the potential for differentiation was present in the results.

Comparing Habitat Use of Wild Turkeys Between Spring and Winter Seasons Using GIS

Presenter: Joy Tie
Faculty Advisor: Andy Madison

Wild turkeys (Meleagris gallopavo) are abundant throughout the east United States, including West Tennessee. Turkey location data collected over spring and winter seasons from the years 2007, 2008, 2009, and 2011 on the Milan Army Ammunition Plant (MAAP) near Milan, Tennessee, is compared using geographic information systems (GIS). Habitat types are assessed visually by using an aerial map and a land cover type map. Results from the aerial map show more accuracy and are used for further analyses. By comparing habitat types at observed locations with random locations, wild turkeys show preference for row crop and avoid upland deciduous forest. Wild turkeys also prefer upland coniferous forest in winter compared to spring, but avoid pasture or grassland.

Zebra Grazing Preferences And Their Preventive Effects Against Laminitis

Presenter: Virginia Warren
Faculty Advisor: James Huggins

In this study I sought to determine preference and sugar content for 4 feed sources as a means of limiting laminitis in zebras (Equus quagga). The study was conducted at the Tennessee Safari Park in Alamo, TN. Phase I required the simultaneous feeding of 17 kg of Alfalfa (Medicago sativa) and Bermuda (Cynodon dactylon), along with 11 kg of pellets and sweet feed. Phase II required 23 kg of Alfalfa (Medicago sativa) and Bermuda (Cynodon dactylon), along with 24 kg of pellets and sweet-feed to be fed on individual days. Each feed was also dried, ground, and analyzed by bomb calorimetry to determine the amount of energy contained (kcal/g). The sugar and starch content was determined by the anthrone method. The data was analyzed via ANOVA and the significance between each feed determined. Analysis of the resulting data determined that the pellets and sweet feed would provide the most palatable, low hydrolysable carbohydrate feed sources for limiting laminitis.

White-tailed Deer and Predator Response to Deer Scent Lures

Presenter: Erin Wyatt
Mentor: Andy Madison

White-tailed deer are a commonly hunted animal in West Tennessee. Hunters use many methods to attract deer, including the use of scents derived from deer urine. I hypothesized that the presence of the scent would increase deer and predator visitation. The main natural predators of deer in West Tennessee are coyotes and bobcats. To test my hypotheses, 2 scents were tested at 18 scent stations over a period of 4 weeks. An initial pilot study was also performed to determine the functionality of the cameras at each station. Over the 5 weeks, 13 species were observed, including deer, coyote, and bobcat, as well as armadillo, cow, domestic dog, gray squirrel, gray fox, raccoon, red fox, opossum, wild turkey, and possibly vulture. Nine species were observed at control sites, 8 at buck-derived scent, and 6 at the doe-derived scent.

Antimicrobial effects of Sovereign Silver, Argentin 23, and Oregon Grape Root

Presenter: Amber Wilsey
Faculty Advisor: Andy Madison

Antibiotic resistance in bacteria has been of great concern for several years. Standard pharmaceutical drugs are no longer as effective and many infectious bacteria...
are becoming prevalent again. Researchers are trying to create a super drug combining homeopathic remedies with current medicines. My research initially examined the antimicrobial effects of Sovereign Silver™, Argentin 23® and Oregon grape root extract on 4 bacteria: Escherichia coli, Micrococcus luteus, Staphylococcus epidermidis, and Serratia marcescens. Different dilutions of each product were tested on each bacterium and measurements were obtained at 24, 48, and 72 hour intervals. The most effective treatment, Oregon grape root, had a significant effect on M. luteus. Measureable rings of inhibition were obtained for each dilution at all time checks. The results from the initial test led to a second examination of Oregon grape root tested specifically on M. luteus. The results from the second test provided an average ring of inhibition size of 13 mm for full concentration and 10.4 mm for half concentrations at the 48 hour time check. The examinations provided supportive evidence that Oregon grape root is an effective treatment option for M. luteus.

Comparing Caloric Value of Acorn Seeds in Varying Red Oak Species
Presenter: Nathan Ziegler
Faculty Advisor: Andy Madison

Quercus nuttallii, Q. palustris, Q. phellos, Q. nigra, Q. pagoda, and Q. shumardii red oak species at the West Tennessee Research and Education Center were investigated to determine which species produced the greatest amount of acorns and if caloric content varied among the red oaks selected. There were 3 blocks per species resulting in 18 different stands of bottomland red oaks. One to 2 seed traps per group collected acorns for experiment use. A drying oven removed excess moisture and the caloric value was determined by use of a bomb calorimeter. The potential for improving acorn yields by identifying species that generate acorns with higher caloric values could conceivably be implemented into wildlife management and operations.

The Effect of Conspecific and Predatory Alarm Cues on Fast-Start Swimming in Gambusia affinis and Pimephales promelas
Presenter: John Kartzinel
Faculty Advisor: J. R. Kerfoot

The outcome of predator-prey interactions often depends on the prey's startle response, and chemical cues are significant factors affecting this response. This study analyzed the effects of conspecific and predatory alarm cues on the startle response of Gambusia affinis and Pimephales promelas. It was hypothesized that no significant changes in the startle responses of G. affinis and P. promelas would occur given predatory and conspecific alarm cues. Fifteen P. promelas, 40 G. affinis, and seven Micropterus salmoides were collected from the field and housed in the laboratory at Union University. Prey were given an alarm cue and their startle responses analyzed to determine whether the treatments resulted in significant differences in startle responses. Results indicated no significant difference in the startle-response between the control and experimental groups in either prey species. Similarity in fast-start swimming in both alarm cue treatments may demonstrate an adaptive, homogenous response to any alarm pheromone.

Feeding and Behavioral Interactions Between Bald Eagle Parents and Their Offspring
Presenter: Abby Parker
Faculty Advisor: James Huggins

Being a species of concern to wildlife biologists, bald eagles (Haliaeetus leucocephalus) are carefully monitored to maintain populations. A nesting pair of Bald Eagles at Shiloh National Military Park were observed using video surveillance to help ensure their safety and to gather information concerning sibling rivalries and parental behavior toward young. The nest, with two chicks, was constructed at a height of 24 m in a loblolly pine tree approximately 0.8047 km west from the Tennessee River. The camera was placed looking into the nest and observations were made throughout the day. From videos, measurements were taken for identification purposes and observations of the chicks were made from hatching to fledging to ascertain if favoritism existed and what factors might contribute to favoritism for one chick over the other by parents.
Medina Middle School Traffic Simulation
Presenters: Meredith Gunn, Ryan Cronin, Spencer Thomas
Faculty Advisor: Andrew Tiger

Medina Middle School will be increasing its student population by 100 students in the next two years, adding stress to the current carpool system that is already showing signs of overpopulation. Using our research, we accurately recreated the traffic system using advanced computer technology with the intention of increasing efficiency, reducing congestion, and providing alternative growth options in preparation for future increases in traffic flow. Our results indicate that the current system will not be able to withstand the estimated increase in flow without delaying traffic significantly, blocking important city roads, and decreasing child safety. Therefore, we conclude that in order to maintain high standards of safety, efficient traffic flow, and clear roads, the school needs to create an additional pick-up area to evenly distribute the volume of traffic flow.

The Influence of Personality Type on the Propensity to Forward Viral Videos
Presenters: Thomas Willis, Jeremy Osborn, Kayla Ellingsworth
Faculty Advisor: Wilburn Lane

This study tested the effects of demographic characteristics and personality type on an individual’s propensity to forward viral videos. The “Big Five Inventory” was used to identify different types of personalities. Logistic and hierarchical linear regression were used to analyze the results from a sample of 440 participants. The results indicated that the personality types of Agreeableness and Neuroticism were more likely to forward a viral video.
Are Young Evangelicals into Hip-Hop Music?

**Presenter:** Caleb Stallings

**Faculty Advisor:** Michael Chute

If you look at the development of pop culture over the past thirty years, it would be difficult to miss the rise of hip-hop music. From its origins as a sub-cultural movement located in The Bronx, hip-hop has become a dominant force within popular music. However, this success hasn’t come without protest from those advocating Christian, family values. The goal of this research project was to explore whether or not today’s young evangelicals continue to view hip-hop music in the same way previous generations of evangelicals have. This was done by surveying undergraduate students to see what kind of music they listen to and their cultural background. Ultimately, the data revealed without question that evangelical students were more likely to be open to secular hip-hop/rap music than their parents and/or pastor.
Developing Greener AP Level High School Chemistry Experiments with an Emphasis on Molar Mass Determinations, Spectroscopy, and Reaction Rates

**Presenter:** Kelsey Denney  
**Faculty Advisor:** Sally Henrie

Advanced Placement level high school chemistry classes, which coincide with general chemistry level courses in college, are seeking laboratory experiments that reduce the use of hazardous materials and substances while teaching green chemistry principles. Advantages of using greener experiments include educating students on how to utilize the concepts of green chemistry, lowering costs for materials and removal of generated waste, and reducing the risk of student injury. This research consists of developing greener experiments for AP high school chemistry classes and a general chemistry laboratory kit for online courses. The experiments developed in this research consist of molar mass by vapor density, percentage of water in a hydrate, spectrophotometric analysis, and rate of reaction and its order.

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**Synthesis of Polydiacetylene Liposomes as a Biosensor for Phytophthora Sojae: a Comparison of Two Methods**

**Presenter:** Joel Haire  
**Faculty Advisor:** David Wing

Polydiacetylene liposomes can possibly be used as biosensors for *Phytophthora sojae*. These liposomes were synthesized from 10,12-pentacosadiynoic acid (PCDA) and a variety of amino acid esters to which the zoospores of the *Phytophthora* are attracted.

Research this summer focused on two methods for synthesizing the amino acid derivatives used to make the liposomes. The first method is a two-step synthesis involving N-hydroxysuccinimide. The second method is a one step process involving the coupling agent propane phosphonic acid anhydride (T3P). The T3P method was found to be more effective because it is less time consuming. Both methods produce the same products in comparable yields. To test the concept of a liposome biosensor these derivatives were tested on lipopolysaccharide solutions from *E.coli*, *Salmonella enterica*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*.

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**Determination of the Mechanism of a Dust Anti-Deposition Agent**

**Presenter:** Tyler Hardee  
**Faculty Advisor:** Michael Hayes

Consumer product manufacturers are always looking for new ways to address common household problems. Dust removal is one such problem that has attracted considerable attention over the years. Review of patent literature reveals that there has been some recent work aimed at inhibiting deposition of dust onto surfaces of interest. Compositions containing certain liquid polymeric compounds are claimed capable of effectively retarding dust accumulation on surfaces. The inventors did not advance a mechanism of action for dust repellency. The purpose of this research was to validate dust repellency claims and to preliminarily investigate possible mechanisms by which these compounds may operate. Commercially marketed versions of said compositions were applied to a variety of surfaces in order to determine the effectiveness of the repellent on different materials of construction. A control experiment using a well-known commercial cleaner resulted in dust resettling in 14 days. The composition described in the patent extended the time of dust resettling to 25 days, with the exception of a painted metal box, which collected dust in 11 days. A working mechanism based on ionic charge is suggested from the different effects of the compounds on the various test surfaces.

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**Synthesis of 5-[2-(Diphenylphosphanyl)ethyl]-1,2,3,4-tetramethylcyclopentadienyl Ligand**

**Presenter:** Justin Jacobs  
**Faculty Advisor:** Randy Johnston

Dimetallic cyclopentadiene compounds can theoretically be used as catalysts for various reactions common in industrial settings. The ligand of interest in
this work is the 5-[2-(Diphenylphosphanyl)ethyl]-1,2,3,4-tetramethylcyclopentadienyl ligand. With this ligand, the cyclopentadiene part would bond to one metal, manganese, and a tethered diphenylphosphane to a second metal. Multiple methods to synthesize this ligand were attempted. The results from these synthetic methods will be presented.

Development of Green A.P. Chemistry Experiments with Emphasis on Electrochemistry, Freezing Point Depression and Molar Volume of a Gas
Presenter: Patrick Jones
Faculty Advisor: Sally Henrie

Green chemistry allows for the reactants and the products to produce less waste and be more environmentally benign. Chemistry laboratory experiments that produce less damage to the environment, provide a safer environment, decrease the cost of waste disposal and teach green chemistry principles are being sought out by many high schools and colleges. In this research, greener experiments on the electrochemical series, electrochemical cells, freezing point depression and determination of the molar volume of a gas were developed for future inclusion in an Advanced Placement laboratory manual as well as a kit for the laboratory component of a web based General Chemistry course.

