

# **REACH 2019**

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**Research Experiences and Creative Heights**



## **49<sup>th</sup> Annual Student Research Conference Abstracts**

**Saturday  
March 23, 2019**

**Downing Student Union**

**Western Kentucky University  
Bowling Green, KY**

## ABSTRACTS FORMAT

**Presenter; Co-Presenter(s);** Co-Author(s) "Title" (Faculty Mentor)

**Abbott, Timothy** "Creating Community within the Community" (Shahnaz Aly)

Greenville, Kentucky has deep historical roots that attract tourists from all over the region. Visitors flock to this rural town to enjoy seasonal festivities. However, tourists lacked a proper welcome because the city's tourism bureau was too small and inconvenient for tourists to utilize. There was a need for a common place for visitors to learn about what Greenville has to offer and enrich in the heritage of the community. To revitalize the downtown area, my research concluded the need for a mixed-use facility that would bring residents together in a spacious, multi-purpose community center. Greenville does not have a formal place for reunions or meetings, so this space would contribute to community interaction. Because many of the current office buildings are being vacated, this new space would encourage local commerce by means of two new office suites. A major deficit in the area is a place for the younger generation to recreate. A portion of this building was allocated for fun, safe entertainment that serves as a place of study and conversation. The goal for this project was to design a space that would encourage people to visit Greenville and give community members a reason to rendezvous downtown.

**Abdidatarov, Bektur;** Er, Ali Oguz; Loomis, Devon; Khenner, Mikhail; Saidjafarzoda, Ilhom "Nanosecond Pulsed Laser Deposition of Pb Thin Film on Si (111)" (Ali Oguz Er)

Pb thin film was deposited onto a Si (111) substrate by pulsed laser deposition (PLD). The Pb target was ablated with a Q-switched 1064 Nd: YAG pulsed laser with 5 nanosecond pulse width, 10 Hz repetition rate, and 1 mm beam diameter. Laser energy density, temperature wavelength and the number of pulses were changed. Different thicknesses of the film ranging from 5 to 70 nm were obtained. Morphological structures of the films were measured using scanning electron microscopy and atomic force microscopy. X-ray diffraction (XRD) is used to characterize the phases, preferred crystal orientation, and crystallinity. Our results show that laser energy density, wavelength, and temperature play an important role in morphology. In addition, quantum size effects (QSE) were observed on the ultra-thin films and coarsening effects were observed on the films that underwent high-temperature deposition. Experimental observation is supported by theoretical simulations. Ongoing results of Pb film growth on a copper sample will also be presented.

**Abedinezhadmehrabadi, Zahra** "The Impact of Immigration on the Lives of Iranian Women: A Folklorist Approach" (Ann Ferrell)

The question of immigration and its relationship with women's roles is of significance for the study of folklore. My focus is on the changes in the performances of Iranian women after immigration to the U.S. In doing so, I conducted interviews with a few Iranian women who have migrated to the U.S in the last 15 years to pursue higher degrees. These women grew up in Iran, and their personalities have been consolidated within the cultural climate there. They, in turn, have contributed to the shaping of the landscape within which their efforts in the new community is formed. It is through the analysis of these interviews that possible changes in their lives will be evaluated. A careful examination of the lives of Iranian women in the US indicates that they transcend the stereotypical presumptions about the backwardness, submissiveness, and passivity of Muslim immigrant women. Furthermore, I examine how folk beliefs of Iranian society influence and is influenced by the performance of women in the U.S. The interviewees modestly but unhesitatingly express their personal stories in which they articulate how they overcome some patriarchal constructions and misogynic presumptions a woman may face.

**Adkins, Emily;** Payne, Holly "Helicopter Parenting as a Function of Family Conformity and Conversation" (Holly Payne)

This study examined the relationships between family communication patterns and helicopter parenting. One hundred eighty-two young adults completed questionnaires measuring their family's warm and cold conformity communication patterns, conversation orientation, and degree of helicopter parenting. Multiple regression analysis revealed that cold conformity and conversation orientation explained a significant amount of variance in helicopter parenting. Implications and directions for future research are discussed. Keywords: helicopter parenting, family communication patterns, warm and cold conformity, conversation orientation

**Agrawal, Pranay** "Parallelizing Monte-Carlo Tree Search for Dots and Boxes" (Uta Ziegler)

The Monte-Carlo tree search (MCTS) is a method designed to learn how to solve problems. MCTS performs random simulations from the current situation and stores the results in order to distinguish decisions based on their past. After the simulations, the MCTS algorithm selects the best decision and then repeats the process until a stopping state. Parallelizing the MCTS means to divide the learning process among independent learners. After a fixed number of simulations, some learned data is shared and combined. Past research has shown that this approach is faster than non-parallelized approaches. It seems that the time reduction from dividing the learning outweighs the potential costs from redundant learning. This project focuses on the effect

of the level of various controlled resources on the learned performance of MCTS. Specifically, we explored how the performance of the game Dots and Boxes learned through a parallelized MCTS approach is effected by (i) the number of simulations for every situation, (ii) the number of independent learners, (iii) the amount of information shared, and (iv) the frequency of sharing. A solution for potential symmetric parallelization issues is presented along with details of the MCTS algorithm. Non-parallelization results are also discussed.

**Ainembabazi, Lovence;** Nee, Matthew "Incorporation of Metal Oxides into a Polymer Substrate as Buoyant Photocatalysts" (Matthew Nee)

Due to challenges faced in the degradation of organic compounds by conventional water treatment methods, advanced oxidation processes including photocatalytic degradation have been developed as a remedy. Titanium (iv) oxide has attracted a lot of attention in the treatment of aqueous organic waste because of its stability, non-toxicity and low cost. However, TiO<sub>2</sub> has a wide band gap that limits it to only UV light for reaction and when the metal oxide powder mixes with the waste water, a suspension is formed, which is difficult to separate from the treated water. In this research, tungsten (vi) oxide (WO<sub>3</sub>) and zinc oxide (ZnO) were used considering their small band gaps. Their powders were incorporated into PDMS to form WO<sub>3</sub>/PDMS and ZnO/PDMS beads to eliminate formation of suspensions. Characterization of WO<sub>3</sub>/PDMS, ZnO/PDMS and TiO<sub>2</sub>/PDMS beads was done by SEM, EDS, XRD, BET and Raman spectroscopy, both before and after using them for degradation. In all cases, their crystal structures, element composition and surface morphology remained unaltered. TiO<sub>2</sub>, WO<sub>3</sub> and ZnO beads were then used to degrade Methylene Blue (MB) under UV-Vis-radiations and by the end of 2, 1.5 and 1 hours of degradation respectively, MB lost color entirely. The photocatalysts were successfully filtered off the clear water using a filter paper.

**Al Khayyat, Sarah;** King, Rodney "Does the Suppression of Rho-Dependent Transcription Termination Affect Bacteriophage Plaque Morphology?" (Rodney King)

Bacterial RNA Polymerases (RNAP) are composed of 6 subunits, beta, beta prime, alpha (2 copies), omega and sigma which are encoded by the rpoB, rpoC, rpoA, rpoZ and rpoD genes respectively. This multi-subunit enzyme catalyzes all cellular gene expression. Because of its central role in gene expression it is capable of responding to a wide array of signals, such as those that facilitate termination of transcription. A single amino acid substitution (tyrosine 75 replaced with asparagine; Y75N) in the zinc-binding domain of the beta prime subunit of E. coli RNA polymerase blocks a unique RNA-based mechanism of transcription antitermination utilized by bacteriophage HK022 and its relatives. Mutant phages that overcome the rpoCY75N mutation have been characterized. Although these phages are capable of forming plaques on the rpoCY75N host, the plaques are significantly smaller than those that form on a wild type host. This suggests that the suppression of the host RNAP mutation is incomplete. There are two mechanisms of transcription termination in bacteria, Rho-independent and Rho-dependent. Here, we describe the experimental design to determine if wild type plaque size can be restored by blocking Rho-dependent transcription termination.

**Alcantar, Christian** "An Efficient and Chemoselective Oxidation of Organic Sulfides Catalyzed by Manganese Corroles with Iodobenzene Diacetate" (Rui Zhang)

Manganese corrole complexes catalyze the efficient oxidation of organic sulfides into sulfoxides with iodobenzene diacetate [PhI(OAc)<sub>2</sub>] as a mild oxygen source in the presence of minute amounts of water. Various substituted thioanisoles can be efficiently oxidized into sulfoxides with quantitative conversions (up to 2500 TONs) and excellent selectivities for sulfoxides. The catalyst effects, including the corrole ligands and oxidation states of the central manganese, were investigated, and demonstrated a significant impact on the catalytic sulfoxidations. The previously known high-valent manganese(V)-oxo corroles were chemically generated and kinetically studied in the oxidation of thioanisole substrates. The competition results suggested the oxidation state of manganese metal is crucial to control the nature of active oxidant forms that significantly affected their catalytic activity.

**Alhudaithy, Sulaiman** "Design and Construction Building" (Shahnaz Aly)

The educational path is very important for every individual pursuing college or thinking about it. The project focused on designing school of Design and Construction for Western Kentucky University. The theory for the design is to create a place to inspire students to learn and study and faculty to teach. The project included the architectural science, interior design, and construction management programs. The site is located in Western Kentucky University, Bowling Green, Kentucky. The site is behind CVS on Kentucky St. The project has included several lecture classroom, construction and electrical laboratories. A study has shown that architecture students consume more than 22 hours off class for studying, which make architecture one of the most intensive programs therefor, the building included a recreational and dining area for students to have a place to relax. Offices and meeting halls are encompassed in the building. Green elements are included in the project, such as solar panels and green roofs.

**Alkharusi, Saud Omar** "Outbreak of Tornado, April 2010" (Joshua Durkee)

There is an increased vulnerability of our physical environment. The risks associated with the susceptibility are

more often depicted in different natural disasters that are common in our country. Tornadoes being part of the worst occurrences that are always witnessed within the country, the paper will explore one of the worst tornado to hit majority states in the United State. Emphasis will be on the events and the damages caused and the various advancement of the tornado at that. More obvious are the socio-economic risk, especially within affluent societies that were caused by the tornado. The April 2010 tornado outbreak demonstrated many of these risks within the United States by taking the atmospheric layers and analysis the atmospheric variables on those layers. The Integrated Data Viewer (IDV) from Undated is the main program that will help to integrate the atmospheric maps in order to analyze the synoptic scale. There will be some use of Python in order to compare multiple maps with one main variable but this variable has sub-variables such as vorticity and (CAPE). Gathering the important factors and synoptic variables that have been discussed in this paper has been radically and directly in the formation of severe weather in this region which mean the all synoptic variables were favorable to create the tornado outbreak

**Alotaibi, Saleh** "Creating a Healthy Community" (Shahnaz Aly)

Bowling Green, Kentucky is expanding rapidly. In 2017, the population was estimated at 67,067. Bowling Green has many industries, schools, shops, and other public buildings. Which means there are many workers and many students that have a stressful life so off course they need to get relax, keeping their self-healthy and enjoy in their free time. So, most people enjoy spending their free time in fitness clubs. There are few fitness clubs in BG and many of them are small and just have workout only without a swimming pool or soccer field. The aim of the project is to design a fitness center that will serve some of the South West of BG community which is located at Nashville Rd cross Dishman Ln. The design is unique and beautiful fitness club for the South West of BG community which will include numerous activities to support the growing population such as workout, swimming pool, basketball, soccer, small library, and café to let them enjoy, relax and be healthy. Bowling Green Fitness Club will help people to relax, keeping healthy and enjoy in their free time.

**Alqahtani, Fahad** "Museum of Diriyah" (Shahnaz Aly)

The project is a museum, it will be for the movement and the war that was happened in the capital and near form the capital. The project will be in the historical place. The goal of this project is to make a tour for the people so they can see what is in the Diriyah. The Diriyah has a fort and a lot of old mud houses. The Diriyah doesn't have any visitor center, it is locked by fence. There are no museum for the Diriyah. The museum will be the solution for the people to get more education about the history. The museum will help to get more income for this historical place so they can make it a tour for the tourist. Also the museum will be good for school tour.

**Alrebeh, Ala** "Qatif Oasis Hotel" (Shahnaz Aly)

As an essential part of the developing process of the city of Qatif in the Eastern Region of Saudi Arabia towards becoming a place attractive to tourists, Qatif Oasis Hotel will be built to make this goal a reality. There are many attractions in Qatif such as historical buildings, oasis full of palm trees and of course, the amazing beach along the coast. Located in downtown with a fantastic view directly to the beach of Persian Gulf, the Oasis Hotel will be the first hotel in Qatif. The Oasis Hotel contains four floors with a total area of 91,300sqft. The hotel will offer to gusts different amenities such as a sea food restaurant, a traditional coffee shop, and a wedding hall. The hotel will help to enrich the economy by generating hundreds of job placements. The Oasis Hotel will be a turning point to the city development process. For this project- research were conducted researches of hotel building technics, the weather conditions of the city, building code, as well as green technology.

**Anderson, Andrea; Putnam, Heather; Copeland, Allyson;** Shake, Matthew "The Effect of Mood on Mind Wandering" (Matthew Shake)

Previous research has found that younger adults' unhappy moods tend to lead to greater mind wandering. In the present study, we examined the effect of mood on mind wandering by using the Velten mood induction procedure (1968) to induce participants to a positive, negative, or neutral mood, then assessing mind wandering by having participants complete a "choice reaction time" (CRT) task in which they were occasionally asked what they were thinking about throughout the task. If participants indicated that they were thinking about something other than the task at hand, they were considered to be mind wandering. Participants included 39 younger adults from Western Kentucky University. There was a significant effect of the manipulation on mood change.

**Anderson, Brian** "President Trump and Cross-Strait Relations" (Timothy Rich)

Ever since President Trump broke with precedent and accepted a phone call from Taiwanese President Tsai Ing-wen, international observers have kept a close eye on President Trump's China and Taiwan foreign policies. The cross-strait relationship between Taiwan and China is one of the world's most important, and the United States has played a massive role in both quelling and stoking tensions in the Taiwan Strait. To properly gauge how much influence the United States wields in Taiwan, I am conducting an analysis of popular

perceptions of Donald Trump in Taiwan. This analysis is composed of public opinion polling in Taiwan and a content analysis of Taiwanese English news dailies. This past November, I gathered polling data from the Taiwanese public through National Chengchi University's Pollcracy Lab. The working hypothesis is that there will be very few noticeable Trump-related effects, despite claims that President Trump has irrevocably changed relationships with our allies in East Asia. The ability to properly gauge the impact of Donald Trump's actions will surely further the ongoing debates over the future of the trilateral relationship.

**Antle, Austin** "Synthesis of Core/Shell Semiconductor Nanoparticles in Ionic Liquids" (Lawrence Hill)  
Semiconductor nanoparticles have been found to be good catalyst for light driven reactions. These reactions can be of great use due to being able to use renewable light energy to catalyze reactions such as hydrogen production from water-splitting. During the synthesis of these particles there is the issue of the particles aggregating together. This aggregation increases the particles size making the benefit of the particles greater surface area per volume to be negated. For this reason, ligands have been used to keep the particles from aggregating together. This keeps the surface area per volume of the particles at the more desired amount. These ligands however still take up some of the surface of the particles. Therefore, attempts at the synthesis of nanoparticles in ionic liquids is being researched. Due to the properties of ionic liquids it is believed that nanoparticles can be synthesized at their desired sizes without the use of ligands to prevent aggregation. The properties of the ionic liquids that leads to this theory as well as methods for synthesis of the nanoparticles will be discussed along with characterization methods of the particles for identification.

**Antonic, Maja** "Female Combatants and Activists: Anti-Fascist Front of Women in Yugoslavia" (Marko Dumančić)  
While women are often excluded and/or portrayed as victims in the historical scholarship on war, this research builds on recent scholarship that shows women as active agents in warfare. I focus on Yugoslavia's WWII Partizankas, female soldiers and activists, who held visible positions in the war effort and public consciousness. Using gender as a category of analysis, my thesis explores Partizankas' identities and motivations to join the National Liberation Movement (NLM) in WWII (1941-1945). I argue that the organizational framework of the Anti-Fascist Women's Front (AWF) under the guidance of the Communist Party of Yugoslavia (CPY) emphasized women's ethnic/religious identities along with distinct social standings and geographic locations to motivate them to fight for the common cause and subsequently forge a shared South Slavic identity. This emphasis on ethnic/regional/class differences paradoxically led to the creation of a common Yugoslav national identity. Yugoslav experience broadens the understanding on why women go to war and how gender norms shift during a conflict. I turn to primary sources composed and/or narrated by Partizankas in AFW's publications, conference speeches and audio interviews to substantiate my conclusions. For the conceptualizations, I utilize gender and war scholarship to place Yugoslav experience within ongoing historical debates.

**Appala, Keerthi**; Conte, Eric; Kasumba, John; Carlisle, Anne; Agga, Getahun E; Loughrin, John  
"Quantification of Tylosin Antibiotics and Antibiotic Resistance Genes in Cattle Waste" (Eric Conte)  
Each year 2 million people suffer from the infections caused by bacteria which are resistant to antibiotics and 23,000 of these are estimated to die as a result. New drugs are coming into the market but are at the risk of developing resistance. One of the reasons for the development of antibiotic resistance is the overuse of antibiotics in livestock. In cattle, tylosin is used for treating bovine respiratory complex, foot-rot and calf diphtheria. The products from livestock treated with antibiotics such as milk, meat, excreta and manure possess residual antibiotics and antibiotic resistance genes (ARGs) which are passed to humans. This research is focused on developing and validating a solid phase extraction (SPE) procedure and a liquid chromatography-tandem mass spectrometry (LC-MS/MS) method for quantifying tylosin in cattle waste. Tylosin extracted from cattle waste samples are cleaned up using Strata polymeric weak cation cartridges. Varian 212-LC HPLC and an Agilent 500 Ion Trap mass spectrometer detector are used for analysis. The recovery percentage of tylosin in the cattle waste of the tylosin treated cattle is compared with the control group. Validation results such as percent recovery, LOD, LOQ, linearity and tylosin concentrations in the study group animals will be discussed.

**Aubry, Drew** "Understanding Student Thinking from 'Wrong' Answers" (Scott Bonham)  
Each student comes into an introductory physics class with some amount of preexisting knowledge. This preexisting knowledge creates alternative ways to think about the processes behind physical concepts which can interfere with instruction. Being aware of these alternative ways of thinking is valuable because it gives insight into the ways that students observe and understand the world we live in. This is useful for designing instruction and curriculum to better teach students. To assess student understanding, the Force and Motion Conceptual Evaluation (FMCE) has been administered in the lab portion in University Physics at both the beginning and the end of the semester for over a decade. To evaluate student understanding of different physical concepts, the student responses are broken up into distinct clusters. Responses in a given cluster

consistent with the accepted physics model and those consistent with the common sense model were compared. These results were also compared between the beginning and end of semesters. It was found that these alternative ideas continued to persist after instruction, even after changes were made to the Physics 255/256 curriculum to help address these difficulties.

**Ballard, Andrew;** Khouryieh, Hanna "Evaluation of the Oxidative Stability of Oil-in-Water Emulsions Containing Whey Protein/Kappa-Carrageenan Complexes" (Hanna Khouryieh)

Proteins and polysaccharides are present together in food systems, with both types of biopolymers contributing to stability of foods. The purpose of this research was to investigate the effect of pH (3-7) and NaCl (0 and 100mM) on the oxidative stability of fish oil-in-water (O/W) emulsions containing whey protein isolate (WPI)- kappa ( $\kappa$ -) carrageenan complexes. The oxidative stability of the oil droplets was evaluated by measuring lipid hydroperoxides and thiobarbituric reactive substances (TBARS) values for a 2-week period. The O/W emulsions contained 2%WPI as a primary emulsifier and  $\kappa$ -carrageenan at 0, 0.05, 0.1, 0.2, or 0.4% as a secondary emulsifier. The results indicated that NaCl, pH, and concentration of  $\kappa$ -carrageenan had substantially affected the oxidative stability of the emulsions. As the  $\kappa$ -carrageenan concentration increased, the emulsion stability increased. Emulsions with 0.4% of  $\kappa$ -carrageenan had the lowest lipid hydroperoxides at pH 6 and 7 with 100mM NaCl. Without NaCl, all emulsions at pH 6 had the lowest TBARS values, while with 100mM NaCl, only emulsions with 0.2 and 0.4%  $\kappa$ -carrageenan at pH 6 had the lowest TBARS values, which probably due the high level of electrostatic interaction between the interfacial protein-polysaccharide complex that coated droplets, improving emulsion stability.

**Banaszak, Alexander;** Gupta, Sanju "Graphene-Mediated Surface Enhanced Raman Spectroscopy for Detection of Biomolecules and Monitoring DNA Hybridization" (Sanju Gupta)

In this work, we studied graphene-mediated surface-enhanced Raman scattering (G-SERS) substrates comprising few-layer graphene nanosheets decorated gold and silver nanoparticles for bio-nanotechnology. Surface-enhanced Raman scattering (SERS), is useful for rapid and precise identification of biological molecules, industrially relevant chemical dyes at ultralow concentration and monitoring DNA hybridization. This phenomenon is due to the enhanced Raman signals by several orders of magnitude on SERS-active surfaces. While the key point of SERS technology is the nanoscale metal particles, which generates localized surface plasmon resonances in response to laser excitation, the resulting electromagnetic enhancement, controlled diameter and interparticle gap of metal nanoparticles on graphene supports offer an advance toward sensitive G-SERS substrates via localized hybridization at graphene-metal interfaces. We have used thermal reduction technique to produce functionalized graphene and wet chemistry for size tunable gold and silver nanoparticles as cost-effective facile synthesis approaches for strategic G-SERS platforms. Simple and high-throughput arrays ('biochips') are developed by decorating graphene nanosheets with gold and silver nanoparticles as well as sandwiching gold and silver nanoparticle and few-layer graphene for cascaded signal amplification to differentiate among nucleotide bases (adenine; A, thymine; T, cytosine; C, guanine; G), DNA hybridization through complementary and probe single-stranded DNA and to detect beta-carotene and malachite green chemical dye.