Characterization of Arabidopsis MMD1 and Its Role in Transcriptional Regulation
Presenter: Ashley Kwasigroh
Faculty Advisor: Brenda Peirson

The Arabidopsis thaliana genes Male Meiocyte Death1 (MMD1), MMD1-Like1 (MMD1-L1), and MMD1-Like2 (MMD1-L2) code for Plant Homeo Domain (PHD) proteins, which are thought to play a role in transcriptional regulation. Structural and functional analyses of these proteins were performed in an attempt to better understand their roles in
the process. Purification conditions were determined for MMD1. Successful isolation required Ni-NTA affinity and size-exclusion chromatography and was confirmed by SDS-PAGE. Attempts to crystallize the MMD1 protein are ongoing. In vitro histone-binding assays revealed that MMD1 protein interacts with histones, supporting the idea that MMD1 plays a role in transcriptional regulation. MMD1-L1 and MMD1-L2 purification is underway.

**Computational Studies of Quantum Mechanical and Molecular Mechanical Calculations Using Multiscale Chemical Simulations**

**Presenter:** Michael Lam  
**Faculty Advisor:** Michael Salazar

Chemical kinetics is a rapidly growing field. The equations and algorithms involved in simulations are continually becoming more complex. These developments result in the need for more computational power. Larger chemical systems cause exponential growth in simulation times. The Accelerated Molecular Dynamics with Chemistry (AMolDC) program has been developed for several years and aims to model gas-phase mechanisms. The objectives for this research included performing timing tests during simulations and adding a parallel aspect to AMolDC in combination with an interpolation module. As a result of this work, significant gain in computational efficiency was achieved.

**Synthesis of 2-(2,3,4,5-tetramethylcyclopentadienyl) Eethylamine Manganese Complexes**

**Presenter:** Kathy Shelnutt  
**Faculty Advisor:** Randy Johnston

Two tetramethyl-substituted cyclopentadienyl (Cp*) manganese compounds were attempted to be synthesized and were of the form RCp*Mn(CO)$_3$, where R was (CH$_3$)$_2$N(CH$_2$)$_2$ or CH$_3$HN(CH$_2$)$_2$. Two different methods of synthesis were used to obtain (CH$_3$)$_2$N(CH$_2$)$_2$Cp*. The first involved making a Grignard reagent of R and attaching it to 2,3,4,5-tetramethylcyclopent-2-ene and evolved by a series of changes in the functional group on the ring. The second method was a ring closure method starting with 2-bromo-2-butene, lithium metal, and methyl 3-dimethylamino propionate to form the unclosed ring. p-toluene sulfonic acid was added to close the ring and obtain the correct ligand (CH$_3$)$_2$N(CH$_2$)$_2$Cp*. The Grignard reagent proved to be ineffective, but the ring closure method was thought to have yielded the correct ligand. The ring closure ligand was added to Mn(CO)$_3$Br to yield a tricarbonyl product. Uncertainty was left in the formation of the manganese compound. One method was attempted in synthesizing CH$_3$HN(CH$_2$)$_2$Cp*. It involved a multi-step synthesis beginning with 2,3,4,5-tetramethylcyclopent-2-ene and adding it to lithiated acetonitrile. Through many steps the ketone on the ring was transformed to CH$_3$HN(CH$_2$)$_2$. The synthesis of this ligand yielded a product that was most likely the correct ligand, but there was not enough product to be added to Mn(CO)$_3$Br. Purification methods involved using flash chromatography. Identification methods included $^1$H NMR, IR and GC/MS.

**Synthesis of Chromium Quinone Complexes with Nitrogen Donor Ligands**

**Presenter:** David Wilson  
**Faculty Advisor:** Randy Johnston

Various chromium quinone complexes have been synthesized, yielding a 2:1 ratio of chromium to quinone, and can be used to study the kinetics of the oxidation of different alcohols.$^1$ In this research, the synthesis of certain chromium quinone complexes was attempted, using tetrahydroxy-1,4-benzoquinone (THQ) along with 2,2'-bipyridine and 1,10-phenanthroline ligands to occupy coordination sites on the chromium metal centers.$^2$ The various compounds synthesized were analyzed by infrared spectroscopy and elemental analysis. The two analyses confirmed together that bonding of the chromium to the quinone occurred through the ketone oxygen and a neighboring hydroxyl group. The mono and bis bipyridine and phenanthroline complexes were synthesized, and the synthetic method and characterization data will be presented.
Improving the Synthetic Method for 
Alpha-Sodium Glucoheptonate 
Presenter: Paul Mott
Faculty Advisor: Michael Hayes

Alpha-sodium glucoheptonate is a carboxylic acid salt that is industrially manufactured for use as a calcium chelant in oil drilling operations. The current synthetic route utilizes a method similar to the Kiliani-Fischer synthesis of aldoses. However, this method produces two diasteromers. The alpha diastereomer has physical and chemical properties that make it more commercially valuable than the beta isomer. This research focused on increasing the alpha:beta production ratio by investigating the effect of changing the reaction conditions and the mechanism by which the reaction proceeds. Initial findings have indicated that it is indeed possible to increase alpha production through the manipulation of solvent mixtures, the running time of the reaction and the temperature at which the reaction is run.

Low-Toxicity Perlite as a Fiber Fire Retardant Thermal Insulator 
Presenter: Brent Rainwater
Faculty Advisor: Michael Hayes

Perlite, a common industrial material consisting mostly of silicon dioxide, has properties that could make it commercially appealing as a non-toxic asbestos alternative in some high temperature insulation applications, such as heat-insulating fire-resistant plates from perlite/glass fiber composites. The focus of this research uses expanded perlite, which is developed by heating the crude mineral allowing the water inside the pores of the rock to vaporize, creating bubbles which cause the mineral to expand and give it a low density. Expanded perlite was to be incorporated into an aqueous foam that could be studied for its physical properties and utilized in further insulation applications. The properties of the foam were measured and it was concluded that it is sufficiently stable to be utilized in further application development.

Development of AP level green chemistry laboratory investigations into the concepts of mass relationships and chromatography
Presenter: Kathleen Cooper
Faculty Advisor: Sally Henrie

Due to environmental concerns, there is a need for laboratory course materials with an emphasis on greener methods of conducting chemistry experiments in AP high school and general chemistry college courses. The concept of green chemistry places a focus on the potential environmental impact of chemicals, specifically the reactants utilized, products created and the disposal of these chemicals. The developed procedures, through a focus both on the principles of green chemistry and the chemical principles behind the experiments, facilitate student conducted green chemistry laboratory investigations. Experiments developed in this research allow students to investigate the concepts of determination of the chemical formula for a compound, separation by paper chromatography, gravimetric analysis and stoichiometry.
A Spatial Database and GIS System for Giving Directions  
**Presenter:** Alex Bett  
**Faculty Advisor:** James Kirk

A spatial database system is a database system that offers spatial data types in its data model and query language. It supports spatial data types in its implementation, and provides underlying database technology for geographic information systems (GIS) and other applications. In this project, I use the spatial database capabilities of SQL Server 2008 to store the longitudes and latitudes of various rooms in the PAC building. Then I use a GIS to connect to Google Earth and pull out the specific locations. The practical application of this project is to give directions to various rooms within the PAC building.

Programming a Quantum Computer Emulator  
**Presenter:** Grayson Hardaway  
**Faculty Advisor:** James Kirk

The physics and engineering that make up the modern computer is reaching its limit. As such, researchers have begun to examine alternative architectures for representing the data and instructions in a computer. One option is the quantum computer, a machine which represents information using quantum mechanics. With a quantum computer, there is potential for faster data transfer and instruction execution. However, a quantum computer would mean an entirely new way of approaching computing. This project aims to examine what a quantum computer would look like and its effects on computing and technology. To this end, a program was written which emulates a quantum computer, exposing users to the operation and behavior of this theoretical machine.

Arduino as a Viable Aircraft Control System  
**Presenter:** Andrew Moore  
**Faculty Advisor:** James Kirk

Autonomous operation of flying craft has become an important research topic in recent years with the introduction of the military Unmanned Aerial Vehicle, predator. In order for this technology to proliferate, a cheaper control mechanism must be introduced that allows the public sector to have appropriate access to the system. In order to do this, I will use the open architecture project board, Arduino, to drop costs and development time. In this particular example, I use the Arduino Uno to create a flight control computer for a medium sized quad copter I call the Quaduino. This craft will be able to prove the concepts behind using an Arduino to stabilize flight, avoid obstacles, and hold altitude without much user input.

VST Synthesizer using VST.NET  
**Presenter:** Kevin Reed  
**Faculty Advisor:** James Kirk

Steinberg’s Virtual Studio Technology (VST) enables the creation of audio effect and instrument plug ins for use in a VST host such as a digital audio workstation. This project consists of a VST instrument plug in that synthesizes multiple types (saw, triangle, square) of monophonic sound waves based on MIDI input from a host program. The VST instrument plug in was made using VST.NET, which enables developers to use any .NET language to create VST plug ins. This project explores the structure of a synthesizer and digital signal processing (DSP) techniques.
Showcasing Unreal Development Kit and Its Use For Gaming and Other Applications  
**Presenter:** Jeremy Sims  
**Faculty Advisor:** James Kirk

In game development, a fair amount of time is spent creating a game engine. This can last anywhere from six months to five years, which can quickly burn through precious resources and can hurt the final product. The Unreal Development Kit, or UDK for short, is an alternative to coding a game engine. The UDK is a free game engine from Epic Games that is used by many developers. The UDK is also Unreal Engine 3, the same game engine that is used to create the Gears of War series. Through a simple game I have created, this project shows the many uses of the engine, its intuitive design, and some flaws with the engine that I have come across. I also describe other applications for the UDK outside of gaming.

Object Feature Detection Using Augmented Reality to Direct a Camera’s Aim for Matching Pictures  
**Presenter:** Joy Tie  
**Faculty Advisor:** G. Jan Wilms

To show how a landmark or landscape has changed over the years, photographers attempt to take a picture from the original perspective as shown in historic images. In this project, an iOS app is developed in order to make this process of matching pictures easier. The user will choose a historic picture that is overlaid on top of the viewfinder. The app then will give the user directional assistance to help with positioning the camera as close as possible to the spot where the original was taken. Augmented reality, which is the real-time merging of real-world vision with computer-generated imagery, is used in conjunction with image analysis and object feature detection to develop the app.
Modern CMS: Analysis of Leading Open Source Platforms
Presenter: Rebecca Felts
Faculty Advisor: Cam Tracy

The recent evolution of content management systems has opened doors for individuals and businesses to more efficiently manage their presence on the web. Novice users are able to build and launch custom sites without knowing how to write any code. This tool is also beneficial to web designers and developers for its ease of use. Content management systems allow users to update content, add new media and engage socially with a minimal learning curve. In an attempt to take on this technology, two websites were developed for a local non-profit. Each site utilized similar content and was built with a popular open source content management system. This project will compare and contrast two content management systems and explore the differences in their feature sets.

Extending WordPress: Practical Customizations for the Popular CMS
Presenter: Christina Gooch
Faculty Advisor: Cam Tracy

WordPress has become a standard for bloggers around the globe. However, this medium can also be used as a content management system for standard websites through various customizations. This project will result in a dynamic and fully customized WordPress website for Kincaid-Gooch Voice Studio, a singing lesson studio in Alamo, TN. The site will reflect the company’s preexisting branding and have custom default gravatars for users that reflect their branding as well. Customized security will be implemented on pages intended for student use. In this way, those taking lessons will have exclusive access to songs being currently taught in group lessons. The site will also incorporate social media by connecting to the Studio’s Facebook page. All site pages will be formatted in HTML5 with style sheets in CSS3.

The Scholar Athlete: Creating a Dual-Purpose Multimedia Portfolio
Presenter: Antoine Hall
Faculty Advisor: Cam Tracy

With a goal of showcasing myself in both the technical and athletic job markets, it was my desire to create a portfolio that could do both. This project will consist of creating an online personal portfolio of academic and athletic work accomplished throughout my college career. It will demonstrate my creative projects and showcase my basketball career in a simple design that utilizes photo, video, and graphics galleries. This project will demonstrate research in video editing/publishing techniques, jQuery interactivity, and web design utilizing HTML5/CSS3. It will also explore creative uses of the new <video> tag in HTML5.

Responsive Design: Designing one-size-fits-all sites
Presenter: Joe Ladisa
Faculty Advisor: Cam Tracy

Responsive design is a style of web development that allows the site to respond to the size of the web browser. The developer can design a site that will adjust to changes in the browser and present the user with a new layout based on break points, specific browser widths where the layout will shift. Whether the browser is viewing the site on a computer, tablet, or mobile phone, the elements of the site will be reoriented to be presented in the most effective way. Elements such
as images, text blocks and fonts can be resized, creating fluid images and text for a more valuable user experience. Using the tools of HTML5 and CSS3, a personal portfolio was created that would demonstrate responsive design and present the user with the most effective layout for their devices. The site was created utilizing Wordpress as the content management system, allowing the content of the site to be easily update over time.

The Transmedia Project: Using the Creative Suite to Accomplish Personal Branding

Presenter: Treasure M. Hightower
Faculty Advisor: Cam Tracy

Today, when an audience is presented with an interaction that creatively crosses multimedia contexts, the bond with author and audience is greatly strengthened. Generally dealing with fictitious characters, the definition of transmedia storytelling has broadened in recent years as new mediums for communication are developed on a daily basis. “The Transmedia Project” uses a variety of techniques to build a personal brand that features a suite of professional assets: a personal portfolio, curriculum vitae, and demo reel. Primarily utilizing Adobe’s Creative Suite, the final product will be a multifaceted campaign including physical (print and Blu-Ray) and virtual (website + Prezume) deliverables that will each contain a comprehensive look at an individual’s body of work.
Intercultural Competence in a Cohort of Freshmen at a Faith-Based Institution in the Southeast United States

**Presenter:** Jason Castles  
**Faculty Advisor:** Michele Atkins

This study examined the differences in intercultural competence among a cohort of freshmen. Specifically, differences in intercultural competence among ethnicity, gender, geographic region of primary residence, amount of experience in a country other than the participant’s passport country, amount of experience with intercultural relationships, and religious or denominational affiliation were assessed. The dependent variable was the participant’s level of intercultural competence, which was measured by the Intercultural Development Inventory. The study also explored the distribution of the cohort of freshmen on the intercultural development continuum as well as the collective intercultural competence level. Additionally, the study examined the extent that the variables predict the value the participants place on external study experiences while attending the university. Implications of these findings as it pertains to this sample and recommendations for further research will be discussed. Findings revealed that, collectively, the cohort was operating at the polarization stage of intercultural competence. Furthermore, there was an interaction effect found between geographic region and religious or denominational affiliation. Specifically, Baptist students from outside the United States scored higher than any other combination of geographic region and religious or denominational affiliation. The implications of these findings and recommendations for further research will be discussed.

The Impact of the Number of School Transitions and Self-Efficacy About School on Algebra I End-of-Course Test Scores

**Presenter:** LaJuana Hamer  
**Faculty Advisor:** Ann Singleton

Educators are challenged to find and implement strategies to help students successfully transition from middle school to high school. Supporting the important goal of graduation, the purpose of this study was to examine the impact of the number of transitions by ninth grade students on their mathematics achievement. This study also looked at the relationship between the ninth grade students’ perceived self-efficacy about high school and their mathematics achievement. The study consisted of 97 students from one high school in a rural school district in West Tennessee. The study showed that neither the number of transitions, ethnicity, nor gender impacted the students Algebra I End-of-Course test scores. Additionally, the data revealed that the number of school transitions did not impact the predictive relationship between ninth grade students’ perceived self-efficacy and their Algebra I End-of-Course test scores based on ethnicity or gender.

The Impact of Transition Programs on the Success of High School Students

**Presenter:** Shane Jacobs  
**Faculty Advisor:** Dottie Myatt

The purpose of this study was to explore the effects that a freshman transition program had on the students during the first year of high school. A transition program consists of a variety of services which assist students academically as well as socially during the first year of high school. A control group and experimental group were used for this study. The control group derived from a school that did not offer any transitional services to the students. The experimental group, however, came from a demographically similar high school that offered several transition services that are consistent with most transition programs. The independent variable was the participation in a freshmen transition program. The dependent variables were Algebra I End of Course scores, English I End of Course scores, Biology I End of Course scores, attendance rates, and the amount of credits earned. The sample consisted of 9th grade students in a public school district in southwestern Tennessee during the 2010-2011 school year. To equalize student groups (control and experimental), a multivariate analysis of covariance (MANCOVA) was run using students’ ethnicity, special education status, and emotionally disturbed status.
as covariates. Finally, focus groups of students were conducted to explore their personal perceptions of the freshman year. Significant differences were found among the groups of students in terms of Algebra I scores, English I scores, and attendance. However, no significant differences were found in Biology I scores and the amount of credits the students earned during their freshman year. Additionally, focus group discussions revealed that students felt positively about their first year of high school, regardless of their participation in a transition program. Future studies could focus more on at-risk students to gain a deeper understanding of whether transition programs would be more beneficial for these students rather than the entire freshman class for a school. Moreover, future studies might consider teachers’ effect data as a covariate to gain a deeper understanding of the effects of a transition program.

The Effects of a Web-based Mathematics Program on Student Achievement
Presenter: Andrea L. Woody
Faculty Advisor: Terry Weaver

In order to reduce mathematics achievement gaps, many school districts are integrating technology to improve mathematics achievement. The purpose of this study is to investigate the impact a web-based mathematics intervention program [Education Program for Gifted Youth (EPGY) Stanford Math] will have on mathematics achievement of 3rd, 4th, and 5th grade students who achieve below proficient in mathematics in a metropolitan school district. Few studies have researched a web-based mathematics program that provides an individualized, self-paced experience in mathematics. This study will focus on using a web-based mathematics program as an intervention for students in grades third, fourth, and fifth who scored below proficient in mathematics on the Tennessee Comprehensive Assessment Program (TCAP). The research questions for this study will be: (1) What is the relationship between demographic variables (ethnicity, gender, and SES/Free Reduced Lunch eligibility) of third-, fourth-, and fifth-grade students who scored below proficient in mathematics on the TCAP? (2) What is the relationship between total time spent for the entire school year on the EPGY Stanford Math Program and the percent of items answered correctly as measured by EPGY Stanford Math for third-, fourth-, and fifth-grade students who scored below proficient in mathematics on the TCAP in District A? (3) Are there significant differences in the mathematics Scaled Scores on the TCAP between third-, fourth-, and fifth-grade students in District A who scored below proficient in TCAP Mathematics and who used EPGY Stanford Math Program and those third-, fourth-, and fifth-grade students who scored below proficient on TCAP Mathematics in District B who did not use the EPGY Stanford Math Program but used Compass Learning Odyssey as an intervention? (4) Is there a relationship between the total time spent for the entire school year on the EPGY Stanford Math program for third-, fourth-, and fifth-grade students who scored below proficient in TCAP Mathematics in District A and their Mathematics Scaled Scores on the TCAP? A Pearson r correlation, multiple correlation, and ANOVA will be used to analyze the data.

![Image of students with whiteboard]
**Going-Green: Off-grid Instructors Station**  
**Presenters:** James Avery, Jonathan Gwaltney, John Hall, Wilson Holland, Phillip Johnson, Scott Kahler, Caroline McConnell and Ryan Substad  
**Faculty Advisor:** Don Van

The use of renewable energy has captured the attention of many because of environmental benefits and the depreciating amounts of fuel gathered from alternatives. To promote the use of renewable energy and provide more understanding, we have designed a sustainable and off-grid system to power the instructor station in room B-34. The system converts energy captured by a solar panel and wind turbine to be used by the instructor station and allow the instructor station to run without needing any other power supply. By our design, the instructor station will be able to have a constant power supply even in times of no daylight and/or no wind.

**Electronic ‘Pit’ Bull**  
**Presenters:** Ky Bailey, Rachel Carbonell and Matt Wilson  
**Faculty Advisors:** Jeannette Russ

The Union University Engineering Department has a dedicated space in which its students can study, work on homework, and store possessions. This private space, known as the “Pit,” would benefit from a more secure way for students to store items such as textbooks and computers. Due to a number of security concerns and as a part of the Digital Electronics course, the presenters will design a security system in order to protect students’ belongings. This system will utilize a number of components and concepts from engineering and programming classes in order to secure a set of lockers. The students will present their design process and a working prototype, which may be implemented by the department in the future.

**Optimized Topper**  
**Presenters:** Thomas Drury and Ryan Substad  
**Faculty Advisors:** Jay Bernheisel and Don Van

Our group undertook the idea of examining the effects of different shaped pickup truck toppers and developing an optimized design. Our goal is to find the most efficient design and how that will benefit the user.

There are currently a few different shaped toppers that can be mounted on a pickup truck. The purpose of these toppers is to increase the area of storage and prevent the elements from getting on the luggage.

Recently with the seemingly constant rise in gas prices we feel the need for the most possible fuel saving and we hope to accomplish this by improving the aerodynamics while still maintaining a practical design.

**Mechanism Prototyping**  
**Presenter:** John Hall  
**Faculty Advisor:** Jay Bernheisel and Don Van

The four-bar mechanism may sound simple but can be a complex idea to understand when one tries to relate the movement bar members generate through various smooth lines and circles on a piece of paper. Also hard to visualize is the concept of how an irregular shaped gear spins other irregular shaped gears. The objectives of this project are (1) design and create a four-bar model for classroom demonstration in teaching and learning Machines and Mechanisms, (2) document the process by which the materials and prototyping services are chosen, (3) prototype a Weird Gears concept, and (4) create safety procedures along with tips and tricks for the tools in the engineering workshop that were used to create the various projects.
A Green Solution for Campus Patrol  
**Presenters:** Jacob Hodge and Eric Olson  
**Faculty Advisor:** Don Van

This senior project is the design and construction of a human powered vehicle. A novel frame design, created for this project, will be analyzed and tested. The vehicle will be a reverse recumbent tricycle used by Union University’s Safety and Security department to patrol the Jackson campus in a unique and environmentally friendly manner. It will have multiple safety features and incorporate a rollover protection system, making it vastly safer than the bicycles currently used to patrol campus. A major emphasis of this vehicle will be versatility, allowing for day and night operation as well as a variety of body types.

A More Graceful Glider  
**Presenters:** Caroline McConnell, Joel Ingram and Jonathan Gwaltney  
**Faculty Advisors:** Jay Bernheisel and Don Van

Toy companies mass produce cheap toys in order to maximize profits. Toy companies desire to have a product that stands out in the lineup of mediocrity. A very popular toy among children is the balsa wood glider. The goal of this project is to improve upon a current design by making simple and cost effective alterations that could improve a product’s market share. By improving the flight stability and maximum distance traveled, it would be possible to have better marketing claims. Improvements will be made by repositioning the wings and changing the weight distribution of the plane. Each test will be released from a launch assist mechanism in order to minimize the inconsistencies of human error.

Golf Ball Optimization  
**Presenters:** Scott Kahler, Wilson Holland and Phillip Johnson  
**Faculty Advisor:** Jay Bernheisel

The development of the modern golf ball has risen from 4 centuries of experimental design and accidental discoveries. Materials used have ranged from wood and tree sap to rubber threads and the synthetics which are used today. Currently, a golf ball is regulated by weight and diameter and must perform within other specifications. Our project tests golf balls of various weights, sizes, and textures, both standardized and unregulated, for optimal specifications. Testing is performed by means of driving range and analyzing which characteristic matters most and what combination results in a golf ball with the furthest and most accurate driving distance.

Warming Hearts in North Africa Through Rocket Mass Heaters  
**Presenters:** Grace Morriss and Joel Ingram  
**Faculty Advisor:** Georg Pingen

Every year a group of engineering students and professors from Union University travels to North Africa to work on humanitarian engineering projects in rural communities. One of the problems presented on the last trip was how to heat a schoolroom effectively in a mountain village. Working with engineering students from that country a rocket mass heater was installed that effectively heats the schoolroom without the side effects of smoke or dust. The current system is set up to burn wood. However, this country has a shortage of wood, so the cost of burning wood is too high for it to be a practical fuel choice for heating. The government provides coal to schools making it the optimal fuel choice. The goal of this project is to alter the design of the rocket mass heater to utilize coal instead of wood as the primary fuel source for heating the schoolroom.