**Barnaby, Koji; Schlabach, Jessica; Nole, Emily** "The Impact of Platinum Compound Structure on Mammalian Cell Survival" (Blairanne Williams)

There are three FDA approved platinum-based chemotherapeutics: cisplatin, carboplatin, and oxaliplatin. While all influence apoptosis similarly, by forming Pt-DNA adducts, they have unique structures, and cancer cell types do not respond equally. However, it is unknown how specific ligand structures influence toxicity. In this work, platinum(II) compounds with novel structures are used to establish baseline toxicity in noncancerous human embryonic kidney (HEK 293) and metastatic testicular cancer (NTERA-2) cell lines by examining their cell viability via cell survival assays. Specifically, HEK 293 and NTERA-2 cells are treated with Pt(en)Cl<sub>2</sub> or Pt(Me<sub>2</sub>dach)(ox) to determine the toxicity in each cell type. The results are then compared to the toxicity of the drugs oxaliplatin and cisplatin to correlate the structural differences to toxicity. It is predicted that the absorbance values will decrease as the concentration of the compounds increase. IC-50 values, the concentrations at which half the cells survive, are used to compare cellular responses of these respective cell lines. Preliminary data shows higher toxicity in cancerous cell lines versus non-cancerous lines. By studying these novel structures of platinum compounds and how they regulate cell type-specific toxicity.

**Baunach, Seth;** Agrawal, Pranay; Qiu, Jason "Developing a Mobile App" (Huanjing Wang)

The development of a mobile app sounds a lot more daunting than reality. A plethora of tools exist to assist a completely naïve user in creating their own app. However, many advanced users with specific needs tend to find these options limiting. In my app, I used a variety of tools to create an app for Gatton Academy students to help organize driving shifts (and, potentially, for residents in communities with a similar system). Languages such as Java, PHP, HTML, and CSS were utilized, and a server was set up on a friend's workstation. Using a File-Transfer Protocol (FTP) connected to a host, a database was set up for our purposes. While we

have not tested the app for small-scale use yet, we anticipate that all of our functions will work. This app is a perfect example of impacting a small community and generating ripples which expand outward. If the app is successful in our local area, it may be worth investing into making it a real app with broad use. Though this app in particular is complicated because of the way we created it, many similar apps follow the same paradigm of ripples and become very successful.

**Baxter, Morgan** "America's Pursuit of a Master Race" (Jennifer Hanley)

The occurrence of eugenic sterilization is perceived, by many, as distinct only to the horrors committed against the Jews of Nazi Germany. Rather, it can be found in the words and thoughts of the reformers and legislators beginning in 1910s America. A eugenic model was implemented across the US, but eugenic frames of thought found special appeal in the South. The American eugenics movement can be separated into two separate periods: the first being from the 1910s-1930s, during which predominantly poor, "feebleminded," white women bore the brunt of Southern society's pursuit of social purification. The second period being the 1940s-1990s after the demise of Jim Crow, and the advent of welfare programs, putting Southern Blacks on equal footing with many Southern whites. During which time, Black women became the primary targets of coerced sterilization and enforced birth control. Among the Southern states with the most distinct contributions to the application of eugenic sterilization policies were Virginia and North Carolina. Additionally, this paper on eugenics, with particular attention to the female gender in the South, is grounded upon an understanding of eugenics not as a monstrous abnormality, but a central strand in US culture, and one that reveals oft-entwined subordinations based on race, gender, and class.

**Beck, Brooke**; Brausch, Amy "Differences in Suicide Risk, Acquired Capability, and Distress Tolerance among Individuals with NSSI or Disordered Eating" (Amy Brausch)

Non-suicidal self-injury (NSSI) contributes to higher risk for suicide; this relationship is well-documented. However, research for how much NSSI versus anorexia symptoms contributing to acquired capability, since both involve repeated pain and self-injury, is limited. The current study compared suicide risk, acquired capability and distress tolerance in individuals with NSSI or disordered eating behaviors. Data were collected from a sample of 1199 undergraduates. A total of 328 individuals reported lifetime NSSI behaviors and were below the clinical cutoff for disordered eating; 94 individuals scored above the clinical cutoff of a disordered eating measure, also reporting no lifetime NSSI. In a lab, all participants completed several questionnaires assessing NSSI, suicidality, disordered eating, acquired capability, and distress tolerance. ANOVA results found that the NSSI only group reported significantly higher scores on the suicide attempt subscale than the DE only group. Separate regression analyses were run for both groups, which indicated that distress tolerance was significantly associated with acquired capability in the NSSI group, not the DE group. As distress tolerance scores increased, acquired capability also increased for the NSSI group. NSSI appears to be a stronger risk factor for suicidal behavior than disordered eating behavior. Acquired capability does not differ between groups.

**Beck, Victoria** "The Similarities and Correlations between Mathematics and Tap Dance" (Amanda Clark)

The goal of this project is to use various mathematical concepts, theories and properties to construct original Tap choreography that will be performed on April 12th at the Contemporary Connections show presented by the WKU Department of Theatre and Dance. The research for this project was collected from multiple sources. After reading and investigating the ideas of Math Dance, a company founded by Karl Schaffer and Erik Stern in 1987 that uses dance to teach mathematics concepts, I then graphed steps and combinations from various tap dance classes for analysis to better represent the mathematical structure behind the choreography. Research was also gathered at the Big Apple Tap Dance Festival in the same manner. Throughout the project, my goal was to find mathematical properties, theorems, and formulas within the choruses, steps, and choreography learned throughout the research process. My findings demonstrate that the most common structural ideas used to construct tap dance are: the increase and decrease of sine and cosine, the relationship of least common multiple and greatest common divisor of prime and non-prime numbers, and the alignment of a traditional tap chorus' construction with the side length relationships of a triangle and various four-sided polygons.

**Belekov, Ermek**; Lauren, Cooper; Kholikov, Khomidkhodzha; Devarakonda, Koushik "Bacterial Deactivation by Using Graphene Quantum Dot as an Effective Photodynamic Therapy Agent" (Ali Er)

Antibiotics are commonly used in bacterial infection. However, the widespread use of antibiotics has resulted in the emergence of multidrug-resistant or pathogenic bacterial strains. Consequently, the need for developing new bactericidal materials and techniques arose. Photodynamic therapy is proposed as an alternative approach. In PDT, light interacts with certain materials and chemicals to induce damage to bacteria. Graphene quantum dots (GQD) are one of the most promising antimicrobial agents since they possess high germicidal activity against a broad range of microbes. In our project, we aim to investigate an effective, inexpensive and available compound which will hold even higher antimicrobial activity and lower toxicity toward human blood. For this purposes, we used GQD and methylene blue (MB). GQDs were grown by focusing nanosecond laser

pulses into benzene and were later combined with MB. The Gram-negative bacteria, *Escherichia coli*, and Gram-positive bacteria, *Micrococcus luteus*, were deactivated by GQD/MB. Detailed characterization was performed with transmission electron microscopy (TEM), scanning electron microscopy (SEM), Fourier-transform infrared (FTIR), UV-Visible (UV-Vis), and photoluminescence (PL) spectra.

**Bell, Savannah; Stevens, Ricky; Blair, Andrew** "A Comparative Study of Computational Fluid Dynamics Tools for Simulation of Rotational Flow in Lawn Mowers" (Farhad Ashrafzadeh)

Computational fluid dynamics (CFD) software has become an essential modeling tool to study and validate flow problems in engineered systems. Many computer-aided engineering (CAE) programs for CFD are available with different capabilities, making it difficult to select the best program for a specific application. This problem compounds in applications where rotational flow is required and it is subject to variations. This research aims to compare and evaluate few available CFD programs suited for rotational air flow due to spinning lawn mower blade. In this project, simulations were performed using the three commercial programs called: SolidWorks, SimScale, and ANSYS Fluent to study rotational air flow due to movement of lawn mower blades under controlled conditions. The program's features, drawbacks, usability, and outputs were recorded and compared. These attributes were placed into a decision analysis matrix, enabling objective benchmarking of CFD tools for a specific application. So far, the data indicates that the Fluent appears to have a higher solution accuracy and visualization capabilities. The simulation results were validated using experimental data for the spinning blade power consumption in steady state operation. This research was carried out in close collaboration with an industrial partner which is among top manufacturer of the lawn movers.

**Berg, Ethan** "Enemy of Himself: Karl Marx's Role in Tarnishing His Legacy" (Jane Fife)

Karl Marx has had a crucial impact on modern history through his life's work. Its impact has had grave consequences in countries like the Soviet Union, Cuba, and North Korea. To discover how he had such a controversial legacy in the 20th century, this essay first elaborates Karl Marx in his lifetime. Marx emerged from Hegelian philosophy and sought what he viewed as a purer form of democracy. His studies of his contemporary world led him to conclude that, to achieve freedom, communism must replace capitalism via changes in human organizations. While he would inspire political movements for decades, he failed to clarify his work's key concepts. The essay describes the factors cumulating in this failure. His multidisciplinary concentration led to conflicting and inconsistent conclusions, which caused his ideas to be vague. Despite his international appeal, Marx was biased in his work, focusing his studies particularly in Germany and France when trying to develop concepts to be applied on a global level. Marxists, throughout the centuries, had to clarify Marx's ideas resulting in atrocious applications. Marx is partially responsible for his controversial legacy due to the vagueness and regional bias in his work requiring adaptations for other contexts.

**Berry, Alyssa; Derryberry, Pitt** "Approaches to Parenting and Social Information Processing" (Pitt Derryberry)

Research supports that corporal punishment has a negative effect on a child's social and emotional development, specifically empathy and moral development (Lopez, Bonenberger, & Schneider, 2001). Research also supports that consequences of corporal punishment extend beyond the child, as children who received corporal punishment are more likely to use corporal punishment with their own children (Gagné, Tourigny, & Pouliot-Lapointe, 2007). Three hypotheses frame this study: 1) Receiving corporal punishment as a child predicts lower empathy and moral judgment development. 2) Parental usage of corporal punishment (PUCP) predicts the likelihood of using corporal punishment as a parent (LUCPP). 3) LUCPP mediates the effect of PUCP such that increased and decreased LUCPP respectively account for PUCP's effect on empathy and moral development. Participants were 133 undergraduate students. Ages ranged from 18 - 46 ( $m = 20.1$ ,  $sd = 3.54$ ), including 23 males and 110 females. Descriptive statistics support that the sample had moderate PUCP scores, low LUCPP scores, was average in terms of empathy, and tended to gravitate towards lower levels of moral reasoning. Previous findings concerning the relationships among corporal punishment, thoughts on using corporal punishment, and moral development were supported. Though not supported as a mediating variable, findings illustrate that thoughts on using corporal punishment pertain to the effect of parental corporal punishment.

**Bhavsar, Viral; Kasumba, John** "Effect of Antibiotics on Methane Production from Anaerobic Digestion of Agricultural Waste" (Eric Conte)

The purpose of this study is to investigate the production of methane from anaerobically digested agricultural waste in the presence of antibiotics. Microorganisms in anaerobic digesters break down the components of waste into simpler components such as methane ( $CH_4$ ), carbon dioxide ( $CO_2$ ) and other gases. The produced methane bio-gas, which is a form of renewable energy, is used as a heating fuel for farmers. Antibiotics may alter the microorganism (methanogens) population that produce methane. Antibiotics investigated will include tylosin, sulfonamides, and tetracyclines. This study will produce data that will allow us to gain insights into the effect of antibiotics and their concentrations for the optimization of methane production in these digesters. The laboratory digester design will be presented along with our preliminary results.

**Blake, Deven; Meehan, Chloe;** Hughes, Mallory; Anderson, Andrea; Putman, Heather; Copeland, Allyson "The Effect of Lifetime Cognitive Activity on Later Life Cognitive Performance in Older Adults" (Matthew Shake) Previous research has suggested that cognitive activity throughout one's lifespan is positively related to cognitive performance during late adulthood. The present study examines how early life cognitive experiences affect older adults' performance on a cognitive battery, designed to measure cognitive functions such as fluency, attention, working memory, and inhibition. Participants self-reported their Lifetime Cognitive Activities on a questionnaire (LCAQ). The questionnaire asks participants to report the frequency of various forms of cognitive stimulation at ages 6, 12, 18, 40, and currently. Once participants completed the LCAQ, they were guided through the cognitive battery. After running Pearson's correlation, results showed a significant correlation between cognitive stimulation at age 6 and two measures of cognition, phonemic fluency and inhibition. Future research should be aimed at investigating the discrepancies among other measures of cognition in addition to further examination of which cognitively stimulating activities are most salient for promoting a higher level of performance on cognitive tasks.

**Bonds, Brandon** "Synoptic and Mesoscale Analysis of the November 6-7th, 2012 Nor'easter" (Joshua Durkee) This case study will analyze the importance of both synoptic and mesoscale meteorology. This convective system was analyzed due to its oddity in timing and the impacts made to the northeastern USA. By isolating specific height contour lines in the atmosphere, an examination was done to forecast the formation and progression of this storm. At a synoptic level, the quasi-geostrophic (QG) theory was implied for this early November event. Understanding the trough/ridge pattern, the positive/negative advections associated with the system, the Omega term, and the temperature advections allowed for the base "ingredients" that could allow the setup of a mesoscale phenomenon. To fully understand the mesoscale dynamics that occurred, analysis was done with the use of the Gibson Ridge software, satellite imagery, and hodographs. Through these processes, it was found that the QG theory was a major contributor to the formation of this system. On a mesoscale level, mesoscale snow bands, deformation zones, and frontogenesis led to isolated snow amounts of up to 13.5 inches in Connecticut, New York, and New Jersey. In the end, it is clear that this system was forced synoptically and combined with mesoscale dynamics, caused havoc on the northeast just days after hurricane Sandy.

**Bowen, John** "Theory-to-Practice Applied-Learning Model as It Pertains to Emergency Management Skill Development" (Joshua Durkee) Western Kentucky University witnesses a host of emergency incidents each year that require expert care and response. The university experiences everything ranging from inclement weather, to slips and falls, violence, and any number of relatively minor incidents that can occur during various on-campus events. It is crucial for the university to have personnel that can respond to these incidents in an appropriate manner. Just as well, WKU must have prevention and mitigation plans in place to minimize the consequences of these incidents. The purpose of this observational study is to describe the theory-to-practice applied-learning model to demonstrate how both, the university and its students benefit from having student emergency management operators. This study subjectively analyses the activities of nearly 15 students who work on emergency management operations as part of experiential and professionalized learning. These events include football games, the Cage the Elephant concert, commencement, FEMA training, among others. Overall, this study indicates that this applied initiative has both, educational and practical benefit for students studying meteorology and emergency management. This professionalized learning experience provides the university with experts to handle these situations, and to ensure students are prepared for the professional world upon graduation.

**Bowlds, Anna** "Innovative Spaces Promoting Innovative Thought" (Shahnaz Aly) In the sphere of architecture, the use of space, color, and material can change the expression of human thought and emotion. Spatial design can affect the human brain in many ways such as fostering mental growth. With this fact in mind, the form of interactive space becomes just as important as its function. An excellent example of this phenomenon is the positive effect that natural sunlight has upon both mental health patients, and students engaging in active learning. This proves the impact that is possible due to the constant interaction with a natural space. Joy bringing sunlight can be filtered into a room using a design technique called day-lighting, color and material choice can evoke a calming sensation in people of all ages and spatial design can be manipulated to welcome interaction. The only limitation being human imagination and ingenuity. It is our responsibility as architects to push these limits and infuse design with both purpose and meaning. My project, Sunshine Child Care Center, tackles this challenge by choosing innovative exteriors to promote a playful and inviting space that cultivates a spirit of learning in children at a young age.

**Bowles, Hunter** "The Evolution of Combat Medicine" (Katherine Hudepohl) This paper looks at the changes in combat medicine over time. Though I will provide some historical context, the paper mainly focuses on medics in World War II and the wars in the Middle East. The paper looks at the training that these medics received, materials used, and how they fared in combat. The gathering of information was primarily through archival research. During this research of combat medicine certain trends

became apparent. One, the most obvious, is that the gear issued to the medics changed and became more technical and effective. This is an expected change as time goes on more technology becomes available for the troops on the frontlines. Two, the training that medics go through now is constantly focusing more and more on medical issues instead of a learn-as-you-go situation present in earlier medics. Medics have also started carrying weapons on the battlefield as snipers targeted them. Even though time separated these medics they faced similar issues and had to find solutions to them on the battlefield.

**Bratcher, Fox;** Zhang, Rui; Alcantar, Christian "Synthetic and Catalytic Studies of Metalloporphyrin Complexes for Biomimetic Oxidations" (Rui Zhang)

The use of biomimetic metal complexes as catalysts is inspired by the cytochrome P450 (CYP450) enzymes which catalyze important oxidation reactions in Nature. Two different porphyrin free ligands containing different aryl groups were synthesized according to a well-documented procedure. Metals of iron and manganese were inserted into the porphyrin ligands and the resulting metalloporphyrin complexes were characterized by <sup>1</sup>H-NMR and UV-vis spectroscopies. The metalloporphyrin complexes were evaluated as catalysts in alkene epoxidation and sulfoxidation with PhI(OAc)<sub>2</sub> as a mild oxygen source. High conversions and excellent chemoselectivity without overoxidation of epoxides into ketones or sulfoxides into sulfones were obtained with various substrates. Of note, visible light irradiation was found to promote the manganese porphyrin-catalyzed oxidation in a significant way, which will be discussed in the presentation.

**Brewer, Steven** "Terrestrial Autonomous Robots – A Comparative Study of Robotic Simulation Software between Matlab and Gazebo" (Farhad Ashrafzadeh)

Virtual prototyping (simulation) prior to physical prototyping is a key step in the technology development process in engineering. In the study and design of robotics, robotic simulation software enables the creation of sophisticated functional models that permit the testing and validation of robotic functions in various and often complex or unpredictable environments faster and more efficiently, without the risk of loss or damage to prototypes. While the overall benefit of simulations in general can be obvious for some, there exists the need to analyze the changing software technology landscape in order to contrast the available simulation software. Using Robot Operating System (ROS) on Ubuntu Linux, simulation software that includes MATLAB/Simulink and Gazebo are compared to select the appropriate robotic simulation package and used in a terrestrial autonomous robotic simulation. The TurtleBot2i - a terrestrial autonomous robot with a robotic arm, robotic vision, teleoperation, and Simultaneous Localization and Mapping (SLAM) - will be used as the robotic platform in this study. The findings of this study shall aid the software selection process for research and development in robotics and autonomous navigation.

**Briggs, Emma** "The Utopic Balance between Adaptation and Tradition: Examining the Success of Amish and Mennonite Communities" (Anthony Harkins)

The histories of American Amish and Mennonite communities exemplify the necessity of change in the development of utopic groups. Though both groups possess Anabaptist roots beginning in 1525, the Amish community divided in 1865 following disputes over competing interpretations of their guiding principles into the Amish-Mennonites and the Old Order Amish. Their ideological and spiritual differences fundamentally shaped both communities' futures, yet they retained much in common. Both faced the need to delicately balance adapting to modernity while still striving earnestly to please God. Their attitudes toward balancing these objectives, however, differed in the past and today. While the Old Order Amish hold a "necessary-evil" mindset toward modernity and social integration into the broader American society and seek to do so in as limited ways as possible, the Mennonites view such adaptations as a healthy tool to grow and sustain communities to advance the will of God. Despite these contrasting attitudes, both communities believe that a modified, long-lasting community is preferable to an unchanged, dead one, a view that has sustained the changing communities for nearly five centuries.

**Brown, Gillian;** King, Rodney "Nanopore DNA Sequencing, a Novel Technology Applied to the Analysis of Newly Discovered Bacteriophages" (Rodney King)

Nanopore sequencing is a novel method of genotyping that returns full-length sequences of any genetic material without the use of amplification steps such as Polymerase Chain Reaction (PCR) or chemical labeling. Nanopores are protein channels inserted into an electrically resistant membrane. As polymers such as DNA pass through the channel, the order of the nucleotides can be determined. This is achieved by exploiting small disturbances in an electric current as different bases pass through the nanopores. The MinION is a handheld portable device developed by Oxford Nanopore Technologies Ltd that electronically returns high-quality reads in real time. By using this device to perform long reads on bacteriophage DNA, we can now analyze newly discovered bacteriophages isolated by students in the WKU Genome Discovery and Exploration Program.

**Buri, Anna** "Livia: Reconstructing the Life of One of the Most Powerful Women in Ancient History through Film" (Richard Weigel)

History is a dynamic and nuanced subject with fascinating stories to divulge, yet mainstream films often gloss over or completely erase some of the most interesting historical tales. While artists are entitled to their

creative license, I have attempted to reconstruct through a screenplay the life of Livia, the wife of the Emperor Augustus, with as much historical accuracy as possible, only using artistic license where ancient records are sparse regarding her life. In doing this, I hope to generate more interest in creating screenplays and other such media that captures the public's interest in our world's history. I will read an excerpt from the script in which Livia convinces Augustus to grant clemency to someone who conspired to kill him, and in so doing makes Augustus more favorable in the eyes of his potential enemies.

**Bushon, Hannah** "Scientology: The Cult of Religion" (Sandra Hughes)

The Church of Scientology advertises the idea of an ultimate utopia, a mental utopia, that frees the individual from past traumas or negative emotions. For all of Scientology's lofty promises, the organization uses a combination of ritual, rites of passage, indoctrination, and isolation, many of which mimic theistic religions, to control members of the organization. Focusing on the first two types of ritual—the practice of "Auditing," or individual self-improvement, and annual events celebrating the charismatic founder, L. Ron Hubbard—alongside carefully crafted practices of familial isolation, this research will show that the organization peddles a utopic, idyllic path to ultimate mental clarity and freedom. Celebrities, lifetime members, and the organization itself allege to possess the tools and skills needed to help any person be successful in any situation. Critics and former members charge the organization with financial, physical and sexual abuses alongside mental manipulation to essentially trap members into servitude for the organization. By giving members the illusion of personal growth through these rituals, the Church of Scientology presents eerily similar characteristics to well-known cults throughout history and begs the question: where does one draw the line between religion and cult?

**Butler, Sarah** "Bias of Voting Systems and How Far Can the Non-Transitivity of Random Variables Be Stretched" (Attila Por)

Abstract: We investigate the bias of voting systems with at least three candidates and describe them in a model with random variables and ask what is the worst case of their non-transitivity. In mathematical terms, what is the largest probability  $p$ , such that there exist three random variables  $X, Y$ , and  $Z$  such that  $\text{Prob}[X > Y]$ ,  $\text{Prob}[Y > Z]$  and  $\text{Prob}[Z > X]$  are all at least  $p$ . It is not too hard to see that  $p = 2/3$  is the right answer, but the only example for that are random variables that are not independent. We then ask, what if the random variables have to be independent. We show that the best possible value for  $p$  is  $(\sqrt{5}-1)/2$ , or approximately 61.8%.