Off-Grid Cashew Roaster  
**Presenters:** Karl Magnuson, Nate Peterson, Rob Calvert and John Hall  
**Faculty Advisor:** Don Van

Our senior design project consists of developing a complete design for a cashew roaster to be used in the secondary processing of cashew nuts. This roaster must be completely off-grid, able to be used without requiring engineering
a consistent supply of electric power. This roaster is intended to be used in third world countries to enable the secondary processing of the cashew nuts to occur in the same location where the nuts are grown and where the primary processing takes place. The goal in doing this project is to bring the profit associated with secondary processing and packaging of the cashews to the farmers themselves rather than a middleman or large corporation.


**Presenters:** Dylan Baker, Zachary Baker, Meinrad Charles, Cody Giles, Robert Jones, Taylor Mayo, Grace Morris, William Murray, Rachel Townson and Alexander Wainscott

**Faculty Advisors:** Jay Bernheisel and Georg Pingen

With the depletion of petroleum reserves and overflowing landfills, there has been a turn toward bio-degradable materials. In the scope of these occurrences, there is a demand for bio-based plastics to address the situation. In Materials Engineering, the combination of these two needs have opened a new branch of research in bio-based and bio-degradable plastics to be used for everyday products. This project will present some of the common bio-based and bio-degradable plastics as well as an introduction to the new field of genetically modified bio-based plastics. The project will concentrate on and present the feasibility of these plastics by an analysis of cost, production method, method of disposal, and appropriate application.

Lattice Boltzmann, 3D Thermal Topology Optimization

**Presenter:** Caroline McConnell

**Faculty Advisor:** Georg Pingen

The Lattice Boltzmann Method (LBM) is a computational flow analysis that has gained increasing interest in the past several years. Previous research has developed the lattice Boltzmann method (LBM) to solve coupled heat and mass transfer 2D topology optimization problems. This project introduces a thermal base layer to an existing 2D LBM topology optimization program to allow the modeling of 3-dimensional conduction effects. The computer program treats the fluid flow as a 2D problem, while heat transfer can occur in 3 dimensions, permitting topology optimization of e.g. lab-on-a-chip devices. In this program fluid porosity and thermal diffusivity depend on design variables, permitting the design to continuously transition from fluid to solid. We will discuss and present functional forms for the porosity and diffusivity that lead to physically realistic final designs.

PringLess Drain Cleaning Robot

**Presenters:** Rachel Quinn, Aaron Porterfield and Jeffrey Maharrey

**Faculty Advisor:** Don Van

The Pringles Plant in Jackson, TN has a desire for their production floor drains to be maintained with minimal employee involvement. Our team will design a robot to fulfill this need. An automated system will allow technicians to use their time improving production rather than cleaning drains. The technicians need only be involved in the setup of the system. The robot will ideally be used once a month and keep the drains in a clean state.
Determining the Effectiveness of a Green Roof

Presenters: Dylan Baker, Todd Jones, Kian Jost and Alex Wainscott
Faculty Advisor: Georg Pingen

For our final project in Thermal-Fluid Sciences I, we will improve upon a lab procedure from the course that attempted to quantify the effectiveness of a green roof by comparing the heat transfer rates of a green and a normal roof when exposed to a light source. To do this, we plan to construct two model houses, one with a standard black roof and the other with a green roof and compare the heat transfer into and out of each model. In general, a green roof is one designed to be energy efficient in that it absorbs less thermal radiation than a standard roof. This difference in absorptivity should cause a measurable difference between the internal temperatures for a given radiation. In this project, we will apply concepts learned about heat transfer in class to find the actual effectiveness of a green roof.

The Smart Switch: A Solution to Modern Automated Lighting

Presenters: Josh Grant, Rebecca Sharpe, Brady Sheppard and Jon Vunk
Faculty Advisor: Jeannette Russ

As power prices increase there is a greater push to save electricity wherever possible. Automated lighting is a solution that is becoming more common since it saves power by keeping lights turned off when no people are present in a room. One problem with conventional motion-sensing automated lights is that the lights are switched off after no movement has been detected for a specific amount of time; thus, it is possible for lights to be turned off with people still working or studying in a room. One solution to this problem would be a light switch that includes memory, ensuring that the lights remain active as long as people are in the room. The purpose of this project is to design an automated light switch that will count people entering and leaving a room to ensure that the lights remain on only when people are present.

The Perfect Shot

Presenters: Alex Charles and Zac Baker
Faculty Advisor: Georg Pingen

The objective of the project is to analyze and replicate optimal fluid flow in a miniature espresso maker in order to create the perfect espresso shot. The espresso maker consists of three main sections: the alcohol combustion chamber, the boiler, and the brew head. The theoretical aspect of the project consists of analyzing and optimizing heat exchange between the combustion chamber and the boiler as well as calculating the air pressure within the boiler so as to obtain the required exit steam pressure. Lastly the efficiency will be calculated with respect to theoretical and actual results of the espresso system.
Wind Tunnel Flow Visualization
Presenter: Thomas Drury
Faculty Advisor: Georg Pingen

Last year, two Union engineering students built a low speed wind tunnel for flow visualization. While one essential component of a successful wind tunnel is the ability to see the flow, the current wind-tunnel is limited in its flow visualization quality due to the use of a simple fog machine. To allow this wind-tunnel to be used more efficiently and to clearly visualize the fluid flow across an object, this project will focus on the development of a low cost, improved smoke generator. I will be presenting the design and implementation of an improved flow visualization setup for the wind-tunnel.

Greenhouse Effect for Solar Water Heating
Presenters: William Murray, Taylor Mayo and Derique Cannon
Faculty Advisor: Georg Pingen

Solar energy has become a topic of increasingly significant value, and engineers are expected to lead this push toward innovation. With this in mind, we decided to improve upon a solar water heater developed by previous classes. The existing water heater is large and modular, allowing students to experiment with different configurations. To improve usability in engineering labs, our project is to create several smaller, more portable versions of the solar water heater, as well as develop the associated lab to be used in future classes.
ENGLISH

Mixing it Up: A Cross-Genre Reading of Creative Works

Presenters: Mark Waite, DeShuni Sanders, Courtney Olson, Chris Rowland, Ellen Cline, Kate Benedetti, Lindsay Olford, Mary Davis, Megan Pinckard, Morgan Riekeman, Rebecca Edgren and Rebecca Farrell

Faculty Advisor: Chris Bailey

Although the process of writing often occurs as a solitary experience, the result of writing is often experienced by many. The students from this spring’s English 312: Creative Writing will share excerpts of their creative works, written in various genres. The presentation will include pieces of creative nonfiction that reflect personal experience and reflection, as well as imaginative, convincing works of fiction and poetry. This cross-genre reading of honest and edgy writing is the end-result of a semester-long exploration of voice, theme, and form.

“The Fall of Lucifer”: A Reader’s Theater Presentation of the Medieval Play from the Chester Mystery Cycle

Presenters: Alex Rhoades, Amanda Bennett, Cale Little, Courtney Olson, DeShuni Sanders, Heather Franks, Holly Owens, Jonathan Boyd, Jordan Sharp, Julia Appleton, Logan Smith, Mary Laarz, Michael O’Malley, Sara Tate, Savannah Mealer and Whitney Williams

Faculty Advisor: Gavin Richardson

This will be a “reader’s theater” presentation of the “The Fall of Lucifer” from the medieval Chester Mystery Cycle. Students will read the play in Middle English. The star of the show is the language, but students will do some light performing of roles such as God, Lucifer, his sidekick Lightborne, and the various orders of the angels.

A Grotesque Grace: Aesthetics of the Cross in Flannery O’Connor’s Fiction

Presenter: Whitney Williams

Faculty Advisor: John Netland

This paper explores the theology and aesthetic behind Flannery O’Connor’s fiction. Filled with the grotesque and violence, Flannery O’Connor’s stories present a kind of Christian fiction that would shock and horrify many Christians. Well aware of her fiction’s eccentricities, O’Connor uses the grotesque and violence to bring her characters, and the readers they model, into contact with the Christianity she wishes to portray. Her decision to include these aspects in her fiction reflects not only her fiction’s purpose but also the aesthetic at its heart. By examining O’Connor’s fiction in light of the theological aesthetics which influence her, one can better understand the basic theology behind her various depictions of unlikely redemption and how her aesthetic choice brings her readers along for the experience.

HISTORY

Judge M.M. Neil, A Tennessee Supreme Court Judge: An Active Conservative During the Progressive Era

Presenter: Savannah German

Faculty Advisor: David Thomas

Tennessee Supreme Court Justice Neil, a native of West Tennessee, wanted to preserve Tennessee from domination of majority groups and monopolistic institutions and to also protect the right to property within Tennessee. During his time on the Tennessee Supreme Court, Neil dealt with two distinct lawsuits, *Ira Landrith and others (Unionists) vs. J.L. Hudgins and others (Cumberland Presbyterians)* and the State of
Tennessee vs. the Standard Oil Company of Kentucky, in which he exhibited his desire to prevent domination of larger groups. Though Neil gives the appearance of a progressive, his motives stemmed from his conservative upbringing and nature as he advocated a conservative emphasis on local ownership and a prevention of large institutions dominating the state.

Southern Heart And Dixie Drive: Anne Dallas Dudley, Sue Shelton White, And The Woman Suffrage Movement In Tennessee, 1911-1920
Presenter: Caraline Rickard
Faculty Advisor: David Thomas

The purpose of this paper is to chronicle the work of two women leaders of the woman suffrage movement in Tennessee, Anne Dallas Dudley and Sue Shelton White, and the organizations they worked for; to discuss how the cooperation of their organizations was the key to the success of the Nineteenth Amendment debate in Tennessee; and to offer a look at how these organizations fit into the larger picture of the ratification session of the Tennessee General Assembly in August 1920.

A Voice for the Children: Florence Kelley and American Child Labor
Presenter: Caitlin Roach
Faculty Advisor: David Thomas

Progressive Era advocate Florence Kelley devoted most of her life to fighting against the atrocities of child labor in American industry. While she and her contemporaries devoted enormous amounts of time and energy to ending this commonplace evil, they had difficulty achieving a clear victory in their fight. Success of the federal front was quite limited, with most positive changes occurring on the state level. Kelley’s work was thus not transformative for the entire country, but this does not mean she is unworthy of examination. Kelley embodied the Progressive Era’s attitude in both her actions and writings, and her work reveals the juxtaposition between the vigorous movement to end American child labor and the moderate results Kelley and her contemporaries achieved.
The Space Between Two Worlds: An Exploration of the 1.5 Generation Phenomenon
Presenter: Megan Bailey
Faculty Advisor: Cynthia Jayne

The 1.5 generation is identified as second-generation immigrants whose parents have maintained a great ethno-linguistic distance between themselves and the majority population of their host country. This research explores the struggles a member of the 1.5 generation faces while navigating three complex spaces: the culture they experience at home, the majority culture they experience at school, and a space between those two cultures that often occurs as the result of the individual’s identity negotiation process. The findings reveal the importance of developing programs or processes that will better assist members of this generation and their families during the negotiation process.

Baptists and Church Segregation in the Urban South
Presenter: Jonathan Crouch
Faculty Advisor: Cynthia Jayne

This research examines the complex phenomenon of segregation in black and white churches in the urban South and how Baptists have and are now responding to this issue. Dr. Martin Luther King, Jr. once said, “It is appalling that the most segregated hour of Christian America is eleven o’clock on Sunday morning…” Of over 300,000 Christian congregations in the United States, less that 5½ percent are integrated, and within the Baptist denomination, whites comprise over 80% of church members. This study focuses on the ebb and flow of the theological antecedents and the changing social stratification that has influenced the Baptists’ responses to racism and segregation within the church. The aim of this study is to identify ways to encourage dialogue and action within the Baptist community to move towards integration and reconciliation.

How Far Will France Go? A Look Into France’s Removal of Outside Cultural Influences
Presenter: Mallory Cupples
Faculty Advisor: Cynthia Jayne

In October of 2010, France became the first country to sign into law a bill that bans Muslim women from wearing the Muslim veil in public. The ban came about as a reaction to the influx of Islamic immigrants throughout the post-colonial era. The culture of Islam, soon began to threaten the French culture as it was. Many different arguments rose through the fog of French discontentment and resulted in the ban of all ostentatious religious symbols in public schools in 2003. However, this ban was not enough to remove the attention away from the Muslim women who still wore the veil in other public areas. It was then that the 2010 law was created to move past the bounds of religious freedom in order to create a social space that was still distinctly French.
Analysis of Social Policies on Homosexuality in Christian Institutions
Presenter: Danae Pacileo
Faculty Advisor: Cynthia Jayne

A report of the Council of Christian Colleges and Universities calls homosexuality the “issue of our day… on which our institutional identities are being tested.” These united Christian institutions address the highly contentious issue of homosexuality with a common worldview. This study examines social policies on human sexuality from institutions in the CCCU, including Union University. Though these institutions share a theological stance on homosexuality, they have divergent approaches to students who express homosexual desires or tendencies. Through the lens of identity negotiation theory, using methods of interdisciplinary research, this study contrasts those policies and discusses possible implications for the individuals most affected by them.

Daughters and Prostitutes: Experiences of Marginalization in Modern China
Presenter: Katherine Pullen
Faculty Advisor: Cynthia Jayne

Academic literature and popular media predominantly depict women in prostitution as either “sex slaves” or empowered “working girls.” This study examines influential factors affecting the lives of women in today’s globalized economy. Based on a small-scale qualitative interview analysis conducted in Southwest China, the study describes the lived experiences of women in prostitution and, in the women’s own words, shows their circumstances to be far more complex and compelling than some depictions from the past. The research illustrates how prostitution is founded on distorted power relations between rich and poor, men and women, city dwellers and country folks, addressing the role of familial relationships and the impact of gender on societal status in the context of the rural to urban migration phenomenon in China. It emphasizes the importance of economic choice as a critical factor in counteracting the marginalization of those who are poor, migrant, and female.

America, The Melting Pot?
Presenter: Kelsey Reeder
Faculty Advisor: Cynthia Jayne

When asked to describe America in relation to its various ethnic groups and immigrant populations, most people would label it as a “melting pot” society. The concept of American society being a melting pot is unclear because it is flippantly used in reference to the country’s diversity. From a historical aspect, the American identity was comprised of a mixing of nationalities and ethnicities, especially during the “great immigration” in the time frame of 1850-1920. However, how is the melting pot idea seen in regards to contemporary immigration? This project delves into the idea of the melting pot term being problematic for us now because the results of the two immigrations are different. The melting pot theory is an outdated label and should be replaced by the concept of cultural pluralism and integration.
Mirror, Mirror, on the Wall: An Analysis of Cultural Change Reflected in Snow White

**Presenter:** Victoria Stargel

**Faculty Advisor:** Cynthia Jayne

Once upon a time, American culture re-popularized and re-invented the fairy tale. This research analyzes Grimm’s version of the tale known in English as “Snow White” and three film and television adaptations. Using qualitative, interdisciplinary analysis it compares the manifest cultural phenomena reflected in each adaptation and examines how they illustrate cultural change. The four versions of the tale; Grimm’s “Little Snow White,” Walt Disney’s *Snow White and the Seven Dwarves*, ABC’s “Once Upon a Time,” and Relativity Media’s *Mirror, Mirror*, span exactly 200 years. The research emphasizes shifts in the core values, worldview, gender roles, and cultural norms of American culture over that period of time. Emergent themes of interest include the emphasis on true love, the exceptional qualities of a hero or villain, the increased sexualization of characters, and the empowerment of women as agents of their own fate.
MATHEMATICS

On the Theory of Numbers—A Paper by Évariste Galois
Presenter: Emilie Huffman
Faculty Advisor: Matt Lunsford

The foundations for group theory can be found in the famous paper by Évariste Galois, “Memoirs on the Conditions for Solvability of Equations by Radicals,” in which he finds a criterion for determining whether or not a polynomial equation is solvable by radicals. However, Galois also wrote a lesser known paper entitled, “On the Theory of Numbers,” which while shorter and more obscure, is the first to consider incommensurable solutions for polynomials with coefficients in a finite field, and uncovers several valuable results, albeit in manners different from the ways in which these results are currently presented to undergraduate students. This research attempts to update the language, notation, and presentation of the paper to that of contemporary writing. Relevant examples and historical content have been added as well, so that this paper can aid in the pedagogy of abstract algebra at the undergraduate level.

Oddities in \( \mathbb{C} \times \mathbb{C} \)
Presenter: Kimberly Lukens
Faculty Advisor: Bryan Dawson

The proofs of two theorems involving \( n \) points in the Euclidean plane \( \mathbb{R} \times \mathbb{R} \) (due to Gallai [a.k.a Grünwald] and Ungar, respectively) rely on the fact that \( \mathbb{R} \) is an ordered field. As such, they do not generalize to the complex ‘plane’ \( \mathbb{C} \times \mathbb{C} \); in fact, these theorems fail over \( \mathbb{C} \times \mathbb{C} \). However, strengthening the hypotheses from not all points collinear to no three points collinear may allow for generalization. This presentation details the failure of the original theorems and an approach to verifying the stronger version of Ungar’s Theorem using Gröbner bases.

MUSIC

Wandering Alone in the Garden of Spring: Beethoven’s Adelaide
Presenter: John Dugger
Faculty Advisor: Joshua Veltman

This project examines Adelaide, a Lied composed by Ludwig van Beethoven in the 1790’s. Written around age 25, Adelaide was one of Beethoven’s favorite Lied compositions. The piece is considered in the context of the Classical period and is examined in the light of Beethoven’s life and other works. Emphasis here is placed on the Imitation period, Beethoven’s first style period, but comparisons to works from other style periods will be drawn as well in order to showcase the difference in style. Next, a formal analysis of the piece is offered. Finally, the piece will be regarded from a performer’s viewpoint. Together, the information presented will be useful to both performers and listeners for cultivating a fuller appreciation of Adelaide and other works.
“Take the A Train”: An In-depth Look at Strayhorn’s Jazz Classic

Presenter: Daniel Hodges
Faculty Advisor: Joshua Veltman

“Take the A Train” by Billy Strayhorn was the signature song for the famous Duke Ellington Band. Troubled circumstances led to its creation. ASCAP’s inflated licensing fees caused DJs to boycott the music managed by ASCAP. This meant that no Duke Ellington songs were being played on the radio. Strayhorn quickly came to the rescue, writing what would later be known as “Take the A Train.” Ellington’s band had a reputation for being quite the carousers, the Duke himself being the ringleader. Audiences were already in love with the band’s talent, attitude, and aura; this made “Take the A Train” an instant hit. For a full appreciation of this piece, one must consider not only its musical characteristics but also the musicians’ personalities and the Harlem culture surrounding them. The presentation will conclude with a live performance of the piece by a guitar-trumpet duo.
Using Dexmedetomidine to Prevent Emergence Delirium in Pediatric Anesthesia

**Presenters:** Renee Armstrong, Beth Clark, Felicia Jenkins, Joseph Tribble and Clay Tummins

**Faculty Advisors:** Zolia Sanchez and Connie Cupples

Emergence delirium is agitation, disorientation, and incoherence following anesthesia. It affects up to 80% of children, promoting postoperative complications: increasing bleeding, recovery periods, injuries, and staffing needs. Dexmedetomidine is a possible treatment option, providing analgesia, cooperative sedation, and anxiolytic effects. The purpose of this integrative review is to assess the efficacy of dexmedetomidine at reducing emergence delirium postoperatively in children recovering from general anesthesia. In pediatric patients receiving general anesthesia, how does dexmedetomidine compare to other treatment options at affecting emergence delirium in the postoperative period? A methodical search of scholarly databases was conducted using specific key words: dexmedetomidine, Precedex, alpha-2 agonist, -2 agonist, midazolam, Versed, emergence, delirium, and agitation. After a critical appraisal of the evidence, twelve studies, from 2004 to 2012, met the inclusion criteria. The data was analyzed using comparative tables and graphs. Synthesis shows that intravenous dexmedetomidine significantly decreases emergence delirium over other treatments.

Propofol's Effect on Postoperative Nausea and Vomiting: a Systematic Review

**Presenters:** James Baker, Tyler Blocker, Nichole Goel, Holly Harris and Jorge Quintana

**Faculty Advisors:** Connie Cupples and Zolia Sanchez

Problem: Nausea and vomiting can be extremely distressing for patients, can cause pulmonary aspiration of gastric contents, and may be detrimental to the operative area. Therefore, prevention of postoperative nausea and vomiting (PONV) is an important goal of the nurse anesthetist. Purpose: The purpose of this integrated review is to determine effects of the anesthetic agent, propofol, on PONV. Clinical Question: Does propofol have an effect on the incidence of PONV in pediatric and adult patients undergoing general anesthesia for surgery? Method: CINAHL, Google Scholar, PubMed, and Medline search with terms “propofol” and “postoperative nausea and vomiting”. Findings: The synthesis method to include tables of findings and logical comparisons of Propofol with other anesthetic agents and their effects on PONV. Conclusion: It is hypothesized that propofol, in comparison to other anesthetic agents, decreases the incidence of PONV. Dissemination approach: verbal and poster presentation to anesthesia professionals.

A Snapshot View of the Healthcare System in the United Kingdom

**Presenters:** Lori H. Byrd, Donna Fraysier and Debi F. Sampsel

**Faculty Advisors:** Denise Thornton- Orr and Zolia Sanchez

The United Kingdom (UK) has a fascinating history of unique traditions. One of the traditions of the UK is their socialized medicine. All are invited to stop by for a spot of tea and to go on a brief international encounter with one of the USA’s greatest allies’ health systems. You will observe various media formats and learn key points about UK’s health care system, such as financial construct, reimbursement mechanisms, World Health Organization ranking, the payer system, and how men and women of the United Kingdom have their own health care needs meet. The content of this poster has many different perspectives from which students, from a variety of disciplines, will have an opportunity to explore, learn, and compare to the United States healthcare system. The authors’ appreciate an opportunity to dialogue with you about their data sites and discoveries.
Red Yeast Rice as an Alternative to Statins for Hyperlipidemia

**Presenters:** Anna Carroll, Ashley Gullett, Brittany Hart, Tracie Woodward and Chelsie Worrell

**Faculty Advisors:** Connie Cupples and Zoila Sanchez

The purpose of this project is to determine the efficacy of red yeast rice (RYR) on total cholesterol. Question: In adult patients with hyperlipidemia, what is the effect of red yeast rice on total cholesterol compared with statins within 12 weeks? Method: The group researched multiple databases to find appropriate research by way of peer reviewed medical journals and newsletters, all of which were in controlled settings. Findings: Research reveals that RYR is comparable to statins in decreasing total cholesterol in patients with hyperlipidemia. Behavior modifications in combination with RYR proved to have greater effects than statins on total cholesterol, especially low-density lipoproteins (LDL-C). However, research yields that there are discrepancies in the ingredients of RYR supplements. Conclusion: RYR is an effective alternative for patients who are unwilling or unable to take statins due to adverse drug reactions.

The Efficacy of Hypodermoclysis as a Rehydration Technique

**Presenters:** Mordecia Dickenson, Quaneshia Farris, Courtney Goode, Lanitra Matthews and James Tetleton

**Faculty Advisors:** Connie Cupples and Zoila Sanchez

Dehydration is an extremely severe condition associated with increased morbidity and mortality. Hypodermoclysis is the subcutaneous administration of fluids used for rehydration therapy. The aim of this project was to evaluate the safety and efficacy of hypodermoclysis in the treatment of mild to moderate dehydration compared to routine intravenous therapy. CINAHL, OVID, Medline Plus, and UptoDate databases were searched using the terms: Hypodermoclysis, rehydration therapy, hydration techniques. It was noted that hypodermoclysis is less invasive, less expensive, and has fewer complications than intravenous rehydration, hence reducing the cost of hospitalizations for dehydration in palliative and long term care settings. Disadvantages to the study include the lack of exploration in broader patient populations, such as pediatric clients. The more clinicians are educated about the benefits of HDC, the more likely HDC will become a practical, widely used alternative for rehydration therapy.

Health Economics Poster: Comparison of U.S. and Canadian Health Care Systems

**Presenters:** Phyllis Dunn, Brian Foster and April Yearwood

**Faculty Advisor:** Denise Thornton-Orr

The Canadian and U.S. health care systems are very different. Canada has a single-payer and is mostly publicly-funded, while the United States has multiple payers, most of which are private. Although the U.S. and Canada are culturally similar, there are vast differences in infant mortality and life expectancy among young adults. Canada provides universal access to health care for its citizens, while nearly one in five non-elderly Americas is uninsured (nber, 2012). Canada also spends far less on its GDP on health care (10.4%, vs. 16% in the U.S.) yet performs better than the U.S on two commonly cited health outcome measures, the infant mortality rate and life expectancy (nber, 2012). Overall, Canada has a more equitable distribution of health outcomes, as might be expect in a single-payer system with universal coverage.