**Bybee, William; Compton, Hannah** "Determining the Physical Effects of Sports on Teachers" (Amanda Salyer-Funk)

Athletics play a large role in the American life, and as former athletes ourselves our group was curious about the physical effects of athletics in high school later in life. We chose to study teachers as most teachers have a similar activity level which allows us to have more accurate results with less variety. We chose to mainly focus on a person's flexibility, mobility and range of motion in their hips, knees, and ankles because these are three big aspects of physical fitness as well as three large joint areas that are affected when playing sports. We sent out surveys to local school systems and asked for teachers to complete it. From the responses that we received back each test showed that the athletes had a higher range of motion and less pain when performing the tests compared to non-athletes. From the research that we have done and the data that we received back we can come to the conclusion that it is more beneficial to an adult to have played sports in high school.

**Cahill, Olivia** "An Analysis of the Predictability of the Severe Storm and Subsequent Concert Stage Collapse at the Indiana State Fair on August 13, 2011" (Joshua Durkee)

Incident-based climatology often overlooks the occurrence of weather-influenced social events to determine specific weather-related causes, impacts, and casualties in comparison to risk and vulnerability. This case study focuses on a severe thunderstorm with ~70 mph wind gusts that tracked across central Indiana and caused a stage collapse during a concert at the Indiana State Fair on August 13, 2011. This event is worth highlighting, given the storm had a known history of producing severe winds, was warned in advance of the concert, no evacuations were made, and seven people lost their lives. Further, earlier opportunities to cancel the concert were ignored. Specifically, this study provides an analysis of the larger-scale atmospheric environment conducive to this event to determine the overall predictability and understanding of the storm system. Media reports often stated this incident was rare given the "freak" and unsuspecting or surprising nature of the storm. Results from this study clearly indicate the overall incident could have been mitigated with proper protocols and procedures in advance of what was a well-forecast storm system that approached a highly vulnerable event.

**Carter, Justin** "Fostering an Appreciation for Nature through Design" (Shahnaz Aly)

In today's technology driven world there should exist places that allow for a respite from the modern world. Spaces should be created that allow for a reconnection to our roots as people. As a society we should feel responsible to the environment instead of trying to push it further and further out of our minds. This is the

issue that an Architectural Science student examined in their senior capstone class. The project includes the construction of an outdoor lifestyle resort. The resorts architecture and sustainable practices further the connection to nature that we all share. The contemporary architecture employed along with the primitive nature of the structures allows the two worlds battling for our attention to exist in harmony with each other. The project encourages an active lifestyle based on the site's proximity to National Parks and outdoor recreation activities in the Ruedi Reservoir area of central Colorado.

**Cecil, Wendy;** Kim, Moon-Soo "Development of a Double-Stranded DNA Biosensor Using Engineered Zinc Finger Protein Pairs Linked to a Full  $\beta$ -Lactamase for Detecting Antibiotic Resistance Genes" (Moon-Soo Kim) This work develops a novel double-stranded (ds) DNA detection biosensor using zinc finger proteins (ZFPs) and a full  $\beta$ -lactamase to detect specific DNA sequences in antibiotic resistance genes by employing three pairs of ZFPs. Three different target locations within the tetracycline (tetM) gene are recognized by the three different ZFP pairs. A six finger ZFP binds to 18 base pairs with high specificity. A pair of two six finger proteins, (ZFP(A) and ZFP(B)), can detect 36 continuous base pairs of DNA. A full-length  $\beta$ -lactamase enzyme was linked to the C-terminal of the ZFP(B) detection probe as a signal transducer. The capture probe, ZFP(A), is immobilized on an acrylamide gel surface, and ds-DNA containing the target sites are applied to the capture probe for binding. After incubation and washing, the detection probe is applied to the bound complex of the capture probe and target DNA. After washing, the signal produced by enzymatic amplification of a  $\beta$ -lactamase is measured in nitrocefin assay, which indicates the binding of target DNA to ZFPs. The array is optimized to determine sensitivity, and the full  $\beta$ -lactamase system will be compared to the existing SEER-LAC system. The application of this study is to develop an efficient and accessible detection device to indicate the presence of antibiotic resistant bacteria with a quantifiable signal.

**Chagnon, Elizabeth** "Fragments and Frescoes: Contextualizing the Void in the Modern Art Museum" (Guy Jordan)

Using the 11th century frescoes of the Hermitage of San Baudelio de Berlanga as a historical case study, I explore the curatorial and cultural complexities of representing the "void" in a Museum setting. As a FUSE grant recipient, I had the opportunity to visit each of the six institutions that hold a part of the 22 frescoes of the Hermitage, including the Met Cloisters and the Hermitage itself on the frontier of Soria, Spain. With their uncertain history and their curious blend of traditional Romanesque and Mozarabic styles, the frescoes in fragments arguably tell a different story together than they did when they were in situ at San Baudelio. How the individual institutions have chosen to represent and exhibit their sections of the fresco alters visitor perceptions of the work. Through interviews with curators, museum staff, and those native to the original area, as well as through conducting a community-based exhibit that mimicked the exhibition conditions of the frescoes, I have developed a more nuanced understanding of the crucial role of contextual representation in museums, the challenges curators face in sharing the story of the Hermitage, while also gaining new perspective on engaging the museum audience's interaction with fragmented history.

**Chan, Norman; Storrs, Ian;** Tassel, Darby; Gondal, Anas "Sifting through the Dirt: An Analysis of Costa Rican Dung Beetle Activity Times" (Keith Philips)

As recyclers, dung beetles are vital to the ecosystem and an excellent measure of the health of the environment. As such, it is important to understand the adaptations and behaviors of these arthropods. The following study concerns the activity periods of central Costa Rican dung beetles in the Cloudbridge Nature Reserve; cloudforests such as this are extremely unique environment that makes up only ~1% of land area on Earth (Carter & Vella, 2014), and hold unique biodiversity. Dung baited traps were set in both primary and secondary forest and samples were collected at the end and beginning of the day to determine the diversity and quantity of dung beetles that foraged either diurnally or nocturnally. The results of the study strongly suggest that most Cloudbridge dung beetles are nocturnal, indicated by the much higher variety and biomass of the night-time collection. This behavior is hypothesized to enable dung beetles to avoid predation from diurnal carnivores. The findings of this study give insight into the lives of these essential insects, and broaden our view of the ecosystemic function of Neotropical cloudforests.

**Chani, Aken; Reagor, JT;** King, Rodney "Morphological and Genetic Diversity in Bacteriophages Isolated on the Same Bacterial Host" (Rodney King)

Bacteriophages are viruses that infect and destroy bacteria. Despite their microscopic size, studies have shown that their impact on the ecosystem and medicine is profound. In order to further understand the diversity of bacteriophages, we isolated, purified and characterized bacteriophages Inach and GeeTay during the WKU Genome Discovery and Exploration program. These phages were grown on *Microbacterium foliorum*, a bacterium found in soil and on plants. After purifying and preparing high titer stocks, we characterized the phages through plaque morphology, electron microscopy and DNA restriction analysis. Inach formed plaques ranging from 0.5 to 2 mm in diameter, but GeeTay created regular plaques, each approximately 2 mm in diameter. Electron microscopy revealed that Inach has a podoviridae morphology but GeeTay has a

siphoviridae morphology. DNA restriction analysis on the purified genomes showed that only the HaeIII enzyme generated cuts. Although Inach and GeeTay were grown on the same bacterial host and were collected from similar locations, their behaviors and structures were drastically different. We conclude that there is striking morphological and genetic diversity among bacteriophages even those that are isolated on the same bacterial host and from similar environments.

**Chaudhari, Mamata** "Racial Disparities and Impact of Teen Pregnancy in Kentucky" (Grace Larthey)

Purpose: To focus on the role and current rate of racial disparities in teen pregnancy and the health impact. Teen pregnancy rates have been on the decline in the United States over the years; however, disparities exist across racial groups. Teen birth rate among Hispanics (39.9/births/1000 girls) is higher than Non-Hispanic Blacks (28.3/births/1000girls) and Non-Hispanic White (29.0/births/1000 girls). Teen pregnancy continues to be a major contributor to school dropouts and poor health outcome of girls. Teen parents are more likely to have poor education and poor health outcomes as well. In addition, children who are born to these parents face some challenges regarding their own health, which may lead to negative health outcomes throughout life. Policy Implications: This paper will assess implemented policies to prevent teen pregnancy and make recommendations.

**Chebchoub, Fatima**; Mikkilineni, Aswinidutt; Prince, Jared; Ogonnaya, Chisom-Agacaleb "Cloud-Based Replica of the WKU HPCC" (Michael Galloway)

Cloud computing emerged as a technology where users can conveniently get on-demand network access to a shared pool of computing resources. The paper aims to describe a multi-tenant cloud architecture that replicates the support of WKU HPCC software packages. Moreover, the ability to use these software packages through a web based user interface can help users to access these packages remotely and can make these software packages platform independent. This cloud computing project provides a method of running jobs on a cluster from a web application. Users can manage files within their private directories and can also create persistent containers which are accessible via ssh. The persistent containers are currently inaccessible from the web application, but in future work users would be able to run jobs within these containers using the GateOne terminal from the website.

**Christian, Viraj** "Analyze the Benefits Payable on Death/Disability Due to a Certain Form of Cancer, Cardiac and Lung Diseases Presumed Incurred in the Line of Duty Emergency and Public Safety Employee/Firefighters" (Ritchie Taylor)

The purpose of the study is to analyze the benefits payable on death/disability due to a certain form of cancer, cardiac and lung diseases presumed incurred in the line of duty emergency and public safety employee/firefighters. After careful analysis of death / disability benefits for firefighters among Kentucky, Indiana and Missouri state the research team concluded that certain cancers, heart and lung diseases and infectious disease recognized by the national institute for occupational safety and health which are related with the inline duty among firefighters must follow certain criteria for payable of health benefits. The design of analysis of the policy includes verify, define and detail the problems, establish evaluation criteria, identify alternative policies, evaluation alternative policies, display and distinguish among alternative policies and monitoring the implemented policy. After analysis of policies from the different states the research team can make conclusion of certain common findings (duration of duty, duration of disease after separation from services, age, pre-work evaluation and not using disease causative agents) which are mandatory for the benefits and some criteria must be included in the policy so after evaluation best benefits can be payable for the firefighters in line of duty.

**Christoph, Jed** "Diagnosing the Large-Scale Synoptic Patterns of the February 28-March 1, 2017 Tornado Outbreak" (Joshua Durkee)

Every year in the United States, outbreaks of severe weather and tornadoes rip across the country- leaving a wake of destruction in their path. On February 28, 2017 a violent tornado destroyed much of the town of Perryville, Missouri as part of a multi-day tornado outbreak across the Midwest that caused billions of dollars in damages and killed four. The purpose of this study is to investigate the large-scale upper atmospheric conditions that forced this outbreak to occur and to enhance learning and preparation for future severe weather outbreaks. After documenting the Perryville tornado firsthand in 2017, the atmosphere was later analyzed from the ground up to about 34,000 feet using high quality data and modeling software. This data was inputted into Integrated Data Viewer where maps were made to closely analyze different slices within the atmosphere. The results indicated that many of the known large-scale atmospheric circulations conducive to severe weather generation were in play, confirming that this outbreak was in fact forced by these upper atmospheric conditions.

**Chumbler, Isabel** "Mercury Bioaccumulation in Bats from Mammoth Cave National Park" (Cathleen Webb)

This project evaluates mercury levels in bat hair samples collected at Mammoth Cave National Park. Mercury bioaccumulation in bats results from atmospheric deposition from industrial and natural sources. Atmospheric

elemental mercury is transformed to methylmercury in the environment, which bio-accumulates and may impact reproductive success, growth, and survival of bats. Bat hair samples are analyzed for mercury using the LECO AMA-254 Mercury Analyzer, which reports mercury levels in parts per million. A total of 200 hair samples from bats were analyzed to date. Mercury levels vary with gender following a trend, where female bats possibly show lower mercury levels due to the females' decreasing body load of mercury through lactation. In a prior study, juveniles showed the lowest levels of mercury of all the samples due to their age. Results indicate that levels of mercury also vary with species.

**Clark, Cole** "A Survey of Madtom Catfish in Areas with Varying Mussel Shell Density" (Philip Lienesch)

A prior study conducted by a student at WKU showed evidence of madtom catfish in the Green River preferentially using shells of deceased mussels as cover. I hypothesized that there would be more madtoms at sites with higher mussel shell availability. To test my hypothesis, I performed daytime snorkel surveys to assess the density of mussel shells and madtoms. I surveyed five sites along the Green River in Kentucky. Included in these sites are two sites in Greensburg KY, one site in Munfordville KY, and two sites in Horse Cave KY. At each site, I performed three 15-m snorkel surveys in riffle habitat (< 0.7 m depth). There was a negative relationship between the number of available shells and the density of madtoms. Greensburg, the area with the highest density of madtoms, had the lowest density of dead mussel shells. Further research will be conducted to increase the number of sites and to collect information on other environmental variables that are affecting madtom density.

**Coffey, Nicholas** "The Characterization of Genes Annotated in the Genome of the Mycobacteriophage Moomoo" (Claire Rinehart)

First isolated, sequenced, and annotated in 2013, MooMoo is a singleton mycobacteriophage, which means that it shares less than 50% of its genome with any other annotated virus. However, general function knowledge of viral genomes has expanded since 2013. I am doing a new annotation of MooMoo's genome to review start sites and update functions to its annotated genes based on updated genomic and proteomic data collected from programs and data bases that are compiled by PECAAN. The results of this project will be a new annotation of MooMoo's genome that leads to a better understanding of MooMoo and identifies the families of viruses MooMoo may derive from. This annotation will be submitted as an update to the current NCBI annotation of MooMoo's genome, where it will provide information for future annotations of viral genomes. In light of antibiotic resistance, additional knowledge of viruses could lead to virotherapy becoming a medically viable method of combating infections in a clinical setting. In virotherapy, a virus is utilized to kill its host bacteria with high specificity and minimal damage to the host of the bacteria. For example, MooMoo's host are mycobacterium, which contain species that cause serious human illness.

**Collings, Colten**; Duffin-Rexroat, Lisa "An Experimental Test of an Online Growth Mindset Intervention: Challenging College Students' Beliefs about VAK Learning Styles" (Lisa Duffin-Rexroat)

At post-secondary institutions, student attrition and graduation rates are of concern. One contributing factor could be students' beliefs in inaccurate information about the brain. Previous studies examined the prevalence of neuromyth beliefs among teachers, college graduates, and pre-service teachers – the most rampant being the visual, auditory, and kinesthetic (VAK) learning styles myth. The purpose of this study was to expose college students' misconceptions about learning, investigate barriers to learning of believers in the VAK myth, and test the efficacy of a growth mindset intervention targeting this myth. The sample of college students (N = 231) was recruited and randomly assigned to one of two conditions: treatment (n = 125) or control (n = 106). In both conditions, students experienced a 20-minute online module. All participants completed a 10-question pre- posttest containing true/false neuroscience statements, assessing their beliefs about the brain and neuromyths. For the two statements regarding VAK learning styles, there were no significant differences between the groups at the onset of the study ( $p > .05$ ); both groups were strong believers in the myth. However, there were statistically significant differences at the conclusion ( $p < 0.00$ ) based on Chi-Square analyses with a strong effect on changing college students' incorrect beliefs.

**Collins, Christopher** "Kinetics of a Degradable Antioxidant Polymer" (Lawrence Hill)

This project examines the kinetics of a novel degradable antioxidant polymer. This polymer will consist of two components. First is a difunctional initiator which degrades in the presence of peroxides. Second is an antioxidant monomer which consists of ascorbic acid groups attached to a common acrylate. The polymers will be synthesized via atom transfer radical polymerization (ATRP). Size-exclusion chromatography will be used to characterize the distribution of polymer weights, and nuclear magnetic resonance (NMR) will be used to characterize the degree of polymerization. Following the synthesis, an oxidizer will be introduced to cause degradation, and the degree to which polymers degraded will be tracked over time using the same methods. Currently, we have baseline kinetics data for the synthesis of a polymer which uses off-the-shelf reagents, and we have synthesized both the initiator and monomer which will be used in the novel polymer. We plan to have this polymer synthesized by the time of the conference.

**Congleton, Hannah; Bogard, Sophia;** Khouryieh, Hanna "Influence of Environmental Conditions on the Stability of Emulsions Containing Droplets Stabilized by Whey Protein-Kappa-Carrageenan Complexes" (Hanna Khouryieh)  
The purpose of this research was to investigate the influence of pH and NaCl on the stability of fish oil-in-water (O/W) emulsions containing whey protein isolate (WPI)/kappa carrageenan ( $\kappa$ -Car) complexes. The O/W emulsions were prepared with 2 wt% WPI, 10% v/v Cod liver oil, and  $\kappa$ -Car gum at 0, 0.05, 0.1, 0.2, or 0.4%. The emulsion creaming and physical stabilities at pH values of 3, 4, 5, 6, or 7, and 0 and 100mM NaCl were evaluated by measuring the droplet particle size, zeta potential, creaming index and rheological properties. The stability of the emulsions was significantly affected by the addition of NaCl, pH and concentration of  $\kappa$ -Car. As the  $\kappa$ -Car concentration increased, the emulsions physical stability increased. Emulsions containing 0.4% of  $\kappa$ -Car were the most stable when adjusted to a pH of 5 and 6.  $\kappa$ -carrageenan emulsions with 0.2 and 0.4% gum displayed highest viscosity for at pH 4 and 5, respectively. At pH 4 and 5 zeta potential was near 0 mV indicating minimal electrostatic interactions. The particle size in 0, 0.05, and 0.1% emulsions peaked at pH 4 and 5, indicating increased flocculation due to the low electrostatic interaction.

**Conkin, Ethan** "Campus Crusade for Christ Community Center" (Shahnaz Aly)  
The project created was a campus ministry office and student center for WKU Campus Crusade for Christ. CRU is a community of believers passionate about connecting people to Jesus Christ. CRU holds weekly meetings on campus while sharing the good news of Jesus through evangelism. Western Kentucky University's Campus Crusade for Christ (CRU) is the only campus ministry without a residence/office building on campus. This space allowed CRU staff and students (current and future) a place to worship, gather, learn, teach and have a sense of community while at Western Kentucky University. Research areas included were: structure, location of building, mechanical system, and sustainability. The main goals of the project were to provide an effective and efficient space for WKU CRU staff and students, make the center/office as accessible as possible for any person, and make the building green and sustainable in terms of design. This building would make CRU a name people will know and want to experience for themselves in the Bowling Green community.

**Cooper, Lauren;** Ilhom, Saidjafarzoda; Belekov, Ermek; Er, Ali "Hydrogen Production from Aluminum Powder Using Nanosecond Laser Pulses" (Ali Er)  
A simple generation of hydrogen from aluminum powder in water using nanosecond laser pulses in a single step approach is reported. This method, alternative to conventional hydrogen production techniques, offers fast, cheap, and environmental friendly yet effective route. Amount of hydrogen was comparable to other common methods. We found the delivery rate of  $1.2 \times 10^{-5}$  gram H<sub>2</sub>/sec/gram aluminum without using any chemical promoters at room temperature by irradiating aluminum powders in water with a laser. Hydrogen production rate and amount were found to be strongly dependent on laser fluence and time. Small handheld devices and laptops could be powered up by hydrogen obtained thru this method due to its portability and simplicity.

**Cooper, Natalie; Mullick, Maunil;** ; King, Rodney "A Comparative Analysis of Newly Discovered Bacteriophages Groovydude and Spiffy12" (Rodney King)  
The purpose of this project was to gain insight into the diversity of the bacteriophage population by isolating and characterizing bacteriophages from the environment. A single bacterial host naturally found in soil and plants, *Microbacterium foliorum*, was used as the host for this experiment. Soil samples were collected from two different locations in Bowling Green - one near a busy sidewalk, and the other in a cornfield. The viruses isolated from the soil samples were subjected to several rounds of purification before high titer stocks were prepared. Transmission electron microscopy revealed that the viruses were siphoviridae with the same average tail length, though the average capsid diameter of Spiffy12 was greater by 13 nm. Genomic DNA was isolated and digested with restriction endonucleases and the products were analyzed by gel electrophoresis. Surprisingly, similar restriction patterns were observed. Although GroovyDude and Spiffy12 were isolated from the same geographic region, grown on the same host, and share the same restriction endonuclease cleavage sites, they have distinct differences in plaque development and particle morphology. We conclude that these are two similar bacteriophages which represent a small portion of the population, and the diversity of bacteriophages can only be understood with further isolation and experimentation.

**Creech, Zachary** "Lithological Character and Sequence Stratigraphy of the Ste. Genevieve Limestone in Western Kentucky" (Michael May)  
The Ste. Genevieve limestone is a stratigraphic unit that is a prominent hydrocarbon producer (oil, natural gas etc.) in states such as Missouri, Kentucky, Indiana, and Illinois. There has been little study focused on characterizing the Ste. Genevieve limestone (characteristics such as the lithofacies, stacking patterns, and sequence stratigraphy of the unit) through the analysis of roadcut exposures of the unit in western Kentucky. The focus of this study is to use data collected from outcrops, draft the data into cross-sections of stratigraphic columns, and use the results to characterize the lithofacies, stacking patterns, sequence stratigraphy, and identify areas in the unit that have a high potential to be hydrocarbon reservoirs.

Preliminary results of the study show that the lithofacies of the Ste. Genevieve limestone primarily consists of alternating layers of grainy limestone (fossiliferous limestone, oölitic fossiliferous limestone) and muddy limestone (primarily dolomitic limestone). The stacking patterns and sequence stratigraphy of the outcrops are typical of carbonate systems, and the units with the highest potential to be hydrocarbon producers are primarily oölitic limestones enclosed by relatively muddier units and dolomitic units.

**Curtis, Levi** "Discrete Variable Representation of the Reduced Density Matrix for Molecular Relaxation Dynamics" (Jeremy Maddox)

Classical mechanics describes matter and energy on scales relatable to our daily lives. Classical mechanical systems include tossing a baseball or pushing a box up a ramp. In contrast, quantum mechanics describes the behavior of matter and energy at the atomic level. Examples of quantum mechanical systems include the energy state of electrons in atoms and the vibrational behavior of molecules. The most fundamental mathematical equation for describing quantum mechanical systems is the Schrödinger equation. Despite widespread use of the Schrödinger equation throughout physics and chemistry, it remains very difficult to solve for many quantum systems. Discrete variable representation, or DVR, is an applied mathematical method for solving equations similar to the Schrödinger equation. Computer codes utilizing DVR were created to analyze a series of quantum systems. These results were compared to published results in the literature. Further modifications to the code were made to model the reduced density matrix and its time evolution. The reduced density matrix is a useful mathematical representation for modeling collections of quantum mechanical objects how these collections change over time.