The Efficacy of Enoxaparin Versus Heparin in the Prevention of Deep Vein Thrombosis in the Post-Operative Population

**Presenters:** Valerie Brown, Ashley Landrum, Lisa English, Rebecca Fisher and Courtney Moore

**Faculty Advisors:** Zoila Sanchez and Connie Cupples

Deep vein thrombosis (DVT) is a common problem among hospitalized patients, especially in the immediate post-operative population. The purpose of this study is to compare the efficacy of enoxaparin to unfractionated heparin (UFH) in this population. For patients who have experienced an invasive surgery requiring hospitalization, is enoxaparin as effective as UFH for the prevention of DVT in the immediate post-operative period of seven to ten days? Ovid, PubMed, Medline and Google Scholar were searched using the terms DVT prophylaxis, post-operative, enoxaparin, and UFH. Literature review and synthesis methods include tables of findings and logical comparisons of enoxaparin and UFH in the prevention of DVT in the stated population. Drug trials find enoxaparin to be more effective in the prevention of DVT in the post-operative patient than standard UFH therapy. Conclusively, it is proposed that enoxaparin is more effective than UFH for the prevention of DVT in the post-operative population.
Tele Medicine – GPS: A Vehicle for Navigating Access to Diabetes Self – Management Education (DSME) in a Rural Community  
**Presenter:** Cevette Hall  
**Faculty Advisor:** Kelly Harden

The purpose of this study is to assess the utilization of a diabetic self-management program via group telemedicine sessions in a rural community. Diabetes is a contributor to the soaring health care costs, the increasing chronic disease burden and the reduction of quality of life in the US. Access to diabetic self-management education (DSME) is critical to improved patient outcomes. Health care providers have limited resources to provide DSME and often access to endocrine referrals is limited. A retrospective chart review was used to de-identified data with Statistical Package for the Social Sciences (SPSS) analysis and weekly group telemedicine sessions were conducted.

There were 141 participants were enrolled in the program. Seventy-eight percent attended two or more sessions.

Conclusion: Group telemedicine sessions are a viable vehicle for increasing access to DSME in rural communities.

The Benefit of Medically Induced Hypothermia on Neurological Outcome  
**Presenters:** Megan Callicoatt, Andrea Hay, Stephanie James, Lisa Redmon and Britney Tucker  
**Faculty Advisors:** Connie Cupples and Zoila Sanchez

Millions of patients suffer cardiac arrest (CA) every year. Of those that survive, the most common complication is decreased neurological functioning due to decreased cerebral perfusion occurring during cardiopulmonary resuscitation. The purpose of this integrative review is to examine the efficacy of medically induced hypothermia on preserving neurological functioning for adult CA patients. Question: Do post-CA adult patients who receive therapeutic hypothermia intervention experience less neurological dysfunction than those patients not receiving this intervention? Methods: A literature review was performed using the databases PubMed, Ovid, Google Scholar, and Ebsco. Synthesis method: Includes a table of findings and logical comparisons of neurological outcomes of adult post-CA patients who received hypothermia treatment versus patients who did not. Results and Conclusions: This study is a work in progress, thus results and conclusions have not been determined. However, we hypothesize that medically induced hypothermia will produce favorable neurological outcomes for adult post-CA patients.

It’s All in How You Do It: Peripheral Venous Access Techniques to Minimize Pain in Pediatric Patients  
**Presenters:** Nan Henderson, Jacqueline Scott, Jamie Wise, Julia O’Day and Bobby Stewart  
**Faculty Advisors:** Zoila Sanchez and Connie Cupples

Advanced practice nurses (APN) are responsible for effectively minimizing a patient’s pain and anxiety during insertion of peripheral venous catheters. Studies report pain is undermanaged in pediatric patients undergoing peripheral venous access. The purpose of this integrative review is to assess if pediatric patients receiving buffered lidocaine needle free injection prior to peripheral venous access report less pain than those receiving no pain relieving measures prior to the procedure. CINAHL, PubMed, and Cochran Review were used to search terms such as pediatric pain, pain with peripheral venous catheters, peripheral venous catheter insertion, J-Tip, pediatric pain relief, and buffered lidocaine. Through a thorough review of the literature, there is strong evidence to support the need for pain management in this age group and that buffered lidocaine needle free injection is one method that has been effective. Further research is needed to determine other methods of managing pain in this population.

Diabetes Type II: Control through Lifestyle and Pharmacological Methods  
**Presenters:** Cacye Redding, Kathy Hurst, Megan Johnson, Tina Parker and Paula Walker  
**Faculty Advisors:** Zoila Sanchez and Connie Cupples

Recent studies conducted over the past ten years have produced significant findings in the area of Adult Type II Diabetes Mellitus. The CDC currently ranks Diabetes...
Mellitus Type II as the seventh leading cause of death in the United States. By 2050, if current trends in diabetes continue as many as 1 in 3 adults will be affected. The purpose of this integrative literature review is to systematically review and assess current literature to determine if pharmacological intervention is more effective than life style modifications in maintaining glycemic control in adult type II diabetes with a hemoglobin A1C of 7-11%. Question: Will the inclusion of early administration of metformin alone produce a greater reduction in glycemic control rather than life style modifications with emphasis on low-carbohydrate and low-fat diet combined with exercise? Findings suggest a greater improvement in glycemic control with the administration of metformin alone as an early treatment.

Does maternal smoking cause asthma?

Presenters: Scott Jackson, Charity Hart, Cara Roberson, Mitzi Williams and Brad Jones

Faculty Advisors: Zoila Sanchez and Connie Cupples

Childhood asthma is a significant public health problem. Research links tobacco smoke exposure to childhood asthma. The purpose of this integrated review is to assess current studies to determine if prenatal tobacco smoke exposure causes childhood asthma. Question: Are fetuses exposed to maternal smoking, compared to those not exposed to maternal smoking, at higher risk for developing asthma in childhood? Databases used for this synthesis were PubMed, CINAHL, and Ovid. Search terms prenatal, smoke exposure, asthma, pregnancy, and quantitative were used, to reveal articles containing current quantitative research on the subject. Research revealed that exposure to prenatal tobacco smoke increases the probability of asthma in children due to structural lung changes and it diminishes the effect of corticosteroid therapy. Research also showed that some children are genetically predisposed to wheezing when exposed to prenatal smoke. This research presents new information that can be used to educate pregnant mothers about smoking.
Impact of Teamwork Training on ED Staff Perceptions of the Culture of Safety

**Presenter:** Florence Jones  
**Faculty Advisor:** Cynthia Powers

Creating a culture of safety and implementing safety systems in hospitals to ensure safe practices is critical. The purpose of this study is to determine if teamwork training will lead to measurable improvements in employees’ perception of the culture of safety in the Emergency Department. This was an independent sample comparison study with a quantitative design. Project leader provided training on teamwork over a four weeks period using Team Strategies and Tools to Enhance Performance and Patient Safety program (TeamSTEPPS). Participants in the study completed the Agency for Healthcare Research and Quality’s (AHRQ) Patient Safety Culture Survey (PSCS) four to six weeks after the training occurred. Comparison of the 12 domains pre and post TeamSTEPPS Training showed an overall increase in the percent positive responses. Out of the 12 domains, only one domain (non-punitive response to error) had a decrease in the percent positive score.

The United Arab Emirates: An Oasis in Healthcare

**Presenters:** Leslie Lee, Terrell Carpenter and Arnette Everett  
**Faculty Advisor:** Zolia Sanchez

This poster presentation is to introduce viewers to the healthcare delivery system of the United Arab Emirates (U.A.E.). The U.A.E. was originally formed from the group of tribally organized Arabian Peninsula sheikhdoms which presently consists of a loose federation of seven emirates. The population of the U.A.E. is estimated to be approximately 8.9 million with less than 15% being Emirati and the larger population consisting of individuals from all over the world called expatriates. The U.A.E. is faced with a growing population and rising healthcare costs. It is focused on and committed to improving the coordination and delivery of health care services to its native and expatriate populations. The ultimate goals for the U.A.E. are to ensure the best-class medical care to their people, promote overall economic growth, and to become an oasis for healthcare and medical tourism.

The Effectiveness of Outpatient Congestive Heart Failure Clinics on Hospital Readmission Rates for CHF Exacerbation

**Presenters:** Catherine Aslin, Kayla Massey, Heather Polmonari, Kathryn Smith and Leigh Ann Stone  
**Faculty Advisors:** Connie Cupples and Zoila Sanchez

Congestive heart failure (CHF) in adults represents a complex clinical syndrome that frequently requires hospital readmissions due to disease exacerbation. Although chronic CHF management has traditionally included pharmacological management and sporadic patient education, enrollment in an outpatient CHF clinic shows promise to reduce CHF patient readmission rates. The purpose of this integrated review is to determine if adults who are enrolled in an outpatient CHF clinic are less likely to be admitted to the hospital due to CHF exacerbation. This research review includes studies from CINAHL and EBSCO, as well as practice guidelines from the Heart Failure Society of America and the American College of Cardiology Foundation/American Heart Association. Based upon analysis of this literature, we predict that adults who are enrolled in outpatient CHF clinics have reduced readmission rates for CHF exacerbation versus those not enrolled in an outpatient clinic.

Examining Postoperative Sore Throat in Patients Receiving Monitored Anesthesia Care (MAC) Using a Traditional and Non-Traditional Oropharyngeal Airway

**Presenter:** Roxanne McMurray  
**Faculty Advisor:** Bradley Harrell

The purpose of this prospective study is to establish the incidence of sore throats in postoperative patients that had an elective outpatient surgical procedure under Monitored Anesthesia Care (MAC) with an
oropharyngeal airway (traditional) or nasopharyngeal airway placed in the mouth (non-traditional) to alleviate airway obstruction. From review of the literature there appears to be a high incidence of postoperative sore throat (POST) after a general anesthetic, but there has been very little written about the incidence of POST after a MAC anesthetic. No studies have reported examining POST comparing both traditional and non-traditional airway devices. The findings from this project will help identify factors associated with POST to improve patient satisfaction. Findings from this project may also generate novel evidence regarding the usefulness of a nasopharyngeal airway placed in the mouth to advance anesthesia practice by providing a superior approach to airway management.

N.E.W. Death by Design: An Emerging Phenomenon
Presenter: Kathy M. O'Connor

The Drug Enforcement Administration (DEA) published an emergency order in 2011 to control synthetic stimulants (Bath Salts, Molly's Plant Food) and synthetic cannabis (K2, Spice), new designer drugs. Designer drug is a term used to describe drugs that are created (or marketed, if already in existence) to avoid the provisions of existing drug laws. The availability of these new drugs has accelerated at an astonishing pace over the last decade. These drugs of abuse are nontraditional, emerging, and web-based (N.E.W.). It is estimated that 100 persons die of drug overdose daily in the U.S., a threefold increase in less than 20 years. A significant proportion of increasing deaths can be attributed to the N.E.W. designer drugs. Understanding the effects of these N.E.W. drugs is complicated and our knowledge about their precise chemical composition and short and long-term effects is limited, yet the information we do have is worrisome and warrants a proactive stance to understand and minimize any potential dangers to the health of the public.

The Relationship between Spiritual Well-being and Years of Practice in Nurses Delivering End-of-Life Care
Presenter: Carol Sykes
Faculty Advisor: Cynthia Powers

Nurses delivering end-of-life care distinguish themselves from their peers in other specialty areas by the continual focus on death and dying. Dealing with death and dying every day could significantly affect the spiritual well-being of a nurse. This quantitative, descriptive, correlational, non-experimental study utilized the Spiritual Health And Life-Orienta-tion Measure (SHALOM) to conduct a needs assessment survey to evaluate whether there is a relationship between spiritual well-being and years of practice in nurses delivering end-of-life care. The SHALOM survey assesses spiritual well-being in four domains: personal, communal, environmental, and transcendental. The study population consisted of 33 nurses who deliver end-of-life care in hospice and acute care settings.