**Daniels, Katie** "Melrose by Moonlight" (Walker Rutledge)

When most people study abroad, they bring books, a camera, a journal, maybe a traveling gnome. When I went to Scotland last fall, I brought my Celtic harp and a DSLR. I have been playing Scottish harp professionally for over ten years. I am also a singer/songwriter and storyteller. In this project I combine my musical skills with an interest in filmmaking and photography in order to create a short series of web-length videos that capture a little of the essence of Scotland and my reason for being there. A study-abroad experience is difficult to explain, either during or upon returning. The experience is intangible and beyond the scope of language but not, in my opinion, beyond the grasp of story or music. This project is both my Honors CE/T and my Gilman follow-on service project. With it I hope to bring a little piece of Scotland home with me to share with those who cannot go themselves. This project is a combined oral presentation on my experiences in Scotland, the nature of the project, and some of the challenges I overcame in the process, and concludes with some clips showcasing the finished videos.

**Davis, Andrew** "Development and Application of a Density Dependent Leslie Matrix Population Model with Variable Population Distributions" (Bruce Kessler)

The ability to efficiently and accurately model a trend in data is central to our ability to predict future events, including the growth of populations. The Leslie matrix population model is a computationally efficient model that can effectively model age groups within the population, but lacks the versatility to fit many population scenarios, including a change in age group distribution. The authors previously developed a modified density-dependent Leslie matrix model that expands the applications of the Leslie matrix, notably including the ability the change age group distributions over time. This talk will describe the application of this modified model to a set of generated data, including the outline of the algorithm used to generate the data and apply the model to this data. It will also describe if there is any statistically significant improvement between this model and the single distribution density-dependent model.

**Davis, Christopher; Tang, Reuben** "Evaluation of Mitigation Efforts Using Building Information Modeling (BIM) in Kentucky" (Fatemeh Orooji)

Annually in the United States, natural disasters affect millions of people's lives. A study by Smith and Katz demonstrates an increasing trend of about 5% in the frequency of billion-dollar natural disasters per year. In 2016, there were 15 disaster events with losses of more than \$1 billion each in the United States, resulting in deaths and significant economic damage to the impacted areas. The state of Kentucky, with 56 major disaster declarations since 1953, is one of the ten states with most natural disaster declarations in the United States. Therefore, stronger building codes have been implemented, and regulatory changes in building codes (e.g., International Residential Code) have been adopted by state and local jurisdictions. Regardless of attempts by federal, state, and local agencies to assist home owners in increasing residential resilience, mitigation decision making remains a challenge. Implementing all available mitigation options is not advisable and may result in overly robust, high-cost building stock without a sufficient return on investment. The goal of this study is to evaluate the economic benefit of hazard mitigation techniques through quantification of avoided losses for single-family residential buildings in the state of Kentucky. The intent is to support home users in the process of mitigation decision making.

**Davis, Devin** "Electrohydraulic Forming" (Morteza Nurcheshmeh)

Analyzing and creating improved electrohydraulic metal-forming process for automobile body panels Current methods of electrohydraulic metal-forming (EHF) processes are cost-draining, mechanically intensive and thus have created sub-par assembly line efficiency. This has caused massive reductions in automobile manufacturing capabilities, and thus, new approaches to the process must be studied and applied. Most importantly, little work has been conducted to pinpoint the best materials to utilize, materials that will respond well to the process by allowing for precise cuts of light materials. In order to increase the manufacturing capability of this unique and comparatively groundbreaking process, an emerging need was seen by the automobile industry for testing on metal forming limits. In order to test for the best metals and materials to be utilized under electrohydraulic forming, simulations were created using the Computer Aided Design: ANSYS software suite. The simulation works by creating forming limit diagrams, essentially quantifying how far these materials can be morphed under the process. By comparing these forming limit diagrams under various metals, we hope to effectively identify the best materials to be utilized with EHF to create products that can better cater to a new age of manufacturing, one requiring lighter and more refined edge parts.

**De Logé, Desirée** "Tuning Effects of LefreQue Sound Bridges on Powell Flutes and Piccolos" (Heidi Alvarez)

The lefreQue Sound Bridge is an accessory that can be used on different instruments to repair "broken" connections where the joints connect. On a flute specifically, there are three places where sound breaches can occur due to these broken connections. These breaches in sound can affect a flutist's tuning, dynamics, and their ability to produce smooth intervals. Very little research has been conducted on this topic, so this study aims to provide basic information on lefreQue's for those interested and to hopefully propel the interest in research on these accessories. A control group was established by assessing the normal tuning tendencies of two Powell flutes and two Powell piccolos made of various materials and with no lefreQues attached. These tuning tendencies were assessed chromatically, through the full range of the instrument, and through the use of harmonics. Each instrument was tuned to A=440 Hz. Once data from the control group had been collected, different metal values and size combinations of lefreQues were attached to each instrument and any changes in tuning were assessed using the analysis feature of the app TonalEnergy Tuner and Metronome.

**DePoy, Hannah** "Canada's Memorialization of Indigenous Residential Schools" (Marko Dumančić)

Each country chooses how to confront and address the different aspects of their pasts, especially its darker chapters. This is a study on the way Canada confronts their complex history of indigenous residential schools—and the question of how to term these events—as atrocities, massacres, genocide, cultural genocide, or something entirely different. My research will concentrate on the usage of the term "cultural genocide," which is the destruction of the structures and practices that allow, and make, a group to be a group. Although "cultural genocide" is not explicitly stated in the UN's legal definition of genocide, there is one cultural genocidal action listed in the definition: "forcibly transferring children of the group to another group." This study analyzes how the Canadian Museum of History presents the history of indigenous residential schools, where indigenous children were forced to attend. I analyzed the Canadian Museum of History in order to understand how the indigenous residential schools are currently being explained and memorialized. This is important because the way that the Canadian Museum of History memorializes residential schools affects public memory, which, in turn, affects public perceptions of Canadian indigenous people today.

**Devarakonda, Koushik**; Cooper, Lauren; Belevkov, Ermek; Kholikov, Khomidkhodza; Er, Ali "The Effects of Photo-Activated Graphene Quantum Dots on Bacterial Deactivation" (Ali Er)

With the growing levels of anti-bacterial resistant pathogens spreading in society, new forms of treatments and therapies are needed to effectively deactivate bacteria. A biocompatible photodynamic therapy agent that generates a high amount of singlet oxygen with high water dispersibility and high levels of luminescence is desirable to increase the effectiveness of the therapies. In this work, a graphene-based biomaterial was produced as a less-toxic alternative to other photosensitizing agents, using Methylene Blue as a standard photosensitizer for comparison. Graphene quantum dots (GQDs) were synthesized by irradiating benzene and nickel oxide mixture using nanosecond laser pulses. The productivity of GQDs was investigated by changing laser power density and wavelength with respect to time. Atomic force microscopy (AFM), Raman spectroscopy, transmission electron microscopes, and scanning electron microscopes were used for characterization of GQDs. Results show that GQDs with size less than 10 nm with excellent photoluminescence property were obtained. Initial results of deactivation of *E. coli* with methylene blue show 90% efficiency. The results of these studies can potentially be used to develop therapies for the eradication of pathogens in open wounds, burns, or skin cancers.

**Dillingham, Megan**; King, Rodney "Using Chromosomal Engineering to Investigate the Importance of a Conserved Cysteine Residue in *E. coli* RNA Polymerase" (Rodney King)

All bacteria contain multi-subunit RNA polymerases (RNAPs) that are essential for gene expression. Because of the centrality of these enzymes in cellular life, the structure and function of the various subunits is intensely

studied. The primary sequence of the RNAP beta prime subunit contains five cysteine residues that are highly conserved. Four of the cysteines coordinate a zinc atom and form the beta prime subunit zinc binding domain (ZBD). Mutation of any one of the ZBD cysteines is lethal to the cell. However, the role of the fifth residue (C58), which is located upstream of the ZBD cysteines, has not been investigated. In previous work, we cloned a copy of the *E. coli* rpoC onto a plasmid and changed the cysteine at position 58 to an alanine (C58A). Phenotypic analysis suggested that expression of the mutant subunit from the multi-copy plasmid inhibited *E. coli* growth at high temperatures. In this study, we describe our attempts to generate the C58A mutation in single copy on the chromosome using a chromosomal engineering technique. In addition, we investigated how the mutant subunit affects the expression of reporter gene constructs.

**DiMeo, Chris** "Lucky No. 8/8 大财" (Matt Tullis)

Skateboarding and skate culture are long-standing and still flourishing in the United States, but are still new and infectious in China. However, even though the skateboarding communities in both countries are increasingly international, skate wear and skate gear companies typically market to them in isolation. In this project, I created a universal brand identity for a skate wear company that unites Chinese and American skateboarders. I researched the evolution of skateboarding culture in both countries, as well as existing skate wear brands in each, to understand the similarities, differences, and trends in Chinese and American skateboarding culture and fashion. I then applied the resulting brand, Lucky No. 8/8 大财, across marketing and apparel mockups, including an infographic on the importance of the number 8 in Chinese culture, a skateboard design, a Tech Deck mini skateboard design and packaging, hoodies, t-shirts, skateboarding gloves, backpacks, hats, and pollution masks. The United States and China wield the two most powerful economies in the world, yet consumers in these countries—particularly in the United States—are often blind to the other's cultural trends. The goal of these applications is to entice American skateboarders into the world of Chinese and international skateboarding.

**Dobler, Jacob**; Robinson, Taylor; Gupta, Sanju "Hydrothermal Synthesis and Properties of Mesoporous Molybdenum Disulfide (MoS<sub>2</sub>) – Reduced Graphene Oxide Composites for Hydrogen Production" (Sanju Gupta) Graphene-family and related nanomaterials attracted a great deal of attention as game changer at the grand challenges of energy-water-sensing technologies. The related applications require delicate control over geometric and electronic structures affecting physical and electrochemical properties. In this study, we prepared a range of three-dimensional graphene-based aerogels with varying graphene oxide-MoS<sub>2</sub> (molybdenum disulfide) composition under hydrothermal conditions (P < 20 bar, T < 200 oC). We demonstrate that precise control of defects density (via MoS<sub>2</sub> desulfurization), hierarchical porosity and topological interconnectedness (via monolithic aerogels), invoked in synthesized reduced graphene oxide-MoS<sub>2</sub> aerogels that can finely tune morphology, structure, and enhance heterogeneous electron transfer rate (k<sub>ET</sub>). This study allowed to design graphene heterostructure interfaces, understand their interaction through optical absorption, XRD and Raman spectroscopy (RS), to correlate between number defect density (via RS) and heterogeneous electron transfer rate (via scanning electrochemical microscopy; SECM) quantitatively, useful for fuel cell applications. Additionally, Raman spectral bands are analyzed in terms of band position, intensity and integrated intensity ratio determining structural disorder, inter defect distance, number defect density, interaction and number of MoS<sub>2</sub> layers. Moreover, the pore size distribution and mesoporosity are determined from electron microscopy and tomography. The multiple roles of oxygenated (carbonyl; C=O, carboxyl; -COOH) surface functionalities in graphene and MoS<sub>2</sub> and bonding configurations are emphasized for improved physicochemical properties.

**Dodeja, Krishna; Byrd, Lindsey; Brady, Joseph; Alshaikhjafar, Muhannad** "A Design Approach to Separated Heat and Light Sources in a Brooder House" (Julie Ellis)

Heat and light are critical for the growth of healthy chicks, and, in the setting of a brooder house, heat lamps are commonly used as the standard source of both heat and light. Heat lamps are not easily controlled, produce a fixed amount of heat and light at a given time, and radially distribute heat creating a safety hazard for the chicks as they huddle toward or away from the heat source when the temperature becomes too hot or cold. The purpose of this study is to design independently controlled heating and lighting systems to ensure an even distribution of heat along the surface of the brooder house, simulate a diurnal lighting pattern to improve chick health, and publish a design that can be implemented in similar brooder houses. This problem has been approached by measuring the area of a brooder house at River Cottage Farm and approximating the amount of energy needed to design independent heating and lighting systems. It is expected that the design produced by this study will allow farmers to have better control over the internal variables of the brooder house, the mortality rate of chicks will decrease, and increased efficiency will improve cost savings.

**Dolan, William** "Dice Mythbusters" (Warren Campbell)

Dice have been used as random number generators for thousands of years, with hundreds of millions sold annually. While many qualitative techniques are able to find weight imbalances, little has been done to

statistically determine how unfair a certain die is. This project analyzed the number of rolls necessary to confidently detect an unfair die with a given level of unfairness. Different die abnormalities, such as uneven side lengths, weighted sides, and bubbles in the plastic were analyzed. Monte Carlo simulations with a running chi square goodness of fit test were used to test each die scenario. For each scenario dice were virtually rolled 480 million times to generate probability distributions of the number of rolls beyond which the chi square statistic remained above the 95% confidence value. The probability distribution of the number of rolls beyond which chi-squared > chi-squared-crit can be fitted with the 2-parameter gamma distribution very accurately. The resulting distributions suggest that a die must be extremely unfair to detect it in

**Downing, Shohei** "Sin, Development, and Punishment: Understanding Hawthorne's Unpardonable Sin" (Sandy Hughes)

For Nathaniel Hawthorne, the idea of sin is pervasive. Within his stories, he explores various facets of sin, including the "unpardonable sin"—a sin so grave that it cannot be absolved. Importantly, these sins develop from an innocuous sin into the unpardonable. For Hawthorne, the self plays an intrinsic role in this development. In other words, even after the germination of sin, the self still has agency. Thus, Hawthorne's characters perpetuate their own downfalls. Through a comparative analysis of three Nathaniel Hawthorne short stories, a model of understanding of this unpardonable sin becomes clear. Due to its overt linearity, "The Celestial Railroad" provides a clear image of the development of sin into the unpardonable. When we use "The Celestial Railroad" as a lens through which to understand "The Birth-mark" and "Young Goodman Brown," Hawthorne's idea of unpardonable sin becomes clearer. As Hawthorne explores unpardonable sin through its various manifestations, at the core of his narratives, he depicts sin mixing with negative human qualities—ignorance, obsession, paranoia—that ultimately doom the principle characters. The research was conducted primarily through literary analysis, peer discussion, and historical study of Nathaniel Hawthorne and his short stories.

**Dukes, Jessica; Wheeler, Katie;** Luna, Catherine; Willoughby, Austin "Context Specificity in Predictive Learning: Comparing Visual and Auditory Contexts" (Sharon Mutter)

Prior research has demonstrated that physical and temporal background stimuli produce context-specificity effects in predictive learning, especially when these stimuli help disambiguate cue – outcome relationships (Bouton, 1997). In this study, we investigated whether auditory stimuli are as effective as visual stimuli in producing these context effects. During a 'Spy Radio' predictive learning task (cf., Pineno, Ortega, & Matute, 2000), participants saw shape cues, predicted whether a road was safe or dangerous, and received feedback on the accuracy of their prediction. The Context 1 cues were reliable predictors (i.e., always predicted safety or danger), whereas the control cues in Context 2 were ambiguous (i.e., predicted safety equally as often as danger). At test, participants made predictions for target cues without feedback in either the same context in which they were learned or in the other context. Visual context produced a strong context specificity effect - test predictions were more accurate for cues presented against the same background color than against the switched color. However, auditory context did not produce a context-specificity effect. These findings suggest that participants were more likely to attend to visual context than auditory context during predictive learning although both were equally relevant for reducing cue-outcome ambiguity.

**Dykes, Samantha;** Salyer-Funk, Amanda; Crandall, Jason "Efficacy of a Game-Centered Program for Increasing Physical Activity in Children: A Pilot Study" (Amanda Salyer-Funk)

During inclement weather, indoor recess may be only option for children and generally excludes extended bouts of physical activity. Bingocize® may be an effective alternative to add physical activity during the day. Purpose: to adapt the Bingocize® program for preschool children and compare physical activity during the program to a typical unstructured indoor recess. Method: Children (N=21; 3-5 yrs old) wore pedometers (GOPHER FitStep Pro) during a Bingocize® session, led by a trained classroom teacher, and during indoor recess. A paired sample t-test was used to compare total step counts during each condition ( $p < .05$ ). Results: Statistically, no significant differences between the experimental and control conditions were apparent ( $t(16) = 1.43$ ;  $p=0.171$ ). The range of step counts decreased for the experimental versus control condition. Thirteen of the twenty-one children had higher step counts during the experimental condition. Conclusion: Results of this pilot investigation Support further study of Bingocize® for children is warranted. Classroom teachers reported Bingocize® is a time-efficient, structured, and fun way for the children to stay engaged physically.

**Eads, Kristen;** Mishra, Ila "The Effects of Chronic Sleep Fragmentation and Chemical Sympathectomy on Microglial Activity" (Noah Ashley)

Obstructive sleep apnea can lead to adverse health effects such as metabolic, cardiovascular, and neurobiological problems. Catecholamines are produced when the sympathetic nervous system is activated due to sleep loss. Research suggests that microglia are activated during sleep loss, which triggers inflammation in the brain. The neurotoxin 6-hydroxydopamine (6-OHDA) was used to chemically sympathectomize mice. There were six cages of mice; two controls, two sleep fragmented, and two sleep fragmented followed by a week of recovery. One cage from each group received a vehicle (phosphate buffered

saline) and the other received the chemical sympathectomy. The mice were placed in a cage with a moving bar that swept across the bottom during the 12-hour light period. Microglia were examined from the prefrontal cortex, hippocampus, and preoptic area of the brain using Sholl analysis. Chronic sleep fragmentation increased microglia number, cell area, and ramifications in all three areas of the brain. One-week recovery was enough time to return the microglia levels to that of a rested state in the preoptic area and prefrontal cortex. The 6-OHDA decreased microglia activity. Chronic sleep fragmentation increased microglial activity and 6-OHDA inhibited the response. The week-long recovery period was enough time to decrease microglial activity.

**Edens, Kolbi; Pitts, Bailey; Yoho, Kristin; Lyons, Scott; Link, Kim; Jones, Susan; Tinius, Rachel** "Effects of Evidence-Based Materials and Access to Local Resources on Physical Activity during Pregnancy" (Rachel Tinius) Physical activity (PA) during pregnancy has been shown to be safe and effective for improving maternal and infant health. PURPOSE: to determine if the distribution of evidence-based materials and access to community resources will increase PA levels and knowledge/beliefs about PA during pregnancy. METHODS: Participants (8-12 weeks) completed assessments concerning their physical activity levels and knowledge/beliefs regarding PA during pregnancy. Next, participants were randomly assigned to either an intervention (IG) or control group (CG). The IG received educational information regarding PA, as well as access to local fitness facilities. At the end of pregnancy (32-39 weeks), all baseline assessments were repeated. RESULTS: 45 women completed the study (IG: 24, CG: 21). 13 IG women utilized PA services (prenatal yoga: 8, gym: 2, both: 3). The IG spent less time sedentary from the 1st to 3rd trimester, while the CG were more sedentary ( $p=0.12$ ). There were no differences in step counts or knowledge/beliefs regarding PA between groups. The IG was further along the transtheoretical model than women in the CG ( $p=0.04$ ). CONCLUSION: The intervention was unsuccessful at significantly increasing PA levels. Educational materials and community resources are not enough to increase PA levels during pregnancy but could aid in future investigations.

**Eliassen, Isabel** "On the Other Side of the Closet: The Acceptance of Homosexuality in Taiwan" (Timothy Rich) In May of 2017, Taiwan's Constitutional Court ruled that same-sex marriage should be legalized in order to preserve equality in Taiwan. Since then, support for same-sex marriage has wavered, and many Taiwanese still view homosexuality and same-sex marriage negatively. As the debate about same-sex marriage heats up in Taiwan, this study aims to see if perceptions of homosexuality are conditional based on proximity to and relationship with the homosexual person. In order to study this, I conducted an original survey in Taiwan, where respondents received one of five versions of a question. In the first version, I asked if they would support a homosexual Taiwanese person. In the latter versions, "a Taiwanese person" was replaced "a member of my community," "my friend," "my sibling," and "my child." In Taiwan, family ties and the wellbeing of the group are very important, so I expected that closer relationships would cause support for homosexuality to decrease. I found limited evidence to support this, as the question about siblings was linked to negative results, but not the version asking about children. These results may help LGBT activists in Taiwan or be useful as the Taiwanese government looks to write legislation on same-sex marriage.

**Ellis, Madison; Gatlin, Samantha; Zwakenberg, Autumn** "Advancing the Study of Social Support in Trauma and PTSD: An Overview of a Novel Experimental Approach" (Matthew Woodward) Posttraumatic stress disorder (PTSD) has been associated with a number of problematic outcomes. Therefore, understanding factors related to PTSD is of vital importance. Social support has been identified as one of the most important factors following trauma exposure, but few studies have examined its effects using experimental studies, and much is still unknown about how it relates to PTSD. The purpose of the current submission is to present an overview of an experimental study examining the impact of friend-based social support during a stressful experience designed to approximate trauma exposure. Undergraduate female students are randomly assigned to watch a film clip depicting a fictional sexual assault either alone or with their friend present. Participants skin conductance and subjective measures of distress are assessed along with a three-day examination of intrusive memories of the film. It is hypothesized that participants who watch the film with their friend present will have lower distress and fewer intrusive memories of the film compared to individuals who watch the film clip alone. This study may provide identification of facets of social support that are especially important when adjusting to stress and inform psychological therapies utilizing social support as an agent of change in PTSD symptoms.

**Elzey, Benjamin** "May 25, 2016 Severe Weather Outbreak and Chapman Ks Ef-4" (Joshua Durkee) On May 25, 2016 a long track EF-4 tornado formed in a slight risk environment and remained on the ground for 90 minutes injuring 8 people. This tornado was one of a handful that occurred that day, and the strongest tornado of a larger 4-day series of tornado outbreaks across the great plains. We will analyze the atmosphere leading up to this event and study the details of what made this event possible. Diving into the Quasi-Geostrophic theory and jet streak dynamics to figure out how all the pieces came together at the right time to make this event possible. We will also look into the factors that contributed to other severe weather that occurred that day, specifically a damaging hail and strong winds that occurred in the Northern Great Plains.

We will identify what common factors affected these storms and contrast their dissimilarities. By the end of this paper, we should have a detailed synoptic analysis of the weather that occurred throughout the Great Plains that day. For this event we will be using RAP 0H analysis data, as well as SPC soundings to analyze the environment.

**Evans, Brendan;** Henson, Alex; Gupta, Sanju "Graphene-Polymer Thin Film Composite Membranes as Efficient and Anti-Fouling Membranes for Water Purification" (Sanju Gupta)

Reverse osmosis (RO) filtration is highly adopted, growing technologies to produce clean water by removing undesired (charged or uncharged) solute species. However, polymer and ceramic membranes suffer from low permeability, structural breakdown and fouling. Graphene, a form of carbon, provides the foundation for the production of highly permeable membranes as an emerging technology for RO desalination. Adding oxygen to few-layer graphene nanosheets, i.e. graphene oxide (GO), opens allows efficient adsorption of charged ionic species (selectivity) and augmented flow of water molecules (ultrafast permeability). This works reports on the development of novel graphene oxide thin film nanocomposite (G-TFNC) membranes embedded with a thinner active polymer layer via interfacial polymerization to tackle the trade-offs among water flux transport and salt ionic species rejection, robustness and anti-fouling characteristics. This study overcomes the gap between drinkable freshwater demand and supply through nanotechnology-enabled high performance graphene composite membranes.

**Evans, JC** "Synoptic Analysis of February 24, 2018, Severe Weather Event" (Joshua Durkee)

A winter season severe weather event in Kentucky is a rare, but not an unheard occasion. The February 24th severe weather event in 2018 was a winter season event that spawned seven tornadoes, one of which injured one person and killed another. Since this event happened in the cold season it was not instability driven, rather it was atmospherically and dynamically driven. This analysis uses quasi-geostrophic theory and the omega equation to provide a prognosis for the synoptic setup, which provides a good environment for severe weather to occur. At the 250mb level a large upper level trough moved across the country, a jet streak formed over the region making positive and negative vorticity advection in the entrance and exit regions. This is re-enforced at the 700mb level with vertical velocity moving across the study area in the shape of a quasi-linear convective system. This initiated lift that was helped by the saturation at the same level. The prognosis obtained from the analysis show the synoptic set up during the time of the event. The synoptic features at the time of this event provided a good environment for severe weather to occur in the region.

**Filiatreau, Rebecca; Kimble, Kelsey;** Noel, Christina "Inclusive Special Education Practices in South Africa and the United States" (Christina Noel)

Despite inclusion being an internationally recognized system of educating students with disabilities, there continues to be a fracture between theory and practice. This research project compares inclusive special education practices between Limpopo, South Africa and Kentucky, United States. We interviewed college students in education from both countries about their perceptions of inclusive practices in the classroom. This poster provides themes from the data collected in both countries.

**Fisk, Samuel;** Brausch, Amy "Suicidal Ideation in Young Adults with Autism Spectrum Disorder" (Amy Brausch)

There have been numerous studies on suicidal behavior in recent years, but there is a lack of research examining these behaviors in young adults with Autism Spectrum Disorder. This study examined the effects of perceived burdensomeness and thwarted belongingness on suicidal behavior, specifically in this population compared to the general population. This was accomplished by asking participants at a local university to take a brief survey including several measures. The anticipated results were that individuals displaying more traits of Autism Spectrum Disorder, along with increased rates of perceived burdensomeness and thwarted belongingness, would display greater rates of suicidal ideation and suicidal behavior. When comparing a group of individuals who scored below the cutoff to be considered on the spectrum to a group of individuals who scored above said cutoff, results were significant for all measures. These results are consistent with the hypothesis that individuals with Autism Spectrum Disorder exhibit stronger feelings of perceived burdensomeness and thwarted belongingness, which correlates with suicidal ideation and behavior. The results of this experiment could be used to educate those in the community about the mental health of these individuals, as well as develop interventions for individuals with Autism Spectrum Disorder in crisis.

**Fox, Jason** "An Index-Based Assessment of Tourism Development Impacts on Cold-Climate Hydrologically-Dominant Landscapes" (Leslie North)

Tourism in cold-climate regions is largely characterized by recreational and sightseeing activities at hydrologically-active attractions such as glaciers, coastal cliffs, and waterfalls. While the economic promise of the tourism industry can contribute to a sustainable future for cold-climate communities, the environmental implications of a hastily-developed industry cannot be ignored given that cold-climate landscapes are at risk of rapid environmental change from a warming climate. This study consists of the development of a tourism

impact index for cold-climate hydrologic sites, the first of its kind, and its application and refinement in the field at various locations in Iceland. As no direct precedent for a tourism impact index exists, the creation of the initial index draft was informed by other environmental indices available from the literature in related sub-disciplines. The index contains over 40 visually-assessed indicators, each scored on a scale of zero to three regarding severity of environmental impact. As the index was applied throughout the study region of southern Iceland, improvements were incorporated into the design so as to create a well-validated product that may be shared with tourism managers and developers across cold-climate regions and with researchers to aid in the continued expansion of research in tourism-environmental interactions.

**Freeman, Lucas** "The Effect of Dichloro(ethylenediamine)platinum(ii) Leaving Ligands on Mammalian Cell Death" (Brooke Williams)

Platinum compounds induce apoptosis in many types of cancer. There are currently 3 platinum compounds, which each have different efficacies based on the cancer's tissue of origin and are approved by the FDA for use as cancer treatments: cisplatin, carboplatin, and oxaliplatin. The reason for differences in effectiveness is not understood. Here we examine, the impact of the leaving ligand, which is replaced when the compound binds DNA and the toxicity of novel platinum compounds in multiple cancer cell lines, each from a different origins in the body. We hypothesize that the number of leaving ligands on these novel compounds will affect the toxicity. All cell lines are cultured at standard conditions, seeded in 24-well assay dish at 650,000 cells per dish for 24 hours, and exposed to platinum toxicant for 24 hours. Using a standardized method for determining cell survival, the MTT assay, we will determine individually the compound concentration for which a 50% survival of cells is produced (IC50). Preliminary data show increased cell death with increasing concentration for both compounds. A comparison of data for the two novel compounds suggest a higher efficacy for the diacetato-compound (with 2 leaving ligands) than for the oxalato-compound (with 1 leaving ligand).

**Fugate, Samuel**; Geiger, Romin; Martin, Hannah; Williams, Cynthia; Gregory, Jordan; Gopan, Gopika "Self Regulation: A Cross-Sectional Study of Preschool-Aged Children" (Elizabeth Lemerise)

"Cool" and "hot" self-regulation underlie school readiness. "Cool" self-regulation includes inhibition of a dominant response, working memory, and set-shifting. "Hot" self-regulation involves inhibition, shifting attention, and emotion regulation in arousing situations. We measured self-regulation in 80 preschoolers (ages 3-5). "Cool" tasks (Pencil Tap, Dimensional Change Card Sort, Day/Night, and Head-Toes-Knees-Shoulders) were coded for percent correct; the "hot" task (Snack Delay) was coded for compliance to task demands (no touching of snack/materials until timer beeped). For 3-year-olds, percent correct ranged from 16.3% (Head-Toes-Knees-Shoulders) to 52.1% (Day/Night). Performance on Head-Toes-Knees-Shoulders and Day/Night was significantly different from the other tasks for 3-year-olds. For 4-year-olds, percent correct ranged from 30.4% (Head-Toes-Knees-Shoulders) to 64.8% (Day/Night). Performance on Pencil Tap and Head-Toes-Knees-Shoulders was significantly different from the other tasks for 4-year-olds. Pencil Tap and Head-Toes-Knees-Shoulders showed significant age effects; Dimensional Change Card Sort and Day/Night did not. No gender effects were found. For Snack Delay, 69.2% of 3-year-olds successfully completed all long trials (60 seconds to 2.5 minutes); 76.9% completed the short trials (10 seconds to 40 seconds). The 4-year-olds successfully completed 70.4% of the long trials; 81.5% completed the short trials. Further analyses will be performed to determine correlations between task performance and school readiness.

**Fugmann, Britt** "Are Dietary Factors and Exercise Levels Related to Fertility Status" (Rachel Tinius)

Background: Infertility is a major public health concern as it affects up to 25% of couples in Western Countries. Information regarding the relationship between diet, exercise, and fertility is needed to better inform the development of guidelines for couples trying to conceive. PURPOSE: to examine the relationships between diet, exercise, and time-to-conception (TTC). Methods: Participants (N=33, from an ongoing pregnancy study) completed a survey regarding how long it took them to conceive, what methods they had to employ, if they ever had to seek treatment, and any other pertinent information regarding their fertility status prior to conception. In addition, they were asked detailed information regarding their dietary and exercise habits while trying to conceive. Results: TTC and sedentary time were positively correlated ( $r=0.569$ ,  $p=0.002$ ), while light, moderate, and vigorous activities were not correlated to TTC. Regarding diet, TTC was positively correlated with total calories ( $r=0.376$ ,  $p=0.048$ ) and total carbohydrates consumed.

**Gaither, Emily**; Funge, Simon; Griffiths, Austin "Giving Voice to Kentucky Foster Parents" (Simon Funge)

As of February 2019, 9,810 children in the state of Kentucky were placed into out-of-home-care (CHFS, 2019). Kentucky Governor, Matt Bevin, has sought to promote innovation and introduce efficiencies into the foster care system in order to expedite and increase the number of foster children adopted into families. In this respect, understanding the characteristics and experiences of current Kentucky foster parents is both necessary and timely. In the summer of 2018, 255 Kentucky foster parents were surveyed. This poster presentation will report on factors influencing levels of these foster parents' satisfaction; ways in which

differing levels of agency and peripheral support affect foster parent's intent to continue fostering; how foster parenting experiences impact their well-being; and the various factors that contribute to the recruitment, preparation, and retention of foster parents. Keywords: foster parenting; recruitment, preparation, satisfaction, and retention References Cabinet for Health and Family Services. (2019). Statewide foster care facts. Foster Care FACTS. Commonwealth of Kentucky.

**Garnelo, Israel** "Synoptic Analysis of the January 3-5, 2018 North American Blizzard" (Joshua Durkee)  
The January 3-5 Nor'easter that struck the Northeastern United States included all forms of precipitation although the wintry precipitation was the predominant form of precipitation, and the main highlight of this mid-latitude cyclone. The cyclone brought winter weather into Northern Florida, record-breaking snow into the Carolinas, and blizzard conditions for the Northeast; hence the name: 2018 North American Blizzard. This was the first billion dollar disaster in the United States for 2018 and was also a very predictable storm. The synoptic setup preceding the formation for the mid-latitude cyclone included a well-established high pressure with arctic air associated with it. On January 1st, a 300 millibar shortwave trough exited Canada and entered the northwestern Great Plains of the United States. As this shortwave was propagating along the outside of the high pressure system—24 hours later—another shortwave trough exited Canada and entered the northcentral Great Plains with its axis rapidly rotating counter-clockwise and propagating into the Midwest and Ohio Valley. Shortly thereafter, these two shortwaves became one (i.e., the two shortwave trough axes aligned in phase.) the leading contribution in the quasi-geostrophic equation in this analysis was the 1000mb-500mb thickness advection.

**Garrison, Jessica; Wulff, Andrew** "Paleoclimate Model of Clay Minerals and Sediments from Lake Tecopa, California" (Andrew Wulff)  
Clay minerals are present in most depositional environments. They are often deposited in low-energy environments such as lacustrine or deep oceans. A large variety of elements can be incorporated into rather complex crystallographic structures of the clay minerals. Specific clays may reflect the very specific climates in which they formed, making them good paleoclimate indicators. This research focuses on sediments collected from stratigraphic sections from ancient Lake Tecopa in Southern California. Analyses of the clay minerals present in the stratigraphy are used to develop a paleoclimate model. The minerals kaolinite, montmorillonite/smectite, and illite are commonly used specifically to represent hot and arid, temperate, or warm and humid environments respectively. Percentages of each clay mineral will be identified developed through bulk composition analysis and powder X-Ray Diffraction. Based on previously investigated water analyses, the major climatic change experienced by this lake is already known to have been from a more temperate climate from the large glacial masses present, transitioning to a more dry and arid climate. These clay mineral results anticipate corroborating these same results, but with more detailed information on the timeline of this occurrence, as the water chemistry and erosion patterns changed along with the climate.

**Gartland, Beverly; Willis, Victoria; Maupin, Holly; Milliner, Autumn; Downing, Jennifer; Gill, Jennifer** "Time Budgets in Horses during Continuous and Space-Restricted Rotational Grazing" (Jennifer Gill)  
Pasture can be limited in horses to reduce intake and facilitate weight loss. The objective of this study was to determine the effect of space-restricted rotational grazing on body weight and time budgets in horses. Eight horses were randomly assigned to either a space-restricted rotational grazing group (SRG; n = 4) or a continuous grazing group (CG; n = 4) for 42 d. SRG horses grazed an area that provided a restricted level of intake for six, 7-d grazing periods; whereas, the CG horses continuously grazed similar pasture providing greater than maintenance calorie requirement. Observers recorded behaviors simultaneously on all horses according to an ethogram during three-four, 1-h sessions, three days per week. This included 30 s scans of all horses alternating with 6 minute focal observations per horse. SRG horses lost more BW than did the horses under the CG treatment. Over both treatments, horses displayed behaviors at frequencies of 76% graze, 20% stand and 4% other behaviors. Changes in body weight were correlated with the grazing, such that CG horses gained weight as grazing frequency increased, while SRG horses lost weight as grazing frequency decreased. The findings suggest that space-restricted rotational grazing alters time budgets in horses.

**Gearner, Clarissa; Banga, Simran** "Potential Use of Essential Oils as an Alternative Treatment for Bacterial and Fungal Skin Infections" (Simran Banga)  
Essential oils are plant extracts derived from any part of a plant. The oils have a rich history of therapeutic use, and beside medicinal treatments, the oils are also used in cosmetics, aromatherapy and household products. The purpose of this study was to determine the effectiveness of commercially available essential oils for treatment against skin infection causing bacteria and fungi. Several oils were tested to measure their potential anti-microbial activity against *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Cutibacterium acnes*, *Pseudomonas aeruginosa* and *Escherichia coli*. Further testing is being done with pathogenic fungal species *Trichophyton rubrum*, *Trichophyton equinum* and *Candida albicans*. The antimicrobial activity of these essential oils was quantified using standard methods,

including disc diffusion and MIC. The anti-biofilm activity of the essential oils was analyzed on *S. aureus* and *Ps. aeruginosa*. The effectivity of essential oils was quantified and compared with common antibiotics. Of the oils looked at, we found that five oils and one proprietary blend possess ability to inhibit bacterial growth. Among these, cinnamon, oregano and thyme oils were found to be most effective against the bacterial strains that we tested. The results indicate that these oils can act as a potential antimicrobial alternative in a home or professional setting, as they are known to be skin-safe and easily accessible.

**Gearner, Olivia** "The Enigmatic Evolution of the Bostrichoids (Coleoptera)" (Keith Philips)

Insects are the most diverse and speciose group of organisms on the planet. Beetles (Coleoptera) alone comprise 25% of described animal species worldwide. One less commonly known group of beetles that is vastly understudied but highly diverse is the bostrichoids, which include four main groups, the dermestids, bostrichids, anobiids, and the ptinids or spider beetles. Hypotheses on the evolution of the bostrichoids are currently poorly supported, and almost all are based on morphology. This project looks to improve on previous phylogenetic analyses of the group by increasing the sampled taxa and using the standard genes (CO1, 28S, and 16S) previously used for an earlier molecular phylogenetic analysis. Gene fragments were sequenced and then analyzed using parsimony, maximum likelihood, and Bayesian methods. Results will be used to hypothesize the evolution of morphological traits and lifestyles as well as the basis for a classification based on monophyly, with an emphasis on the spider beetles.

**Ginn, Brad; Wolf, Cheryl** "Values in the Workplace: Exploring Mental Health Professional Work Values, Job Settings, Satisfaction, and Burnout" (Cheryl Wolf)

A mixed-methods embedded study was used to conduct a pilot study consisting of 38 mental health professionals. The research examined the relationship between participants' work value alignment with their current jobs, experiences of job satisfaction and burnout, and perceptions of the advantages and disadvantages of each work setting. Work values were not consistent across all settings, however particular work values did emerge for each setting. There was a positive correlation between participants' value alignment and job satisfaction as well as a negative correlation between job satisfaction and burnout. Finally, perceptions of advantages and disadvantages varied by setting but top advantages and disadvantages did emerge. For instance, amount of pay was an advantage for private practice but a disadvantage for community agencies. An updated survey has been sent to counselors across the nation to increase the sample size and validate the results from the pilot study. The study aims to assist mental health professionals in finding their ideal work setting and identify work environments that align with their particular values. If available at the time of presentation, results from the current data collection will be analyzed and included in the presented poster.

**Goldman, Hannah** "Ghanaian Music Education and Teaching Culture Authentically" (Matthew Herman)

This lecture-presentation will shed light on the shortcomings of the United States' public-school music education system surrounding the way they represent diverse cultural music in the classroom, with a focus on the traditional music of Ghana. The Ghanaian approach of teaching, learning, and performing music within their culture is fundamentally different than the Western approach commonly used in the United States. American music teachers should therefore shift their approach when teaching and rehearsing West African music to engender a more authentic performance. My research questions are significant to music education because art of any kind demands authenticity in various aspects. To accomplish this research, I attended a four-day conference in Accra, Ghana and sat in on presentations, demonstrations, performances, and lectures, all the while collecting notes and audio samples that facilitated answering my questions of authenticity. This presentation will highlight the music and culture of a specific nation and how music educators in the United States should better represent it in their classrooms.

**Gondal, Anas; Salim, Hasan; Srivastava, Ajay** "A Genetic Screen for Proteins Involved in Asp Invasion" (Ajay Srivastava)

Fruit flies (*D. melanogaster*) are ideal genetic model organisms that can closely replicate human genetic anomalies and characteristics. The invasion of the Air Sac Primordia (ASP), an organ analogous to the human lung, into the Wing Imaginal Disc (WID) of larval fruit flies is closely related to tumor metastasis in humans, as both processes use similar mechanisms to break down the basement membrane. By studying genes responsible for ASP invasion, researchers may be able to identify analogous genes in humans responsible for tumor metastasis. A genetic screen, using 100 protein trap lines, was conducted to find genes expressed in ASP and potentially involved in ASP invasion. The protein trap lines tagged endogenous proteins with a Green Fluorescent Protein (GFP) to indicate tissue localization of selected proteins under a fluorescent microscope. WID were isolated from 10 third instar larvae of each line and imaged using fluorescence microscopy. Eleven of the 100 lines screened exhibited GFP expression in the WID, but not in the ASP. Only one of the 65 lines exhibited GFP expression in the ASP. The gene responsible was Apontic (*apt*). Apontic's role in ASP invasion will be further investigated using RNA interference to knock down the gene.

**Goodwin, Timothy; Alotman, Ahmed; Alyami, Majed; Smith, Courtney** "Simulated Electrical Schematic of PLC" (Greg Arbuckle)

PLCs control how the world works around us and will continue to for the foreseeable future. Industry has used them for manufacturing lines and sorting devices heavily in the last couple decades with very good results. With such a large amount of implementation throughout the world, initial setup and troubleshooting PLCs is still very difficult. The task of our project would be to create a simulated electrical schematic of the PLC system in operation using LabView. This schematic would simulate ladder logic with Simatic Step 7 and a physical simulation with Factory I/O. This would create a full simulation with all three phases of the PLC setup that would give the system a very easy to read schematic. Overall this project would provide a basis for others to recreate what we will do for their larger systems. This would cut setup and troubleshooting times down tremendously. Any problem that occurred in the system would be found in the electrical schematic and could be narrowed down to the exact register or wire.

**Graham, Anthony;** Williams, Joseph "Revitalization: Creating New Architecture from Remnants" (Shahnaz Aly) While it may seem appropriate to overlook the old for the new, is it possible to sustain our ecosystem in this manner? Choices we make impact our environment and those within it. Instead of relying on the novelty of the new, we should look to our inadequacies to give us greater opportunities. We can achieve this through revitalization. By using revitalization, we have the opportunity to imbue something with new life and vitality. Revitalization in architecture can serve as a means to stabilize and perform for the greatest benefit to our ecosystem. We should look to revitalization in architecture as part of any design solution. It is our responsibility to imbue a decaying community with the chance at a new beginning. It is our responsibility to examine the existing framework of our cities as a solution to our design challenges. This is the design doctrine that we explored in our capstone projects. One approach is to shift the associated function of inoperative infrastructure into a commodity for community and ecosystem. Another approach explores the unification of modernity and historic memento to elicit the resurgence of the architecture's potential. These approaches show that revitalization is a viable part of architectural design.

**Gray, Phoenix** "Simulating Structural Fluctuations in Bound and Unbound Proteins" (Sarah Edwards) The purpose of this research is to take known protein structures in their bound and unbound states and map their fluctuations while being introduced to changes in temperature. Through the implementation of Amber software, the tertiary structures of the two-protein complex 1F6M were analyzed at various temperatures. The atoms of the individual proteins composing 1F6M were mapped in both their bound and unbound configurations, leading to four individual data sets.

**Gregory, Jennifer; Coker, Riyonna; Pedigo, Harry; Miller, Serenity** "How Would Amending HB 40 Remove Barriers to Restoration of Rights?" (Whitney Harper) Restoration of KRS 431.079 Summary Restoration of KRS 431.079 would provide a easier more effective way for Class D non-violent offenders to restore their lives and be productive members of society. As part of Restorative Justice, restoration of KRS 431.079 would impact 312,046 convicted felons in Kentucky. Issue - 80% of offenders abused drugs or alcohol and it is known that those addicts will recommit if not given an opportunity to reintegrate into society. - Kentucky is only one of four states that does not automatically restore rights to non-violent offenders Background Over the past 18 years many states have restored rights to felons by amending bills and proposing that felons be allowed to have rights after serving their mandated sentences. Recommendation Once Class D felons of non-violent crimes have met the criteria of KRS 431.079, they will be able to petition the courts directly allowing a judge to articulate that the necessary criteria have been met and make an immediate ruling. This would remove any barriers posed by misinterpretation of the law by law enforcement officers and put it in the hands of those who have a higher education and working knowledge of the law.

**Gruber, Brittney** "Science Fiction in Science Education" (David LeNoir) Science fiction titles, such as 1984 and the Giver, frequently appear in high school classes, but usually in language arts classrooms. Science teachers are often missing great opportunities to use science fiction to teach science content. The allure of the unknown is enough to engage students in learning science, especially since statistics show boys do not read as much as girls, whereas girls are not as engaged in science or technology. Theorizing, questioning, and conducting thought-experiments in the classroom can be strengthened by science fiction and will encourage critical thinking in students, especially since science teachers teach through inquiry, or "what if?" Science educators also push for more engaging lessons with ties to real-world problems; teaching science fiction that contains realistic worlds and scenarios moves learning beyond the abstract into application, so students can solve problems and deepen understanding by asking authentic questions pertaining to current events in the world. Through my research and experience with English education and the SKyTeach program, I offer reasons why science teachers should teach science fiction and ideas for how they can do so by using what is arguably the first science fiction novel, Mary Shelley's Frankenstein.