Impact of Ultrasound Guided Regional Anesthesia in Decreasing the Incidence of Intravascular Punctures Associated with Peripheral Nerve Blocks
Presenters: Alice Tudor-Ciur, Miranda Yother, Shannon Sims, Sally Jo Michels and Amanda Russom
Faculty Advisor: Zoila Sanchez and Connie Cupples

Ultrasound guidance has become popular for adjunct in regional anesthesia. This integrative study aims to identify the efficacy of ultrasound guided regional anesthesia in decreasing the incidence of intravascular puncture associated with peripheral nerve blocks. In adult patients undergoing peripheral nerve blockade for facilitation of surgical procedures, will ultrasound guidance versus nerve stimulator for nerve localization reduce occurrences of intravascular injections in the perioperative period? Searches of EBSCOhost and CINAHL was conducted using “ultrasound in regional anesthesia”, “ultrasound and peripheral block”, “nerve blocks and intravascular injection”, and “ultrasound and nerve and block” with specific criteria. Randomized clinical trials, meta-analyses, anesthesiologist interviews, and systematic reviews were retrieved with comparative data providing evidence of reduced intravascular injection when ultrasound assistance was used as an adjunct in the performance of peripheral nerve blockade. Expected outcome of this research is validation that ultrasound guidance is superior to peripheral nerve stimulator in reduction of accidental intravascular injection.
Describing CRNA Practice during Sentinel Events Using High-Fidelity Simulation
Presenter: Molly Wright
Faculty Mentor: Brad Harrell

Response by the Certified Registered Nurse (CRNA) to a sentinel event in the operating room can be a factor in a patient’s morbidity or mortality. Sentinel events are described by Joint Commission as “an unanticipated event in a health care setting resulting in death or serious psychological injury to a patient or patients, not related to the natural course of the patient’s illness”. http://cms.h2e-online.org/ee/regsandstandards/jcaho/. Simulating these sentinel events in an operating room environment can be a way to prepare as well as reinforce the CRNAs skills. Nine practicing CRNAs were brought into the simulation lab where they were measured on “time to respond” and “time to treat” in randomly drawn scenarios. These two time variables were compared to survey data in order to establish a predictive relationship between descriptive characteristics of practicing CRNAs and their performance in simulated sentinel events.

Women’s Body Image after Ileostomy: What Can We Do to Help?
Presenters: Dana Johnson and P. Michelle Wyatt
Faculty Advisors: Connie Cupples and Zoila Sanchez

The purpose of this project is to investigate the quality of life impact of pre-operative counseling specific to altered body image with women who are scheduled for elective ileostomy. Question: Does pre-operative altered body image counseling have a positive impact on a woman’s body image post-surgery? Method: A literature search was completed on articles related to a woman’s body image and ileostomy in Cochrane Reviews, PubMed, and EBSCOHost databases. Eight research articles were found on this subject. The research was analyzed and synthesized in this report. Conclusion: The women that identified negative body issues received supportive needs post-operatively which overall had a delay in coping with quality of life issues. Recommendation: Pre-operative counseling should be performed on all women that express concerns about body image disturbances. Pre-operative counseling with adequately trained health care providers may have a profound impact on how the women react to their body image post-operatively.

Surgical Care Improvement Project: Achieving Better Patient Outcomes
Presenters: Renisha Gardner, Lori Gream, Brandi Henry and Kim Stanley
Faculty Advisors: Connie Cupples and Zoila Sanchez

Millions of surgical procedures are performed yearly. There are estimates of 2.5 to 3.5 million surgical patients per year experiencing complications contributed to pre and post operative surgical care resulting in post operative complications including surgical site infection (SSI). The Surgical Care Improvement Project (SCIP) addresses antibiotic therapy, hair removal, glucose control, beta blocker therapy, and venous thromboembolism prophylaxis. SCIP was implemented to reduce the number of patients incurring complications from surgical procedures. The purpose of this integrative review is to examine the effectiveness of SCIP in reducing SSI, avoidable post operative complications, and increasing positive surgical patient outcomes. Research, evidenced based guidelines, published reports and studies from several organizations such as Institute for Health Care Improvement, Center for Disease Control, PubMed, and American Association of Critical-Care Nurses contributed to this review. Evidence-based outcomes are validated when SCIP protocol is followed, thus optimizing positive patient outcomes in surgical populations.
Dominican Republic Healthcare Economics

**Presenters:** Kathy O’Connor, Frances Thunberg and Tracy Blankenship  
**Faculty Advisor:** Denise Thornton-Orr

This is an overview of the state of healthcare in the Dominican Republic. The Dominican Republic is the second largest Caribbean nation, is home to approximately ten million people, and is located on an island shared with Haiti. Topics covered will include types of payment systems, including both public and private insurance, healthcare provisions and availability, and challenges faced by the healthcare system. Challenges focused on will encompass economics of this nation, population habits that contribute to increased risks, and availability of providers and facilities.

Nigeria Health Care System

**Presenters:** Sandra Hugan, Roxanne McMurray and Rhonda Oldham  
**Faculty Advisor:** Denise Thornton-Orr

The purpose of the poster presentation is to review and compare the health care system of Nigeria with the system in the United States. The World Health Organization assigns Nigeria’s health care system a ranking of 187 compared to United States ranking at 37. Nigeria has a National Heath Insurance Scheme that utilizes formal and informal tiers to provide care to its constituents. Nigerians can enter the system through employers or community user groups. Even though Nigeria has a complex public health system model, many in the country are without basic health care needs due to substandard services or staggering financial hardships. Personal out of pocket expenses accounts for 65.9% of health care costs in Nigeria. □
PHARMACY

An Educational Strategy to Enhance Pharmacy Students’ Attitudes towards Addressing Health Literacy of Patients

Presenter: Kate Wilcoxen
Faculty Advisor: Sean King

Objectives: To evaluate the impact of a Theory of Planned Behavior based intervention on enhancing pharmacy students’ attitudes towards health literacy, perceived behavioral control and intentions concerning communicating with patients possessing inadequate health literacy.

Methods: This TPB-based, intervention consisted of two 50-minute sessions and employed a pretest/posttest control group design. The intervention was administered to third year pharmacy students (n=40); second year pharmacy students (n=42) served as controls.

Results: Analyses revealed significant improvements over time within the experimental group for attitudes (p=0.033) and perceived behavioral control (p=0.033). Intentions to communicate were high for both groups at pretest and no differences were found to exist for this construct in any analyses.

Conclusions: This TPB-based, educational intervention may assist other pharmacy programs in their efforts of incorporating health literacy into their curriculums. The intervention may also be modified and implemented in advanced pharmacy practice experiences, residency programs and continuing education programs.

PHYSICS

Construction of Circuit Boards through Ink-jet Printing

Presenter: Benjamin Bird
Faculty Advisor: Ildefonso Guilaran

Developing an economical process for printing circuit boards is currently a matter of utmost importance to the technology industry. Thus, the purpose of this research was to test the conductivity of certain chemicals when deposited onto paper via ink-jet printing. Specifically, the metal salt silver nitrate was used, along with ascorbic acid to act as a reducing agent. In the procedure, these materials were deposited in varying orders onto size A-9 printing paper. It was hoped that through this procedure, which attempted to replicate research found in the Journal of Micromechanics and Microengineering from April 2007, basic parts of a circuit could be made and measured. Once this was achieved, more complex pieces of circuitry would have been attempted.
Scale Up Lab: Writing, Presenting, and Performing Labs Effectively in a Grade 6-12 Environment  
**Presenter:** Michael G. Thornhill II  
**Faculty Advisor:** David Ward

This research project is an example of how to write, present, and perform labs targeted to junior and high school science classrooms in the United States. The single most important factor in teaching labs to junior and high school classrooms is allowing each student to understand and perform the labs presented in a classroom limited to certain forms of technology and budget. This research identifies the objects needed to perform individual labs, the level of expertise needed or classroom age, as well as analyzes the effectiveness of each lab, and how to communicate properly to each individual within the classroom lab experience. This research also identifies how each teacher can write, present, and perform each scale up lab with a budget of $30.00 per fifteen children within the classroom setting.

Investigation of Nuclear Energy Levels in Cerium-150  
**Presenter:** Ryan Spencer  
**Faculty Advisor:** William Nettles

Nuclei far from stability can be either neutron-rich or neutron deficient. Neutron deficient nuclei have been studied for several decades using heavy-ion collisions. More recently, the spontaneous fission of Californium-252 has provided a wealth of data on the behavior of neutron-rich radioactive non-spherical nuclei. This study examined gamma ray coincidence data, searching for a new vibrational energy band in Cerium-150. A new gamma ray emission was isolated and described in Cerium-150.
POLITICAL SCIENCE

Winning the Latino Vote: Case Studies of Mexican, Puerto Rican, and Cuban Americans to Determine the Cultural Foundations of Latino Partisanship

Presenter: Caraline Rickard
Faculty Advisor: Sean Evans

This paper studies the implications of the growing U.S. Latino population on partisan politics. My purpose is to answer the question, “Why do Latinos identify with either the Republican or Democratic Party?” To answer this question, the paper involves three case studies of the history and culture of the three largest Hispanic origins in the United States – Mexicans, Puerto Ricans, and Cubans – who together comprise 71.6% of the Hispanic population of the United States, or 11.5 million people. My hypothesis is that Latino partisanship is based on certain cultural experiences of a Hispanic origin group. Furthermore, my conclusion will attempt to draw conclusions about the partisanship of the larger Latino population based on the cultural experiences are shared across the community.

PSYCHOLOGY

Impression Formation and The Preferential Treatment of Blondes

Presenter: Shelby Holmes and Ansley Geno
Faculty Advisor: Jinni Leigh Blalack

The purpose of this research is to establish an understanding of social interactions regarding physical appearance. The question proposed by this study is whether blonde females in a group of 3 or more experience a higher degree of preferential treatment than females of other hair colors. Preferential treatment was measured by the order in which members of the group entered a building. The design of the study was observational and anonymous, with a total of 75 observed groups entering various buildings of Union University. The data was analyzed using chi-square analysis: Door Opener ($x^2=3.853$) and First To Enter ($x^2=11.213$). Of the 75 groups observed, 44 groups (58.8%) contained blonde females who entered first. The findings suggest that primarily blonde females will be prompted to enter a building before their peers, thus displaying an affirmation of “alpha” female traits and a preference towards lighter hair colors.

SOCIOLGY

Sidewalk Couples and the Panoptic RAs

Presenter: Holly Jay
Faculty Advisor: Roman Williams

Much of social theory literature can seem abstract and far off from modern, everyday life, but photo essays
provide a medium for observing social theory as lived. Michael Foucault’s theory of panopticism examines the rationalization of punishment, expounding on Bentham’s Panopticon to illustrate relationships between power and knowledge (Foucault 1997:497). This theory and his concept of power that exists with the possibility of surveillance is illustrated by the phenomenon of “sidewalk couples” on Union’s campus. Using photographs taken around campus, this photo essay explores “sidewalk couples” as evidence of Foucault’s theory of the panopticon in modern life. The power structure enforcing open dorm policy is a copy of the panopticon structure. The red paw-prints on the center door in each building liken to the central tower, a very visible reminder that someone has power to intervene should they see anything amiss. Couples spend significant amounts of time together standing outside on the concrete instead of sitting inside on the couch, motivated at least in part by the fear that someone else might be watching. Photos of both the dorm setup and “sidewalk couples” portray Michael Foucault’s theory of the Panopticon, bringing a theoretical piece of work into clear focus.

Cooking Gender: Representations of Women in Women’s and Food Magazines, 1950-2010
Presenter: Alyssa Karr
Faculty Advisor: Roman Williams

Advertisements in women’s and food magazines portray social norms, responsibilities, and roles that women should obtain and employ in their daily lives. Through a content analysis of advertisements in Southern Living, Gourmet, and Good Housekeeping from 1950 to 2010, this research project reveals how advertisements depicted women in traditional or non-traditional roles throughout history. Results indicate that advertisements strongly emphasize women in traditional roles until 1980. From 1980 to 1995, non-traditional roles took precedent through the representation of women; however, after 1995, the representations of women in advertisements were substantially balanced between traditional and non-traditional roles. This fluctuating pattern indicates the delayed societal acceptance of non-traditional female roles, and the acknowledgement of unavoidable cultural changes that have occurred throughout time. While traditional roles have stood the test of time, as of 1995, non-traditional roles are also being presented in advertisements examined in this study in an equal and balanced manner.
Kingdom for the Other: A Trinitarian Renunciation of Word/Deed Dichotomy  
**Presenter:** Skipper Boatwright  
**Faculty Advisor:** Gregory Thornbury

As Christ commissioned his disciples to both word and deed, my paper seeks to reexamine the relationship between word and deed beginning from a Trinitarian framework. The Trinitarian framework which will be used and argued is that of an Edwardsean framework due to its inherent connection between the metaphysical and social ontology. Once a Trinitarian framework has been appropriately argued, it will then be shown how the framework looks in action by examining Dallas Willard’s understanding of the Kingdom of God.