**Hamby, Zoie** "Cowboy Ranch Vineyard" (Shahnaz Aly)

The aim of this project was to design a fully operational winery; with special focus on flow of grape/ wine production, emphasis on subterranean design, and preservation of existing site. There currently are no wineries in Pinal County, AZ. so the establishment of one is of benefit to the community and further develops local business economy. Initial design included special amenities such as a restaurant, brewing areas, multiple venue spaces, tasting rooms, outdoor gardens, and more. The project's site was once a horse ranch, it's terrain and existing elements, such as old horse trails, gave inspiration for a unique vineyard layout while maximizing efficient use of the land. A low-profile design influenced the structure and how it related to the surrounding landscape and grape crop. The designer implemented sustainable technology such as sun energy panels, geothermal structural consideration, and water systems; since the winery is designed on desert farmland. Areas of research include; winery case studies, building codes and type of construction, occupancy classifications, spatial awareness of public versus private areas, environmental factors, sun and wind paths, waste and energy consumption, flow of production, location of site and parking, site zoning, climates for grape harvesting, HVAC systems, and building materials.

**Hammond, Jenna** "The Effectiveness of Mobile Eye-tracking to Enhance Guided Show Cave Experiences" (Leslie North)

While many individuals can identify karst landforms such as sinkholes and caves, an understanding of the interconnectedness of the surface and subsurface in karst landscapes, as well as the vulnerability of karst areas to degradation, is often limited. Show caves, which are caves made accessible to visitation through built infrastructure, can serve as an excellent venue to educate large quantities of people about the importance of these landscapes and their sensitivities. This study used mobile eye-tracking glasses and observation analysis to understand visitor interests and how to construct an educational, yet enjoyable, experience. Data reveal the informal education provided through cave tours at Carter Caves State Park in Kentucky, USA tends to skew towards an entertainment perspective, leaving major gaps in the knowledge visitors' gain through their cave tour experience. Results indicate that lighting within the cave has a major impact on visitor education outcomes; when designed to allow visitors to feel safe, visitors are more engaged in the tour. This is especially true when visitors are provided additional educational opportunities, in this case the form of an informational packet. Data also indicate visitors be somewhat motivated to learn in order to have the best educational outcomes, thus presenting show caves with the challenge of making cave tours engaging to all visitors regardless of motivations.

**Hare, Margot; Yan, David; Vanzant, Elisha;** Roebker, Helen "Observation and Analysis of Hummingbird Aggression at Flowers versus Feeders" (Martin Stone)

The aim of the project was to better understand animal behavior. Hummingbird (*Trochilidae*) behavior was investigated to determine whether they were more aggressive while feeding at feeders compared to existing vegetation. The study was conducted at the Cloudbridge Nature Reserve in a Costa Rican cloud forest, elevation 1,500 m. We observed hummingbird behavior at four locations over four days. Each observation period was one hour long and two periods were completed every day, once early morning and once mid-morning. We analyzed the observations with the chi-square method at the  $P < 0.05$  level of significance. The data showed that hummingbirds are more aggressive while at feeders compared to natural vegetation. This was due to the limited nature of the resource for which all birds were in competition. These data can be used to monitor changes in hummingbird behavior in the future and indicate that a change has occurred in their habitat.

**Hatter, Evan** "Synoptic Analysis of the October 7, 2014 Kentucky Bluegrass Tornado Outbreak" (Joshua Durkee)

During the afternoon of October 7, 2014, nine tornadoes touched down in the north-central and eastern portions of Kentucky. These tornadoes, while not categorically strong, caused significant damage to trees and property, including one known injury. While severe convective events are not uncommon for the Ohio Valley during meteorological autumn, it is not common for these events to be prolific tornado producers or for these to occur under otherwise marginal thermal conditions. The synoptic setup of this day was analyzed according to synoptic principles as well as a framework based on the QG-Omega equation. This included analysis of geopotential height, relative humidity, vertical velocity, thermal advection, and vorticity as well as the effect of each parameter on others during the timeframe of the event. Analysis included upper-air and surface maps studying the verification of the forecast given for the event. The conclusion of this analysis found that synoptic conditions at the time were favorable for atmospheric lift to occur, which in turn lead to thunderstorms forming and ultimately the development of the tornadoes. An area of further study will be to determine what conditions were present and occurring on the mesoscale in order for the thunderstorms that spawned to form.

**Havens, Harlee** "The Effect of Knowledge on Attitudes towards the US Supreme Court" (Jeffrey Budziak)

This study will examine the relationship between one's knowledge regarding the US Supreme Court and one's feelings regarding the institution. To do this I will submit a 15-minute survey to the Amazon Turk system to get respondents, I will fund this by using funding from my FUSE Grant. This survey will inquire about one's

knowledge regarding the US Supreme Court and then varying questions that probe the respondent's approval of the Supreme Court as well. I will also ask the same style of questions about the executive and legislative branches. I will take those results to run multiple regression analyses and test the significance of these relationships. My hope for this research is that it indicates how a lack of education impacts feelings towards the Supreme Court. If my research ends up showing that with lesser knowledge comes more positive feelings about the Supreme Court and their decisions, I would hope that it could be used to help justify a more holistic social studies education so that more knowledge about the judicial systems in place and thus make those strong opinions based on a more factual understanding of American government.

**Hawkins, Alayna;** Haynes-Lawrence, Darbi "Anxiety amongst Second Year Honors Students" (Darbi Haynes-Lawrence)

Funded by a FUSE grant, this study investigated the prevalence of anxiety amongst second year honors students, discovered ways in which the university can assist these individuals, and explored other needs the students may have. This study was a qualitative study with data collected using Qualtrics, an online questionnaire database. There were a total of twenty students who completed this survey. Participants answered twenty open and close-ended questions pertaining to anxiety. Results indicate that the method by which Western Kentucky University can assist students battling anxiety are powerful and includes themes of support groups, more readily available counseling, and increased education about anxiety to help break the stigma of anxiety. This poster allows an exploration of the responses, detailing how the structures that make-up WKU (e.g. Housing and Residence Life, Professors, etc.) could be of better assistance to students. As mental health issues continue to rise among college students, their needs must be met. As a university, the needs of these students can be met one program, professor, or resident assistant, at a time.

**Hebenstiel, Lars** "Monte Carlo Modelling of Multiple Isotropic Scattering of Neutrons through Various Solids" (Eric Steinfelds)

Presented and analyzed is a new in-house Monte Carlo code in the Java language that is intended to calculate angular dependence of neutron flux and the value of the neutron scalar flux at points, as well as at various surfaces. The code uses probabilistic methods to simulate neutron histories which are generated and propagated by way of the scattering simulations of our engine. Our in-house code also includes a visualizer which views generated neutron histories and the geometry associated with them. We are generating (via the simulations of the code) predictions of the values and distributions of current and flux certain geometries, starting with rectangular slabs and spheres. We are adapting our simulations to make them fit some examples which are appropriate for radiation dosimetry and neutron shielding assessments. Qualitatively in terms of ratios, we find for some simple geometries thus far that the predictions from the in-house code and those of MCNP6 show reasonable proportional consistency. The in-house code is still in development and has programming bugs that have not been resolved, but initial tests show cause for optimism for the future usage of the code in more complex geometries and calculations of overall angular dependence and flux.

**Hedrick, Katherine** "The Prosecution of Conflict-Related Sexual Violence in Post-War Bosnia and Herzegovina: An Analysis" (Marko Dumančić)

In the aftermath of the Yugoslav war, Bosnia and Herzegovina's stability diminished. To prosecute war crimes and genocide, the International Criminal Tribunal for the Former Yugoslavia was created. Its recent closure means that Bosnian courts are now in charge of the same prosecutions. While this is being done, there is one aspect that is left out of scholarship pertaining to the country: conflict-related sexual violence. (CRSV). CRSV was a major component of the war, and no scholarship exists about the Bosnian courts' prosecution of CRSV after the ICTY's closure. My research comes in at a critical point in Bosnian history, as it compiles interviews and statistics to analyze the current state of the judicial system, the prosecution of CRSV, and the future potential for its prosecution. I argue that the Bosnian courts will not be able to effectively bring justice to victims of CRSV in coming years due to a lack of resources and stigma throughout the country and its institutions. For so long, victims of such abuses have been unable to tell their stories and begin the search for justice, but with updated information about the courts, steps can be taken to solve this problem.

**Hendrickson, Evan** "Analysis of the Bioaccumulation of Methylmercury in the Organs and Tissues of a Bald Eagle" (Cathleen Webb)

Mercury (Hg) concentration in an individual bald eagle (*Haliaeetus leucocephalus*) from Mammoth Cave National Park was evaluated to assess the overall mercury bioaccumulated within its organs and tissues from the environment. Using an AMA 254 Advanced Mercury Analyzer, 13 different organs and other tissues were evaluated. Approximately 50% of the samples ran were quality assurance and quality control samples. This study provides an unprecedented, comprehensive understanding of the amounts of mercury within the food chain and apex predators. Mean concentrations reached as high as 63.7 Hg ppm in this individual and were significantly higher than those found in other bald eagles studied. Tissue concentrations ranged from  $4.9 \pm 0.9$  to  $28 \pm 5$ , and organ concentrations ranged from  $3.7 \pm 0.7$  to  $109 \pm 20$ . This study reports high-risk levels of

mercury within the kidney, lungs, testes, and down feathers. Further work is needed to determine the concentrations at which the organs and tissues begin to reflect adverse effects. The finding of the high-risk levels of mercury within the testes has important implications pertaining to reproductive decline, increased offspring mortality, and the extent to which mercury is being passed from parent to offspring via fertilization.

**Henry, Shelby; Rollins, Casandra;** Twidwell, Robert; Teeters, Jenni "Trauma Type Differentially Impacts Alcohol Use Outcomes among College Students" (Jenni Teeters)

Objective: Statistics indicate that more than 60% of college students have experienced or witnessed a traumatic event in their lifetime. Past research has shown that psychological outcomes tend to be more severe after experiencing an interpersonal vs. A non-interpersonal trauma. It is possible that the type of trauma experienced may differentially impact alcohol use. To date, no studies have examined how type of trauma experienced is related to alcohol use. The purpose of the present study is to examine whether experiencing non-interpersonal vs. interpersonal trauma is differentially related to alcohol use. Method: Participants were 643 college students at a Southeastern university. Participants completed validated measures of trauma exposure, alcohol use, alcohol-related problems, and alcohol use disorder symptoms. Results: in linear regression models, interpersonal trauma was significantly associated with increased average weekly alcohol use ( $p=0.01$ ) and alcohol use disorder symptoms.

**Henson, Alex;** Evans, Brendan; Gupta, Sanju "Engineered 'Organic-Inorganic' Nanocomposites Properties through Embedding of Smaller Nanoparticles in a Thermoset Polymer Matrix" (Sanju Gupta)

Polymer nanocomposites are significant for modern and future technologies due to their tailored properties, lightweight and low cost. However, 'forward' engineered polymer (host matrix) composites with smaller size nanoparticles (guest) providing desired properties targeting specific applications remains a challenging task as they depend largely on nanoparticles size, shape and loading (volume fraction). This study develops polymer nanocomposites impregnated with 'organic-inorganic' silsesquioxane nanoparticles and graphene nanoribbons, and investigates microscopic structure and dynamics of interfacial layer to predict macroscale properties. The nanocomposites consist of poly(2-vinylpyridine) (P2VP) polymer (segment  $\sim 5\text{nm}$ ) with spherical silsesquioxane nanoparticles (diameter  $\sim 2\text{-}5\text{nm}$ ) and planar nitrogenated graphene nanoribbons (lateral dimension  $\sim 5\text{-}10\text{ nm}$ ), both with attractive (hydrogen bonding and electrostatic) interactions. This approach reinforces the role of molecular parameters controlling the structure and dynamics of interfacial layer in predicting properties. The transmission electron microscopy will reveal microscopic structure and the lattice bonding, interfacial stress transfer and conjugation length are determined from micro-Raman spectroscopy. The glass transition temperature,  $T_g$ , obtained using differential scanning calorimetry reveals positive shift in  $T_g$  values with nanoparticles loadings. We used temperature dependent broadband dielectric spectroscopy to gain fundamental insights into the interfacial layer and diffusion dynamics above and below  $T_g$  and to establish quantitative microstructure-property correlations.

**Hill, Elizabeth** "The Shakers: A Successful Utopian Society" (Sandra Hughes)

Many reject the possibility of balancing personal freedoms with societal values. Consequently, achieving utopia is often deemed impossible. However, after conversing with experts at the South Union Shaker Village Museum and studying various books and academic journals, the research indicates that the Shakers, one of America's earliest utopian societies, successfully achieved utopia for members of their community and the broader society. The United Society of South Union Preamble outlines the Shakers' agreement to "fully confirm our principles of government, increase our union, improve our social compact, protect our equal rights, and privileges, and secure ourselves and posterity in the gospel of peace and tranquility." This paper offers an analysis of the degree to which the Shakers met the agreements stated in the South Union Preamble and an explanation of how each achievement resulted in a successful utopian society. The findings could potentially change one's definition of utopia and inspire Americans to reconsider the possibility of achieving a balance between personal freedoms and societal values.

**Hodge, Brandon** "Legionella Proteins as a Molecular Evolution Model for Legionnaire Disease" (Simran Banga)

Legionnaire's disease caused by *Legionella pneumophila*, is a lung infection that may cause severe form of pneumonia in immunocompromised individuals. The bacterium infects alveolar macrophages and releases a large army of proteins, termed effector proteins, to hijack the cellular processes of the macrophages. The distinct function of many of these proteins remain unknown. The purpose of this study is to perform a bioinformatics analysis on one such protein, LneA to trace the molecular evolution of the protein with a focus on the gene analog found in *Legionella pneumophila*. During an infection, an effector protein works with an array of other similar proteins to produce Legionnaires disease. Using different bioinformatics tools an analysis of the LneA protein domains in the bacterial, mammalian and related kingdoms will be conducted and followed by construction of a phylogenetic tree to trace its molecular evolution. Specifically, the domains conserved across various genera and species will be identified to establish a relationship between the structure and function of the protein. This study can further aid to elucidate the function of this effector protein.

**Hodinka, Brett;** Ashley, Noah "Effect of Sleep Loss on Cognitive Function and Baseline Plasma Corticosterone Levels in an Arctic-Breeding Songbird, the Lapland Longspur (*Calcarius lapponicus*)" (Noah Ashley)  
Animals deprived of sleep typically show reduced neurobiological performance, health, and in some cases, survival. However, a number of animals exhibit adaptations permitting them to carry out normal activities even when sleep is restricted. Lapland longspurs (*Calcarius lapponicus*), arctic-breeding passerine birds, exhibit around-the-clock activity during their short breeding season, with an inactive period of 3-4 h/day. Whether these birds suffer behavioral and/or physiological costs associated with sleep loss (SL) is unknown. To assess the effects of SL, wild-caught male longspurs were placed in captivity on short days (12L:12D) and trained for 1 month using a series of executive function tests. Birds were then subjected to automated sleep fragmentation cages, interrupting sleep every 1 min for 12 h or control conditions. The criterion for success on each test was marked by completing the operant task correctly within 10 min. After the SL (or control) treatment, birds were bled from the alar vein to measure plasma corticosterone levels. Corticosterone levels were significantly higher in SL individuals. Preliminary behavioral data suggest SL individuals performed better than controls on cognitive tests. These results indicate this arctic-adapted species may have evolved some combination of behavioral and physiological adaptations to withstand the costs associated with SL.

**Hodzic, Denis** "Investigating How EF-24 and Cisplatin Affect Cancer, Renal, and Auditory Cells" (Michael Smith)  
Cisplatin is an FDA-approved chemotherapy drug effective against several different cancers. However, this drug can cause serious side-effects, including nephrotoxicity. Curcumin, a natural plant compound, can increase cisplatin's anti-cancer activity and counteract cisplatin's renal system side-effects. Because curcumin exhibits poor bioavailability, there is considerable interest in developing synthetic curcumin analogs (curcuminoids) that are more soluble, that target cancer, and do not have side-effects. This study investigates whether the curcuminoid (3E,5E)-3,5-bis[(2-fluorophenyl) methylene]-4-piperidinone (EF-24) increases the effects of cisplatin against the human ovarian cancer cell line, A2780, and the cisplatin-resistant human ovarian cancer line, A2780cis, while preventing cisplatin cytotoxicity in the human kidney cell line, HEK-293T, and the mouse auditory hybridoma cell line, HEI-OC1. The effect of cisplatin and EF-24 on cellular viability was measured using the colorimetric 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay. Our preliminary data suggests that cisplatin and EF-24 are effective against these cancer cell lines and that their combination in cancer and kidney cell lines is a promising application. Synergistic and nephroprotective effects identified in this project could provide relevant clinical information for treating cancer and preventing nephrotoxic effects from cisplatin treatment.

**Holt, Delaney** "Why Do You Want to Teach? Interpreting STEM Pre-Service Teachers' Motivations through a Semantic Lens" (Lisa Duffin)  
By 2025, 3.8 million teachers will be needed to accommodate the number of children enrolled in elementary and secondary schools (both public and private) in the United States. In addition, 350,000 new teacher hires will be sought. Unfortunately, teacher shortages, especially in science, technology, engineering, and mathematics (STEM), are of great concern, and enrollment in teacher education programs are declining nationwide. Furthermore, not all individuals who enter STEM teacher training programs complete the program with certification. While some research suggests pre-service teacher (PST) attrition could be a result of factors like limited preparation or insufficient mentorship, one must consider the internal motivations that first drove these individuals to pursue a career in STEM teaching. Could one's success or failure to complete STEM teacher certification be predicted through a semantic examination of PSTs' (n = 181) responses to the question: "Why did you choose to become a teacher?" Findings suggest that both groups of PSTs (certified [n = 132] and non-certified [n = 49]) love the STEM content, want to be positive role models for children, and have strong personal perceptions of their content abilities. Only certified PSTs, however, expressed a love for teaching. Additional findings and implications will be presented.

**Holt, Morgan;** King, Rodney "Does Tethering of the Large Subunits of *Escherichia coli* RNA Polymerase Affect the Growth of Bacteriophages HK022 and HK639" (Rodney King)  
Bacterial RNA polymerases (RNAP) are multi-subunit enzymes, and recent studies have suggested that conformational flexibility of specific RNAP protein domains is critical for enzyme function. A zinc binding domain (ZBD) located near the amino terminus of the largest subunit (beta prime) is highly conserved among all bacterial RNAPs, but little is known about its role in RNAP function. In eubacteria and archaea, the rpoB and rpoC genes, which code for the beta and beta prime subunits of RNAP respectively, are encoded in an operon with rpoB preceding rpoC. For most bacteria, including *Escherichia coli*, these genes are translated separately. However, in some bacteria, the rpoB and rpoC genes are tethered, forming a single large protein. Mutations in the ZBD of *E. coli* have been described that block the growth of certain bacteriophage. We hypothesized that the physical tethering of the *E. coli* beta and beta prime subunits may reduce important flexibility of the ZBD and may also affect the growth of bacteriophage that are sensitive to ZBD mutations. Here we describe the construction of *E. coli* strains that contain tethered beta and beta prime subunits and the effect that subunit tethering has on bacteriophage growth.

**Hooper, Jacob** "Fall Creek Hotel" (Shahnaz Aly)

Instead of thinking of a hotel as a means to an end it should be thought of as the end. A home away from home. A place that, through proper design and sustainability practices, can promote a communities growth through its own self. The purpose of this project was to provide Fall Creek Falls State Park with a hotel that reflects the surroundings and brings the guests more in touch with nature and themselves. The methods and studies utilized in this project include: geothermal energy, rain water harvesting, and semi intensive green roof. Over fifty case studies relating to hillside architecture and hotels were looked at and analyzed for this project. This resulted in a three story hotel that contains thirty six rooms. With leisure activities, fine dining, and an up-close experience with nature, there is something for everyone. Understanding Transition spaces such as lobbies and hallways played a huge role in enhancing the visitors experience in hotels. These spaces reflect creative design and a level of comfort that is consistent throughout. It also reflects the first impression the visitor has and provides the architects with opportunities to be unique.

**Horace, Angelique;** Griffiths, Austin; Gabbard, W. Jay "Completing the Conversation on Child Welfare Worker Retention: Administrators Perspectives on Workforce Retention" (Austin Griffiths)

Child maltreatment impacts society on multiple levels. It reaches beyond the individual and into communities, social institutions, and public policy. Child welfare workers are responsible for addressing this significant social problem, facilitating a myriad of tasks focused on the safety, permanency, and well-being of vulnerable populations. Consistent turnover in the child welfare workforce contributes to the inability to provide vital services and has become a recognized financial burden. Prior research into factors influencing workforce turnover is largely focused on the experience of those who work on the frontlines, excluding the top-down perspective of the child welfare administrator. This presentation explores the qualitative findings of a statewide sample of child welfare administrators (n=86), designed to solicit detailed suggestions for improving workforce retention. A total of four overarching themes emerged, focused on agency transformation through changes in: a) policy, b) program, c) performance, and d) practice. Actual quotes from administrators provide depth and illustrate context, furthering the understanding of how this unique population perceives issues associated with workforce turnover. Findings from this study address a gap in the literature and will assist in developing feasible solutions to this national problem. Keywords: child welfare, state welfare, administrators, retention

**Howard, Isaac;** Wang, Ban; Deng, Yongming "Synthesis of Chiral Bis(imino)pyridine Ligands: Asymmetric Bis(imino)pyridine Iron Catalysis for Carbene Transfer Reactions" (Yongming Deng)

The purpose of this research is to synthesize chiral bis(imino)pyridine iron complexes as catalysts for carbene transfer reactions involving diazo compounds. The reactive carbene intermediates are mainly generated from diazo compounds by metal catalyzed dinitrogen extrusion, and their reactions extend from addition and insertion to cycloaddition and ylide formation. The asymmetric version of such reactions catalyzed by chiral metal complexes are powerful tools for the synthesis of diverse enantiopure structures. However, they are often mediated by expensive precious metal catalysts (e.g. rhodium, ruthenium, palladium, gold), which become a major obstacle to the synthesis of enantiopure compounds in an economical fashion. Recently our research successfully demonstrated the catalytic activity of bis(imino)pyridine iron catalysts for carbene transfer reactions. With this accomplishment, our effort here will be devoted to the synthesis of chiral bis(imino)pyridine ligands, which will be applied to the preparation of asymmetric bis(imino)pyridine iron catalysts. This project will deliver the synthesis of a series of chiral bis(imino)pyridine-based iron catalysts with tunable electronic, steric, and chiral environments. This research will lead to the development of new asymmetric catalysis based on less toxic and earth abundant elements for carbene transfer reactions.

**Huber, Murray** "Exploring the Community Integration and Involvement of Immigrant Children in the US through Jump Rope Camps" (Trini Stickle)

The world is currently facing an unprecedented refugee crisis, which calls for the creation of programs designed to assist in the adjustment of refugee/immigration populations to their host communities ("Refugees," 2016). In the past, sports programs have often been used to ease the transition of refugee/immigrant youth to life in a new place, aiming to provide health benefits, increase language acquisition, improve social skills and connections, assist with enculturalization, and create a space for fun (Block & Gibbs, 2017, p. 91; Youri, 2018). The goal of this project was to create a summer jump rope camp and continued program to provide such benefits to the refugee/immigrant youth in Bowling Green, Kentucky. Results of the project include evidence that the program participants experienced many of the intended positive effects. This study also aims to serve as a template for future similar projects, allowing for the involvement and integration of immigrant children in the US and the creation of stronger, cohesive communities.

**Hughes, Joseph** "GIS & WKU Ogden Students: Where Are They and Why?" (Kevin Cary)

Universities are experiencing ever-increasing competition from other universities as enrollment decreases nationwide. With this, the question must be asked, "How do we, Western Kentucky University, fair against

other universities as far as the pursuit of enrollment?". To answer this, Geographic Information Science (GIS) has been deployed to show where students are coming from and answer how WKU can develop innovative recruitment strategies to obtain new students. GIS pursues critical acumen from geospatial data while visualizing it in our physical world. Through spatial analysis we have visualized actionable insights, imperative for future recruitment. For this project, students that declared a major in Ogden College during the fall semester 2016 have been mapped by zip code to assess the current scope of University enrollment for Ogden College. Location Analytics with spatial statistics were deployed to investigate why students may be coming to WKU, and how we may be able to obtain new students through understanding current students' motivations for enrollment. The study showed many of the students are coming from within the state, and most are coming from Warren County, Kentucky. Maps produced from this study display where students are currently coming from and where potential recruitment areas are located.

**Ibrahim, Abdulgafar**; Michelle, Reece; Williams, Mkanta; Khatoon, Rukhaiya; Pope, Darnez; Thakur, Niyati; Tadaluru, Apoorva "Personal Hygiene and the Implications to Health Service among Refugees in the USA" (Michelle Reece)

Refugees in the United States experience barriers to self-care and personal hygiene leading to increased risk of infectious diseases and poor hygiene-related health behaviors. Health behavior and mental health can also contribute to reduced hygienic practices among the refugees. This study examines the implications for care among refugees with poor personal hygiene, the challenges encountered during the process of care by the healthcare providers with refugees, the most common hygienic issues encountered, and interventions to improve and maintain adequate hygienic condition among the refugees. Data was collected in Kentucky, Minnesota, and New York through focus groups, health service provider surveys, and reports from facilities that serve refugee groups or that work in partnership with resettlement agencies in those states. Common hygienic problems encountered with refugees include body odor, walking without shoes, dirty clothes, lack of underwear, poor oral hygiene, and head care/lice. Some of these concerns, including misunderstanding of the importance of personal hygiene can create hindrances to proper attention in a health facility. Poor hygienic conditions promote disease transmission with a high incidence of diarrheal disease and respiratory infections. These are avoidable if effective interventions such as refugee personal care awareness and training program, individual interventions involving the patient and provider, and provider involvement in educating patients at the point of care are implemented.

**Iglehart, Andrew** "Berkel Structural Failure" (Shane Palmquist)

I study a failure in the digging of a basin for waste water. I describe what happened that caused the collapse and how much it cost the company. This poster provides information on what the project was originally intended for and what the progress of the job is now. I show how the errors of the job can be avoided in the future.

**Indulkar, Ajinkya Vishwas** "Node Centrality in Graphs" (Rong Yang)

Centralities are important and useful in a wide variety of applications in network science involving ranking, communication, and infection spread and prevention. Node centrality attempts to determine the relative importance of the nodes in a graph (network). This project compares and contrasts three different methods for computing centrality scores. The three methods are degree centrality, closeness centrality, and betweenness centrality. Each measure uses a very different notion of what defines a central location in a graph. These distinct approaches will be explained and the computations needed for them outlined and illustrated. We will be using the same network for each, and visually display the relative importance of the nodes under each of the three measures. This work shows that these centralities can not only provide different perspectives as to what the "most important" node in the graph is, but also allow the flexibility to effectively study different structural aspects of networks.

**Irihamye, Ivy**; Johnson, Jarrett "Genealogical History and Admixture Proportion of Tiger Salamanders in Black Lake, Mono County, California" (Jarrett Johnson)

Since the mid 1950s, introduced populations of western tiger salamanders (*Ambystoma mavortium*) have hybridized with the native, endangered California tiger salamander (*A. californiense*). Hybridization poses a threat to the persistence of California tiger salamanders across a large portion of their range. Therefore, non-hybridized, California tiger salamander populations are often managed to prevent hybridization, and hybridized populations showing genetic admixture with western tiger salamanders are often managed with a goal to decrease the proportion of non-native genes. In this study, our objective was to ascertain the status of a newly discovered tiger salamander population, and determine genetically which of the three categories (native, hybrid, or introduced) exemplifies this population. Due to the location of the population outside of the known natural range of the California tiger salamander, we predicted that this population would be comprised of individuals with non-native genomes. We assessed admixture proportions (i.e., genomic ancestry percentages) using DNA sequences for one mitochondrial and five nuclear genes. For the mitochondrial data,

we placed our samples into an existing phylogenetic tree comprising other hybridized and non-hybridized introduced populations in California. Preliminary findings support the hypothesis that this population should be categorized as a non-admixed introduced population and may be managed to reduce the risk of future hybridization with California tiger salamanders.

**Jackola, Kailee;** Redifer, Jenni; Stearns, Chloe "Impact of Remembering vs. Knowing in Strength of Belief in Neuromyths" (Jenni Redifer)

Many things the general public believe to be true are either completely false or contradict research findings. However, many people are not willing to give up their false beliefs, even if there is evidence to refute it. In the present study, 197 participants recruited via Amazon's Mechanical Turk were presented with a list consisting of facts about the brain and neuromyths, and asked how strongly they believed each statement on a scale ranging from 1 (firm disbelief) to 5 (firm belief). For statements they believed to be true, they were asked follow-up questions about how they knew the information was true. If they remembered learning it, they were asked the specific source of the information. For 7 of the 10 true statements and 5 of the 8 neuromyths, there was a significant relationship between strength of belief and having a distinct recollection of the source of the information. Our results support the hypothesis that stronger beliefs are associated with having a specific memory of learning the believed information. These findings may be useful for interventions designed to combat neuromyths, as determining neuromyths' origins could help educators identify more effective ways to replace neuromyths with correct knowledge about brain function.

**Jackson, Colleen;** Cecil, Wendy; Kim, Kibum; Ko, Kisung; Kim, Moon-Soo "Diagnostic Applications of Double-Stranded DNA Detection Utilizing Tale Proteins Expressed in Plants" (Moon-Soo Kim)  
Detection of double-stranded (ds)DNA with DNA-binding domains eliminates the requirement of DNA denaturation and hybridization, resulting in a faster and quantitative method of detections for diagnostic applications. DNA-binding domains called Transcription Activator-Like Effectors (TALEs) can selectively bind to dsDNA through repeat variable diresidues (RVDs) located at the 12th and 13th amino acids of each repeat in TALEs. TALE proteins can therefore be designed using RVDs to select for any target DNA sequence. To identify *E. coli* O157, the *stx2* gene which codes for Shiga toxin was used to engineer specific TALEs, and these proteins were expressed transiently in *Nicotiana benthamiana* as an alternate to previous *Escherichia coli* expression system. By subcloning the TALE DNA sequence into the pEAQ vector and then by transforming *A. tumefaciens*, this culture could be agroinfiltrated into *N. benthamiana*. The TALEs could then be harvested from the leaves and isolated through a His Tag column. Proteins were characterized and then were labeled with quantum dots (QDs). The QD-labeled TALEs were applied to the graphene oxide, aiming to develop a new sensing platform using nanosheets.

**Jaynes, Korey** "Georgetown Alumni Center" (Shahnaz Aly)

This project is intended to provide Georgetown College with new athletic and training facilities for the men's and women's basketball teams. The Tigers are often considered a potential candidate to take titles throughout the season, particularly the Mid-South conference title. A new athletic facility would highlight their recent successes and give the local community a new spark of pride for their local college. Case studies were undertaken to provide enough spaces using existing facilities as an example. Green technologies were researched to find relevant techniques to decrease the impact of the facility and to improve the experience of the patrons. Georgetown College's campus was studied to find an adequate site while not further crowding other buildings. The goal of this project is to provide a new athletic facility, multiple classrooms, and functional office space for general use by the University. Georgetown hosts team camps each summer that bring in between ten and twenty high school teams, both junior varsity and varsity squads. They have very little room to provide consistent court times for teams without having long wait times between games. Expansion and improvement of facilities would be profitable for the university through athletics, summer camps, and other community events.

**Johnson, Matthew;** King, Rodney; Rinehart, Claire; Al Khayyat, Sarah "Discovery, Purification, and Analysis of Microbacterium Phage Clancy" (Naomi Rowland)

Bacteriophages exist on the planet in extreme abundance and diversity, and are in almost every environment. There are fewer than 3,000 genomically characterized phages, and very little is known about bacteriophages. Microbacterium phage Clancy was isolated using *Microbacterium foliorum* as a host from a water-based mud sample from the Shore of Reformatory Lake in La Grange, Kentucky, and it is quite rare a phage is harvested from a water-based sample. Purification of the turbid plaques of Clancy, and average plaque size decreased from 11 mm to 5 mm throughout serial dilutions in order to isolate Clancy. Through a transmission electron microscope, the morphological characteristics of Clancy were observed. Clancy had dark heads, which is a sign of above-average amounts of genetic material. The genomic DNA was isolated, and a DNA restriction digest and gel electrophoresis were performed. However, analysis of these gels did not yield major insights into the genome of Clancy, therefore DNA was sequenced at the University of Pittsburgh under the SEA-PHAGES

program. Further annotation is currently being done through bioinformatics principles on the campus of Western Kentucky University, and the individual and specific characteristics of Clancy and the genome of Microbacterium phage Clancy will be discovered.

**Jones, Andrew** "Ethnic Cultural Landscapes: German Breweries and Social Institutions from 1860 to 1920 in Covington, Kentucky" (Margaret Griphsover)

A useful marker for recognizing historic ethnic groups are the social institutions propagated by members of those groups. The foreign born German population in Covington, Kentucky was represented through breweries, churches, saloons, and other institutions that established ethnic neighborhoods and maintained ethnic identity. The study area will consist of the city of Covington, KY from 1860 to 1920. Population, institutional, and address data will be acquired through historic US Census and city directory documents on Ancestry.com. Map documents will be prepared by digitizing historic city maps on Arcmap and geocoding the institutions onto them. The results are expected to show an increased number of German-born citizens and institutions up until the twentieth century in which they are expected to drop due to anti-German sentiments caused by the First World War and prohibition restricting the brewing and saloon industries. The discussion will attempt to contextualize the changes in German population and institutions with historic events.

**Joshi, Apeksha; Seelam, Sweety** "Musculoskeletal Disorders: An Occupational Hazard among Dentists" (Grace Lartey)

Musculoskeletal disorder is one of the most common hazards experienced by the dentists at their workplace. This disorder results from prolonged, improper body postures and repeated movements leading to persistent pain in muscles, joints, tendons and other body parts. Studies have shown that musculoskeletal disorders (29.5%) is one of the leading causes of early retirement among dentist compared to cardiovascular disease (21.2%) and neurotic symptoms (16.5%) (Gupta et al., 2014). Some of the musculoskeletal disorders' dentists experience is pain in the lower and upper back region, and problems in the hand and wrist. Some of the symptoms due to the disorder are numbness in the hands and fingers, excessive fatigue in the neck and shoulder region, weak grip in hands and tingling sensation in the arms. According to the National Institute of Occupational Safety and Health (NIOSH), the goal of ergonomics is to prevent musculoskeletal disorders and soft tissue injuries. Dentists need to be made aware about the correct ergonomics to be followed at the workplace. Incorporation of four handed dentistry will help to reduce strains experienced by the dentist. Also, incorporating ergonomic classes in the dental program will help the dentist to practice ergonomics at their workplace. The dental programs in the clinics must include ergonomics to increase the awareness among dentist.

**Kayser, Rebekah;** Shim, Jiyoung; Kim, Moon-Soo "DNA Binding Affinity of Engineered Zinc Finger Proteins" (Moon-Soo Kim)

Zinc finger proteins (ZFPs) are one of the most common DNA binding proteins. ZFPs are composed of two beta sheets and an alpha helix stabilized by a zinc ion connected to two histidine and cysteine residues. By interacting with the major groove in DNA where the bases are most accessible, the alpha helix of ZFPs can read 3-4 base pairs. Utilizing this property, we engineered ZFPs that can recognize specific genes of selected pathogenic DNA. To test the DNA binding affinity of the engineered ZFPs, a  $K_D$  value is determined using an electromobility shift assay (EMSA). The  $K_D$  value (equilibrium dissociation constant) represents the strength of the protein's ability to bind to its target molecule, with lower  $K_D$  values indicating a high affinity between the protein and target molecules. We determined the  $K_D$  values of our engineered ZFPs. Among them, the  $K_D$  value of ZFP tetM1332, designed to bind tetracycline resistance gene (tetM), was determined to be 0.95 nM, indicating a strong binding affinity to its target DNA. The ZFPs with strong binding affinity could contribute to the development of a DNA detection diagnostic device through strong interactions between ZFPs and its target DNA.

**Kendrick, Samuel** "Photographic Manipulation in Bible Land Atlases" (Ann Ferrell)

Beginning in 1884, the atlas company Rand McNally began producing atlases that catered directly to Sunday School teachers. This paper investigates the underlying motive behind the alteration of photographs, and how art has historically been used to manipulate the public's perception, particularly that of religion and religious images. My research methods included comparing and analyzing images between two different versions of the Bible Land Atlas, one published in 1884, and the second published in 1897. Additionally, all images have been compared to the original images, as they have lapsed into public domain and they are easily found on the Internet in their unaltered forms. As a folklorist, I will investigate the implications that are made when a subject is not accurately represented through media and representation.

**Khaton, Rukhaiya;** Farrell, Colin; Gardner, Marilyn "Impacts of PTSD on Suicidal Ideation in EMS Workers" (Colin Farrell)

Emergency Medical Service (EMS) workers, by the very nature of their occupation, experience an elevated threat to their own general health and mental well-being. Existing research suggests that EMS workers are

more likely to experience Posttraumatic Stress Disorder (PTSD) and experience suicidal ideation when compared to the general public. Our current research aims to examine the relationship between PTSD and suicidal ideation in EMS workers while accounting for multiple confounding and intervening factors.

**King, Hannah; Young, Lauren** "Trait Anxiety and Procrastination Predict Surface Study Strategy Use" (Jenni Redifer)

Study skills play a crucial role in academic performance (Crede & Kuncel, 2008). Therefore, it is important to examine a) whether higher trait anxiety is associated with procrastination and use of surface study strategies, b) whether procrastination is associated with surface strategy use, and c) how working memory capacity (WMC) impacts procrastination and use of surface strategies. Participants ( $n = 146$ ) completed the State Trait Anxiety Inventory to measure trait anxiety, the Academic Procrastination Scale to measure frequency of procrastination, and the Approaches and Study Skills Inventory for Students to measure surface study strategy use. WMC was assessed with shortened Operation Span and Symmetry Span tasks. Students with higher trait anxiety,  $\beta = 0.194$ ,  $p = 0.001$ ,  $np2 = 0.079$ , and who procrastinated more often,  $\beta = 0.187$ ,  $p < 0.001$ ,  $np2 = 0.107$ , used surface strategies more often. Trait anxiety predicted procrastination, with those higher in trait anxiety procrastinating more often,  $\beta = 0.323$ ,  $p = 0.001$ ,  $np2 = 0.069$ . WMC did not have a significant impact on surface strategy use,  $\beta = -1.13$ ,  $p = 0.171$ , or procrastination,  $\beta = -0.12$ ,  $p = 0.46$ . Targeting trait anxiety or procrastination may be paths to improving students' study strategies.

**King, Shelby** "Attentional Capture Effects of Emotional Faces in Young Adults" (Andrew Mienaltowski)

Sustained attention on a specific task is a critical skill. However, social interaction often interrupts our ability to maintain focused on a task. This experiment explored the ability of faces to disrupt our attention. The busyness of the display, the relevance of the distractors, and the valence of the emotion on socially relevant distractors were manipulated to estimate their impact on participants' ability to identify a target. Twenty-six participants completed 432 trials of a visual search task. Individuals were asked to identify a target letter following the 500 millisecond presentation of a circular array of stimuli with either letters or facial images as distractors. People generally required more time to respond and were less accurate when the display was busy. Trials with distractors that elicited a competing response led to lower accuracy. Surprisingly, the disruptive properties of socially relevant distractors did not materialize. Rather, participants were marginally faster at identifying the target when angry expressions appeared as distractors, relative to neutral, possibly due to an attentional boost elicited by threatening social aspects of angry expressions. Furthermore, trials involving angry distractors led to greater accuracy than those involving happy distractors. These findings suggest that perceptual load level influences response time and accuracy, and that arousing negative emotional expressions may stimulate attentional deployment to facilitate target identification.

**Kipper, Chelsey; Kambesis, Pat; Polk, Jason** "A Geochemical Comparison of Two Telogenetic Karst Springs During Reverse Flow, Mammoth Cave, Kentucky" (Pat Kambesis)

Previous studies in Mammoth Cave National Park have identified a phenomenon, referred to as stable reverse flow, that may significantly contribute to cave formation. Groundwater in the Mammoth Cave Karst Aquifer typically discharges from springs into the Green River, the regional hydrologic baselevel. When the river stage increases, water from the Green River enters River Styx Spring, flows over the drainage divide, and discharges at Echo River Spring. This study quantifies the geochemical and hydrologic changes that occur between the two springs during stable reverse flow. The stage of the Green River, influenced by storm events in the Upper Green River Basin, seasonal changes associated with evapotranspiration, and damming along the Green River, control the timing and duration of stable reverse flows. Major ion concentrations, alkalinity, TOC and carbon isotopes are collected weekly; SpC, temperature, and pH are being recorded at 10-minute intervals; and pressure transducers are being used to collect water levels at two-minute intervals. Data show relationships between stable reverse flows, meteorological processes, and human influence on the river basin. Distinct changes in geochemical parameters are used to determine when flow reversals occur. Alkalinity, TOC, and carbon isotope measurements provide information about seasonal and temporal changes in carbon flux, and about how spring flow reversals contribute to carbonate dissolution and conduit development.

**Kiser, Aaron** "What to Do with Alak T'sarran: Storytelling and Mourning the Death of a Role-Game Player" (Ann Ferell)

Storytellers have used oral and written storytelling as a way of communication, persuasion, preservation, and entertainment. During the 1970s, role-playing games developed, focusing on a storyteller, the Dungeon Master, who develops a story and leads a group of gamers through an adventure by providing an overall world and environment in which to roam and explore. Often players in these folk groups become close friends with friendships often lasting for decades. What do you as a group or Dungeon Master do when one of the role players dies suddenly, and his character was the central figure in an adventure that has lasted for years? Do you just throw the story out? Do you just kill off his characters that he has developed? Through personal experience and fieldwork interviews, this paper explores one gaming group and their methods of mourning the death of a friend and player.

**Klaine, Seth;** Winchester, Mike "Oxidation Kinetics of Porphyrin-manganese(IV)-oxo Intermediates Generated by Chemical and Photochemical Methods" (Rui Zhang)

High-valent metal-oxo complexes are significant, active oxidants in enzymatic and synthetic catalytic oxidation reactions. In the following studies, one electron-donating and three electron-withdrawing porphyrin-manganese(III) complexes were synthesized and spectroscopically characterized. Manganese(IV)-oxo intermediates, i.e. [MnIV(Por)O] (Por = porphyrin ligand), in different electronic environments have been successfully generated by visible light irradiation of the photo-labile manganese(III) chlorate precursors. In addition, the same manganese(IV)-oxo species were chemically generated by using iodobenzene diacetate, a mild oxidizing reagent. Kinetic studies were conducted for oxygen atom transfer (OAT) reactions with various organic substrates by generated [MnIV(Por)O] in CH<sub>3</sub>CN solutions. The results of these studies suggest that the apparent second-order rate constants for sulfoxidations by these active oxo intermediates were on average a magnitude larger than the rates for epoxidation of aryl alkenes. The comprehensive studies have also contributed valuable insights into the transient oxidants in oxidation reactions where the actual reactive intermediates are not spectroscopically observable.

**Lamb, Ryan;** Nee, Matthew "Monitoring Photolysis of Organic Pollutants Using Surface-Enhanced Raman Spectroscopy" (Matthew Nee)

Recent studies show increasing amounts of harmful organic pollutants in wastewater. Fortunately, many organic pollutants can be broken down into harmless end products via photolysis. However, more information on the kinetics and intermediates of these reactions is needed to determine their safety. Ideally, Raman spectroscopy can be used to monitor reactions in real time; however, Raman spectroscopy has low sensitivity, so molecules at low concentrations (e.g. 10<sup>-5</sup>-M) do not produce high enough Raman intensity to be effectively observed. In response, gold nanoparticles can be used to greatly enhance the Raman intensity of molecules in water, termed surface-enhanced Raman spectroscopy (SERS). Gold nanoparticles aggregate to form large clusters of nanoparticles which could precipitate and decrease the overall Raman intensity. A capping agent can be used to arrest the formation of large clusters. Using the stable ("capped") nanoparticles, photolysis can be monitored by analyzing the changes in the Raman spectra of the analyte over time. The capped nanoparticles were found to be stable in pH levels between 3 and 11. In this experiment, rhodamine 6G (R6G), a common dye and organic pollutant, and paraquat, a pesticide, were used as the analytes being monitored with sodium dodecyl sulfate (SDS) as the capping agent.