Translation Theory and Ambiguity: A Critique of the Rendering of 1 Timothy 2:12 in the 2011 New International Version of the Bible  
**Presenters:** Hannah Clardy  
**Faculty Advisor:** C. Ben Mitchell

In this paper, I will address the suitability of the 2011 New International Version’s translation of 1 Timothy 2:12, especially in regards to the verb αααααααα, traditionally translated “to exercise authority” but in the NIV11 translated “to assume authority.” The paper will address several standard issues relating to translation and interpretation of this passage, including the history of its translation and an exegesis of the passage. However, I will focus largely on the current debate surrounding the translation of this passage and will propose a solution in the relationship between translation theory and ambiguity. I will conclude with the implications that this critique has for translation practice as well as for Christian practice regarding gender roles.

Antitheses and Interpretation  
**Presenter:** Spencer Connatser  
**Faculty Advisor:** C. Ben Mitchell

My presentation will explore chapter five of the Gospel of Matthew. Within this chapter, verses 21 through 48 record six of Jesus’ teachings about the law. This section is known as the six antitheses. Though there are many interpretations of this passage, I will argue in my presentation that Jesus was not offering a new law to replace the Mosaic Law that was in place from the time of the Exodus until the time of Jesus. Rather, Jesus’ intention was to provide the interpretation for which God ultimately intended when he gave the laws. Peoples’ interpretation of the law had become skewed and faulted, in some instances even taken oral traditions to have the same authority as that of Scripture.

A Semantic and Structural Analysis of 1 Peter  
**Presenter:** Mark Dubis

My Fall 2012 research leave project was focused on the development of a commentary on 1 Peter to be published by SIL International (affiliated with Wycliffe Bible Translators) in their Semantic and Structural Analysis series. This series attempts to serve the specialized needs that Bible translators have, such as analysis of figures of speech, passive constructions, and implicit information. More importantly, translators need help to identify the logical relationships between associated propositions within a given biblical book (e.g., exhortation-ground, condition-consequence, result-means), also known as semantic analysis. At the heart of each volume within this series is a comprehensive set of diagrams that clearly schematizes the semantic analysis for each unit within the book, with the commentary of the volume fleshing out the analysis presented by the diagrams.
The Radical New Testament Husband  
**Presenter:** Jonathan Fix  
**Faculty Advisor:** C. Ben Mitchell

I intend to show how radical a husband’s duties to his wife laid out in the New Testament were in the 1st century A.D. I will compare the Greco-Roman and Jewish views of a husband's role in marriage primarily focusing on before the writing of the New Testament versus the expected role of a husband in the New Testament. A thorough exegesis of Ephesians 5:25-29, Colossians 3:19, and 1 Peter 3:7 in the Greek pertaining to the household codes along with extended research of other biblical and extra-biblical primary and secondary sources can give us a good understanding of how radical was the New Testament husband.

Reconciling God’s Love and Wrath  
**Presenter:** Ethan Giles  
**Faculty Advisor:** C. Ben Mitchell

While there are many aspects to the love of God, this paper will only explore four aspects of it: God’s existence as love (1 John 4:8), Intra-Trinitarian love, God’s love through the Atonement, and God’s love through wrath. For the sake of time, the presentation will focus on the aspect of wrath and love. Simply put, God's wrath can be seen as love in two ways. The first is like a parent who is striving to align their wayward child toward righteousness. The second is God’s wrath upon sinners. God pours out His wrath upon sinners to cause them to realize their need for Him. God desires that all men might be saved and by pouring out His wrath upon mankind He is giving them an opportunity to reach out in need to Him.
Equality, equitability, fairness, justice, these are all words that come to mind when thinking about and discussing the growing concerns about Muslim women, their views, and rights. The purpose of this paper is to describe the distinctions between the normative Islamic teachings and the diverse cultural practices among Muslims being lived out. Specifically, it will dive deep into the view and treatment of women according to primary sources for Islam such as the Quran and the Sunnah. In order to do this in a more approachable and understanding way, this paper will lay out the different aspects of how women are viewed and their rights according to four main issues: social, spiritual, political, and economic.

We Do Now Most Solemnly and Joyfully Enter Into Covenant With One Another: An Exploration of the Mutual Self Giving Shaped, Promoted, and Protected by a Local Church Covenant

Presenter: Jordan Howerton
Faculty Advisor: C. Ben Mitchell

This paper seeks to explore the mutual self-giving formed, advanced, and guarded by a local church covenant that correctly balances law and grace. Like a good family a local church covenant trains its members to love one another through obedience, while calling them to repentance and discipline when it is broken. Often times, however, the solemn, legal elements of the church covenant are overemphasized to the detriment of the grace giving joyful aspects. Comparing and contrasting covenants and contracts will highlight the heart of mutual self-giving behind a local church covenant and reveal that the tension between law and grace, when held properly creates space for and cultivates a joyful reciprocity between covenant members.

Grace & Gratitude: Paul’s Redemption of the Greco-Roman Patronage System

Presenter: Liana J. Saffel
Faculty Advisor: C. Ben Mitchell

In modern scholarship, theologians have often overlooked the influence of Greco-Roman culture upon the Apostle Paul’s teaching. However, in his epistles, Paul does tend to draw redemptive parallels between aspects of Greco-Roman culture and important theological truths. This presentation will emphasize David A. deSilva’s research on Patronage in New Testament culture, exploring how, in 2 Corinthians 4:13-15, Paul uses his readers’ familiarity with the Patronage system to inform their theological understanding of faith, grace, and gratitude. Ultimately, the goal of this presentation is to provide Christians with a biblical understanding of gratitude that they may be moved to glorify God.
What is Secularization?

**Presenter:** Dillon Shaw
**Faculty Advisor:** C. Ben Mitchell

This research project explores the implications of secularization theory on the Church. Works produced in the realm of sociology as well as religious writers will be examined. Similarities and differences will be given special attention in looking at what the two academic worlds have said about secularization throughout history and in the present. Peter Berger's defining work The Sacred Canopy will provide the foundation of the discussion. Finally, an analysis of the validity of secularization theory will be given, as well as how sociological research might help serve ministers and church leaders in moving forward.

Understanding Over Explanation: The Aesthetic Language-Games of Ludwig Wittgenstein

**Presenter:** Caleb Stallings
**Faculty Advisor:** Gregory Thornbury

The Austrian philosopher Ludwig Wittgenstein had an immense impact on theories concerning language and logic. However, it is difficult to get a sense of how his theories extended into aesthetics. “We know more about Wittenstein’s artistic tastes than we do about his aesthetics” wrote aesthetician Morris Weitz. One of the few glimpses we get into Wittgenstein’s aesthetics are a series of lectures he gave at the University of Cambridge in 1938 that have been collected from his own students’ notes entitled Lectures and Conversations in Aesthetics, Psychology, and Religious Belief. This research project aims to show how Wittgenstein made a valuable contribution to an understanding of aesthetics with these lectures through the lens of pop culture. In addition, this project will show how Wittgenstein’s aesthetic views give us the foundation to explore visual languages such as cinema and how they connect human beings across time, space, and culture.

Bioethics and Narrative

**Presenter:** Hannah Wakefield
**Faculty Advisor:** Greg Thornbury

This paper notes the recent attention to the relationship between medicine and narrative and seeks to pinpoint the way in which a Christian understanding of narrative can contribute to the current discussion. The paper takes as its starting point Paul Ricoeur’s philosophy of narrative and places it in conversation with a biblical/theological understanding of medicine, noting places of coherence with Ricoeur’s work as well as places of discord. It examines the ethical function of narrative from a theoretical perspective. Then, drawing on the work on contemporary bioethicists, it then looks to apply this understanding to bioethics, specifically in the area of bioenhancement and physician-assisted-suicide.

Be Anxious for Nothing: Exploring Representative New Testament Texts on Anxiety

**Presenter:** Emily Watkins
**Faculty Advisor:** C. Ben Mitchell

As a Christian who has struggled with anxiety, I have personally experienced opposing views of Christianity and Psychology on the subject. It has been a difficult journey, but it has given me a passion to learn more about anxiety and help others who are similarly affected. Based on my personal struggle and my experience as a Christian Studies and Psychology major, my presentation will focus on representative New Testament texts that deal with anxiety.
Overcoming Metaphysics: Overcoming Racial Oppression

**Presenter:** Zachary Thomas Settle  
**Faculty Advisor:** Gregory Thornbury

The problem of racial oppression in the United States is primarily a result of misunderstanding ontology and metaphysics. That is, a hard distinction between the body and soul has enabled the white man to oppress non-whites. Using the work of Emmanuel Levinas, I argue that Western thought, as it is chiefly characterized by the metaphysical and ontological project, is essentially plagued by cruel forms of abstraction. It is this deeply rooted problem of abstraction that enables racial oppression. From here I argue, using Nietzsche, that metaphysics leads to both a physical and a moral degradation in and of the material world. Apart from its popular and historical manifestations, the Christian tradition actually has much to say in response to metaphysical abstraction. The affirmation the material world as inherently good (Gen. 1), the incarnation, and the death and resurrection of Jesus warrant an overcoming of metaphysics. The Church must follow Christ in his absurd commitment to the material world; the Christian narrative only leaves room for a radically holistic understanding of reality and the human body. Here I work with Levinas’ idea of responsibility, as it results from the self’s encounter with the face of the other. I push back and seek to re-frame our understanding of what Levinas is getting at in his phenomenological work in light of this unified holism; that is, I argue that we actually become responsible to the Other in our bodily interactions, as we encounter the living and breathing flesh of (an)other. These interactions, when guided by a radically holistic understanding of reality and the human body, will leave no room for racial oppression.
Fall 2011 Undergraduate Research Grant Recipients

James Kerfoot and John Kartzinel
“The Affect of Temperature on the Startle Response of the Mosquitofish, Gambusia affinis, in the Presence of a Predator”

Mark Bolyard and David Koh
“Determination of Growth Regulations in the Regeneration of Khaya Senegalensis”

Cynthia Jayne and Katherine Pullen
“Preliminary Field Study in the Causes and Effects of Sex Trade in Asia”

Marc Lockett and John Poole
“Inhibition of the Tissue Factor Pathway of Blood Coagulation by Beta-2 Glycoprotein 1”

Georg Pingen and Caroline McConnell
“Thermal Design Optimization”

Roman Williams, Joelle Williams, and Alyssa Karr
“Cooking Gender: Representations of Women in Food Magazines Over the Last 60 Years”

Jennifer Gruenke and Kayleigh Mitchell
“The Effect of the Immune System on Diet-Induced Fatty Liver Disease in Mice”

Mark Bolyard and Jordann Staples
“Micropropagation of Khaya Senegalensis”

Andy Madison and Nathan Ziegler
“Comparing Caloric Value of Acorn Seeds in Varying Red Oak Species”

Jennifer Gruenke and Julie Cobb
“Testing Potential Growth Stimulators in the Production of Hybridoma Cell Lines”

Jan Wilms and Joy Tie
“Creation of a Mobile Application that Aids Photographers in Recreating Updated Historic Pictures”

Fall 2011 Graduate Research Grant Recipients

Sean King and Kate Wilcoxen
“An Educational Strategy to Enhance Pharmacy Students’ Attitudes Towards Addressing Health Literacy of Patients”

Spring 2012 Graduate Research Grant Recipients

Mark Bolyard and Travis Shutt
“Development of a Tool for Detection Factor Xa and Thrombin Inhibitors Using PCR Mutagenesis”

Mark Bolyard and Liane Gozmao
“Development of an Assay to Test for Inhibitors of Coagulant Enzymes Factor Xa and Thrombin”

Andrew Tiger and Spencer Thomas
“Using Computer Simulation to Model the Medina Middle School Pickup System”