**Lawrence, Emmalee** "4WINGS Skateboards" (Matthew Tullis)

This project, titled 4WINGS, was a research project that I completed in a Graphic Design class this past Winter. Our teacher challenged us to research the meaning, history, and interesting facts about one unique number of our choice. We designed an entire skateboard product line that included merchandise, skateboard deck design, packaging, and an infographic design based on the number we chose. I found myself drawn to the number 4 because of the intriguing facts I found behind it. Some of the features of the number 4 I found particularly appealing were that our DNA is made of 4 nucleobases, most insects have 4 wings, and our lives are made up of 4 seasons. These facts were the central points of my product line. My product line includes visuals and typography that relate to these concepts. Each design is unique and carried out in a way that is appealing to a potential consumer base.

**Lebryk, Eric; Sullivan, Jake; Cravens, Matthew;** ; Young, Sonia "Interaction Effects of Whole Body Vibration and LSVT BIG® on Gait and Balance in Parkinson's Disease" (Sonia Young)

Introduction: Individuals with Parkinson's Disease (PD) suffer from dyskinesias affecting gait and balance, among other symptoms. Previous studies have validated improvements for gait and balance in patients with Parkinson's disease using LSVT BIG® therapy, and moderate results with whole-body vibration (WBV). The purpose of this study is to measure if alternating, low-frequency, WBV augments the results of LSVT BIG® in patients with PD. Methods: This study was a single subject, quasi-experimental design. The baseline phase was 4 weeks, followed by 4 one-hour LSVT BIG® sessions over the course of 4 weeks. The last phase was 4 weeks of combined WBV plus LSVT BIG® that consisted of 4 one-hour LSVT BIG® sessions followed by 5 minutes of WBV. Data for balance and gait was obtained from outcome measures including the Mini-BESTest and the Sensory Organization Test (SOT) on the NeuroCom® SMART Balance Manager®. Results: Increase from initial baseline score to final treatment phase score noted with SOT but no significance found.

Significance was found when analyzing the MiniBESTest between LSVT BIG® alone and LSVT BIG® combined with WBV. Discussion: Our findings suggest that WBV augments LSVT BIG® therapy to further increase functional balance and gait in an individual with PD.

**Lee, Jacob** "Modeling the Rapid Flares Seen in Blazars" (Michael Carini)

Modeling the rapid flares seen in Blazars NASA's K2 mission was able to resolve the rapid timescale flaring behavior of extreme Active Galactic Nuclei (AGN) known as blazars with unprecedented resolution. AGN are the nuclei of galaxies where there is a constant stream of material flowing into a disk feeding a supermassive

blackhole and producing bipolar jets of material moving at nearly relativistic speeds. In the blazar class, the relativistic jets are pointed nearly along our line of site, and they dominate the observed emission at all wavelengths of the electromagnetic spectrum. A defining characteristic of blazars is that their brightness changes constantly in all parts of the electromagnetic spectrum. My project is to identify and model the flares seen in blazar light curves obtained with NASA's K2 mission. The model will provide us with flare shape (symmetric vs anti-symmetric) and flare duration. Flare shape determines the physical process generating the flare and flare timescale sets a limit to the size of the region undergoing the flare.

**Leggas, Timothy; Cannon, Isaac; Kitchen, Samantha; Hilliard, Emily** "Herbaceous Understory Biodiversity in Various Successive States of the Costa Rican Cloud Forest" (Martin Stone)

The biodiversity of understory plants in the Costa Rican Cloud Forest is constantly disturbed by landslides and cattle grazing. As herbaceous understory communities regenerate, biodiversity is constantly subject to change. By analyzing the evenness, dominance, and diversity of species, the health of the environment can be described. By sampling one square meter plots for species diversity, each stage of succession in the Cloud Forest can be described. By comparing species diversity to the age of the plots, a clear correlation is exposed between the two. After a disturbance, species diversity is nearly nonexistent. As succession continues, it was observed that herbaceous understory diversity reaches its peak at the intermediate stages of succession. When the forest reaches its climax state, the understory biodiversity is similar to the recently disturbed areas of the forest. This is likely due to the lack of sunlight that is able to reach the forest floor. This research reflects that undergrowth diversity reaches a peak when there are little to no trees to compete against for sunlight, then declines as trees grow larger and take more sunlight.

**Lemberg, Getter Marie;** Wininger, Steven "Impact of Texting While Cycling on Self-Selected Exercise Intensity" (Steven Wininger)

This study examined a potential barrier to exercising at higher intensities (multi-tasking). The main objective of this research was to determine how multi-tasking via texting on a smartphone while cycling on a stationary bike impacts self-selected exercise intensity? We predicted that the participants will self-select higher intensities during the control trial with no cognitive task. Seventy-eight WKU undergraduates completed the study (54 females & 24 males). Participants completed two sessions, during the second session they completed two 10-minute cycling bouts, one with and one without texting. A fidelity check revealed that there were significant and meaningful differences in perceived CL between the control ( $M = 2.59$ ) and texting trials ( $M = 4.18$ ;  $\eta^2 = 0.46$ ). A repeated measures ANOVA revealed significant differences in self-selected intensity between the control ( $M = 2.20$  miles) and texting trials ( $M = 2.48$  miles;  $\eta^2 = 0.53$ ). The results of this study revealed that attempting to simultaneously engage in exercise and texting lowers self-selected exercise intensity.

**Leverette, Tyrek** "Muhammad Ali Boxing & Fitness Facility" (Shahnaz Aly)

I designed a boxing and fitness facility for the west-end neighborhood in Louisville, KY. The facility will keep the youth off the streets and teach them to have discipline. It will also promote an active lifestyle. The gym exposes the community to a sport we haven't had access to within our neighborhood. The sport of boxing can be used as an outlet to express emotion and find purpose in life. The great Muhammad Ali passed away in recent years, and it's no secret the amount of love and admiration the city of Louisville (his hometown) has for him. Because of this, it was very important for me to dedicate the facility to his name and legacy. Research conducted for this project includes a site analysis, sustainability/green technologies, mechanical systems, code review, and more.

**Liddle, Brendan** "Safe Space: The Psychological Impact of the Built Environment" (Shahnaz Aly)

The goal of this research was to develop a behavioral healthcare clinic to be available to the soldiers and families of Fort Knox, using contemporary construction techniques and an increased understanding of psychological impact of a built environment. The current facilities available for the Behavioral Health Clinic of Fort Knox are in a re-purposed office building, featuring cinder blocks covered in beige paint, claustrophobic hallways, and counseling rooms with little or no natural light. To negate these qualities and provide new usage to U.S. Army, I have conducted a study of the improvement of mental health facilities in the United States, which has made massive leaps forward in the previous years. This study included extensive case study research into other mental health clinics, including ones already ran by the U.S. Army, examining scholarly periodicals in the study of behavioral health, and conducting a brief survey of counselors on staff at the Fort Knox Behavioral Health Clinic's. These measures were taken to fully develop architectural drawings for a theoretical behavioral health clinic to replace the old clinic on Fort Knox. This new Structure will provide the same functions as its predecessor, while improving the standard patient's health.

**Liddle, Bronwyn** "Printmaking in the Community" (Marilee Salvator)

With funds secured from a FUSE Grant, I have, with the help of the print club, held several workshops and

demonstration with the aim of fostering greater engagement with and understanding of the art and technical aspects of relief printmaking. Using a small, portable printing press we invited community members to create their own linoleum print blocks, or observe the process, and demonstrated the methods of printing them both with a press and at home. Through these events we have attempted to demonstrate the community building nature of working within the sphere of printmaking and the social engagement fostered by creativity within our community.

**Life, Terrance** "Development of an Advanced Research Platform for Aerial Autonomous Navigation" (Farhad Ashrafzadeh)

The future of industry is in automation - the ability for a machine to act without the direct control of a human driver having the potential to increase efficiency in any field. Labor intensive fields like agriculture require regular monitoring, soil analysis, health assessment, and irrigation. By utilizing Unmanned Aerial Vehicles (UAV's) in this field, efficiency and production can be greatly increased. However, a platform for developing these high-level systems for autonomous operations was needed. The objective of this project was to design a system capable of controlling the flight of a UAV and develop an algorithm to interface with vision systems, capture images, and analyze images. The process began with selecting suitable tools to develop these systems, both the software to create the system and the hardware to implement it. Once the platform was selected, development and validation of the algorithms for real-time navigation with obstacle avoidance began. With the basic algorithms functional, work then moved toward exploring their usage within agriculture, including crop monitoring and health assessment. This development will result in the creation of a research platform for algorithm development and validation.

**Little, Hunter** "Composing Proactive Approaches: Discussing Student Mental Health in Composition Classrooms" (Daniel Liddle)

The rate of reported mental health issues among college students has consistently risen in recent years. Compositionists have discussed the relationship between mental health and composition in terms of responding to unexpected self-disclosures and guidelines for sensitive situations. However, these approaches overlook curricular opportunities to engage with mental health issues proactively through the content of writing courses. In this presentation, the speaker draws on Lindquist's concept of strategic classroom empathy, in which instructors' emotional responses are used to educate students on social class issues. The speaker shows how this approach can be adapted to focus on mental health issues in first year writing. Additionally, the speaker reflects on her attempts to practice this approach in her writing classes, and describes the potential challenges for other curricular contexts. Attendees will learn how a proactive approach may allow WPAs to encourage tactical engagement with mental health issues in their writing programs.

**Littrell, Kelsey; Suter, Hannah;** King, Rodney "Discovery and Comparison of Microbacterium Phages Mercy and Drippy" (Rodney King)

A major goal of the WKU Genome Discovery and Exploration program is to understand viral diversity. In this study, we isolated and characterized bacteriophages that grow on *Microbacterium foliorum*, a bacterium found in the soil and on plants. The properties of the newly discovered bacteriophages, named Mercy and Drippy, were carefully compared. Both phages were recovered from soil samples collected in Bowling Green, Kentucky and they each produce clear plaques on the *M. foliorum* host. In addition, the viral particles look similar when viewed under the electron microscope. However, restriction endonuclease analysis of the purified phage genomes proves that the DNA sequence of each phage is very different. We conclude that there is striking genetic diversity in bacteriophages even among those that are isolated on the same bacterial host and from similar environments. Of the 15,062 phages listed on the actinobacteriophage database, only 1,412 (9.37%) are microbacteriophages. Our results have expanded the current database and provided new insights that will help us more clearly understand the most numerous biological entities on the planet.

**Lokesh, Ashwini** "Comparison of Recommendation Systems" (Huanjing Wang)

Recommendation Systems are widespread and the most successful category of machine learning. They are categorized into Content-Based and Collaborative filtering (CF) methods and the latter is again classified into user-based and item-based CF. A similarity between two items or between users is calculated. Using R and Python, a comparison is done between the two models of CF for the similarity measures: Cosine and Pearson Co-efficient. For the performance, a confusion matrix has been used on the test dataset. MovieLens data set has been used for this experiment. Furthermore, a comparison between the different programming languages concludes that User-based collaborative filtering with cosine similarity is the best performing model for collaborative filtering recommendation system.

**Lowry, Kara** "Factors That Promote Women Representation in State Legislatures" (Jeffrey Budziak)

As more and more women run for elected offices, the need for information surrounding women in politics is growing. Scholars have extensively researched the factors that deter women from running for state

legislature, but few have studied factors of the states themselves that could potentially be promoting more women representation in state legislature. This presentation will cover a state's geographical location, the education level of the population, and the religiosity of the population in relation to the percentage of women serving in the state legislature as of 2018. This study begins to fill a gap in the research by discussing factors that assist women in becoming elected to the state legislature. The study has the potential to offer future women candidates the benefit of knowing what factors are working in their favor in their home state.

**Lutts, Abbey** "An Ever-Evolving Art Form: An Investigation of Contemporary Ballet in the 21st Century and the Future" (Anna Patsfall)

My FUSE project was directed by my interest in the genre of contemporary ballet. I started with a simple question, "what is contemporary ballet?" This question has provided guidance as I evaluated contemporary ballet and drew conclusions about where ballet is headed in the future. I traveled to both New York City and San Francisco to watch and take classes from professionals in the field. I found that contemporary ballet's derivations from classical ballet include continuity, long-streaming lines of movement, abstraction or new ways of storytelling, athleticism, and individuality. Using the experiences that I had while traveling as participatory research, I then was able to apply what I learned to create my own contemporary ballet. The study of contemporary ballet gives insight to how dance, art, and culture adapts and changes. Contemporary ballet is embracing change, pushing boundaries, and continuing to progress. It acknowledges its rich history while also realizing the social constructs of the 17th-19th centuries, when most traditional ballets were created, are outdated. These ideas need to be evaluated and reformed for this art form to progress and continue to appeal to a diverse audience.

**Lynn, Gabriella;** Huskey, Stephen; Gray, Keegan; Walters, Nicole; Gill, Jennifer "A New Model for Quantifying Hoof Pressure Distribution Using Fujifilm®" (Jennifer Gill)

The barefoot horse may suffer from hoof damage depending on riding surface. Hoof boots may better distribute the forces of the foot with the ground surface. The objectives of this study were to evaluate pressure incurred by the barefoot and to determine the effect of Cavallo Trek hoof boots on pressure distribution over the riding surfaces, asphalt and crushed-stone fines. Five, mature horses (BW 1331 ± 82 ; Age 7-25 yr) were walked over Low Prescale Film (Fujifilm, Sensor Products, Inc., Madison, NJ) with a detection range of 350 to 1400 PSI, that was cut into sixty, 54 cm x 61 cm sections. Hoofprints were collected three times on each surface and for each treatment (barefoot and booting). Preliminary testing revealed that the hoof boot created more low-pressure regions on the film than barefoot, meaning that the hoof boot absorbed more force and distributed more pressure upon impact.

**Lyons, Sarah** "Baby Domination: The Aid of Unrealistic Behavior and Subjectivity in Baby-Specific Films" (Gillian Knoll)

Deep within the isolated rain forest in *Rugrats Gone Wild* (2003), five fearless toddlers dive into their jeep and dash from a ferocious tiger. Their death-defying theatrical skit concludes when Tommy, the actor of naturalist Nigel Strawberry, catches the ride before the wild beast snatches him, jumps off an endless cliff, and becomes endangered by a 'crocodile' in a quicksand swamp. Unrealistic and imaginative scenes like these draw young audiences to the theaters for more than their entertainment value; they appeal to the unconscious desires and ambitions of the children who watch them. My essay employs reception theory and psychoanalytic theory to analyze the complex relationship between powerful young characters and child audiences in films like *Rugrats Gone Wild*, *Boss Baby* (2017), and *Son of the Mask* (2005). These theories provide deeper insights into the power of young characters' unrealistic, often comedic behaviors and dialogue to reveal the latent wishes of child viewers. By erasing the limitations of physical, cognitive, and emotional weakness from a toddler, these films allow child audiences to remove themselves from their personal realities to experience the dream of freedom—and domination—stored in their unconscious.

**Madriaga, Lawrence;** Novikov, Ivan; Nurcheshmeh, Morteza; Dobrokhotov, Vladimir "Identifying Deformation in SEM Images of Steel Samples Using Convolutional Neural Network" (Ivan Novikov)  
Elongation in metal parts is due to movement of imperfections in the crystal grains of a metal. This movement is a sign for part failure if it is inelastic. A scanning electron microscope allows us to see this deformation, combined with image classifying Convolutional Neural Network (CNN) is a unique combination for failure analysis. We present the preliminary results on developing CNN for recognition of Scanning Electron Microscope images of metal sample exhibiting inelastic strain. Steel sheet samples were prepared according to ASTM E8/E8M-11 standards for a tensile test. Each sample was etched with Circle Grid for Circle Grid Analysis and then tested in a loading frame. Stress and strain values were obtained by measuring dimensions of each elongated circle with grid analysis machine. Stress and strain values were tagged with location (on the sample) data and trimmed to portions exhibiting inelastic strain (near the breakage). Multiple SEM images were taken in deformed and undeformed regions of the sample and tagged with results of Circle Grid analysis. Using obtained set of SEM images we train CNN to predict if a SEM image exhibits inelastic strain.

**Martin, Daniel** "Meteorological Analysis of the 2009 Louisville Flash Flood" (Joshua Durkee)

The August 4, 2009 flash flood event in Louisville, KY caused extensive damage in the city that came at a monetary cost of tens of millions of dollars. Within just over an hour, some parts of Louisville received up to seven inches of rain. This study investigates the ingredients that came together to create such a unique and devastating event. Reanalysis data from the Rapid Update Cycle numerical weather model was used to perform a subjective analysis of the atmospheric conditions in the region that were responsible for creating this event. Results indicate that synoptic scale processes provided an environment for lift and, as a result, precipitation. Mesoscale processes, however, were the dominant factor in transforming this storm from normal to remarkable. The cumulative effect of these findings provides a plausible explanation for what occurred. Understanding the main causes for this flood will allow for forecasters to better predict these types of events and allow for better preparation.

**Mattson, Adam;** Gani, M. Royhan; Gani, Nahid "Evolution of the Louann Salt in the Northeastern Gulf of Mexico" (Royhan Gani)

The Northeastern Gulf of Mexico is a proven hydrocarbon province with numerous oil and gas discoveries. The primary success of the northeastern Gulf is linked to the mobilization and remobilization of the Louann Salt, which influenced deepwater depositional systems, formed hydrocarbon traps, and provided migration pathways. The Louann Salt was deposited in the Jurassic during the early-rifting stages of the Gulf of Mexico. Subsequent sediment loading resulted in the mobilization of the salt, forming salt ridges, diapirs, and massifs. While previous research almost exclusively focused on the Neogene salt remobilization and sedimentation in the area, little has been done to understand the deposition and salt evolution of the older stratigraphy. With advances in 3D seismic acquisition and processing, and the recent exploration activity in the deepwater Norphlet Formation, the Mesozoic and Paleogene stratigraphy can be interpreted more reliably, resulting in an improved understanding of the Mesozoic salt evolution in the Gulf of Mexico. Interpretation of newly released seismic data in the northeast Gulf of Mexico shows a complex history of expulsion rollovers, minibasin development, and passive and active diapirism.

**Mayfield, Otway** "Unmasked: Coming Out into Existence" (Amelia Rollings)

Andrea Marcovicci describes cabaret theatre as "...an evening of song and stories in an intimate space that shatters the 'fourth wall'.... At its best, cabaret can amuse, entertain, and inform... it can dazzle you, catch you unawares and make you weep. The audience participates in a direct, emotional conversation with the artiste." Cabaret is a unique type of theatre that utilizes many different methods and procedures to tell a story unique to its writer or emcee. The story drives the performance forward to a focused objective, which differentiates it from a concert or recital. The emcee creates an atmosphere where the audience can discover what is truly important to the emcee, and what he/she values. Through research in Louisville and New York City and through interviews with Jacob Cook and Katie Blackerby, both teachers at the Youth Performing Arts School in Louisville, I have prepared and will present a cabaret of my own, titled, "Unmasked: Coming Out into Existence," which tells my story of coming out to my parents and how it transformed my life from that point forward.

**McAndrews, Jacob** "Creating Effective and Sustainable Incentives to Produce Renewable Energy" (Jacob Byl)

As pressure to transition to renewable energy sources continues to mount, state level tax incentives play an important role. Understanding the effectiveness of different types of incentives (including those involving sales tax, property tax, corporate income tax, and personal income tax) is crucial in order to best promote green energy. This paper examines the policies implemented at the state level and how those policies influence renewable energy production in the state. An overview of the relevant factors to consider follows. Finally, recommendations as to the best ways to incentive renewable energy production are made.

**McCaslin, Lauren;** Schulte, Bruce "Documenting Marine Mammal Behavior and Evaluating the Benefits and Consequences of Viewing Marine Mammals in Southcentral Alaska" (Bruce Schulte)

Marine mammals are in a precarious conservation position because of historic and current anthropogenic impacts and human consumption. In light of changing abiotic conditions, further evaluation is needed on the habitat use, behavior, and interactions among marine mammals. Conservation legislation has helped protect species, but the greatest ground swelling may be the advent of the commercial whale-watching industry. The summer feeding grounds around Seward Alaska have made this area a prime tourism location. These protected waters have a confluence of marine mammal species, including the appealing and abundant humpback whale (*Megaptera novaeangliae*) that may associate with three ecotypes of killer whales (*Orcinus orca*). These species may travel together to feed or be adversaries in a predator-prey relationship. Using whale-watching as a platform, this study evaluated the effects of the presence of these two species separately and together, and of the type of interaction between them, on human perception. Data were collected via opportunistic observations and a pre- and post-survey instrument. Both species were often observed travelling and tourists reported more positive conservation attitudes after whale-watching tours. Applications are to inform best practices for the tourism industry, advise on legislation, and create a more informed public to support conservation.

**McCloy, Crystal** "Nashville Aquarium and Research Center" (Shahnaz Aly)

for my senior capstone project, I have chosen to create an aquarium and research center in Nashville, Tennessee. Through research, I found that an aquarium would be a perfect addition to this rapidly growing city. An aquarium is entertainment, and is all based off emotions, and how to provoke thoughts and stimulate the imagination. Being able to create a space, through architecture, that creates an experience that guides the emotions of people is something special. Aquariums also promote the education of marine life to all ages. Tourist and locals would enjoy this new addition because people love getting to see all the marine life they never get to see. Including a research center to the aquarium people would enjoy knowing the marine life is taken care of properly by educated research members, along with that, this would circulate new jobs to the Nashville area. Lastly, a new aquarium with many sustainable and green features will set this building apart from just being an aquarium. Technology, within architecture, has advanced so much that it has assisted in creating mentally and physical entertaining spaces, with many sustainable and green features that make a difference to the world and our experiences.

**McCormick, Dillon** "The Effect of Expanding the House of Representatives on Its Partisan Makeup" (Kelly Reames)

The United States stands out for the high ratio of citizens to representatives in the proportional house of its national legislature: the average American Representative represents nearly 750,000 citizens, the largest of all OECD (Organisation for Economic Co-operation and Development) states. While there has been much debate on the effects of gerrymandering on the partisan makeup of the House of Representatives, there has been little analysis of the effect such large electoral districts have on the balance between the parties or on the changes that would result from a hypothetical expansion of the number of seats in the House. This paper analyzes the effect of an expanded House of Representatives on the partisan makeup of congressional delegations from several states. I choose three states representative of different partisan arrangements, and, using online tools, reconfigure their congressional districts under several different scenarios, all of which involve the expansion of the House of Representatives beyond its current 435 members. I argue that while increasing the number of Representatives could impact the partisan makeup of the House, the mitigating factors of gerrymandering and Democrats' inefficient geographic distribution prevent the shift from being significant.

**McCoy, Rachel** "I've Imagined Death So Much It Feels Like a Memory: The Purpose of Death in Nineteenth Century British Poetry" (Rob Hale)

Death has always been an important feature in art, particularly literature. The way an artist portrays death depends on their perception of life and their intended effect; therefore, by exploring this portrayal, we can reach a deeper understanding of the author's values, beliefs, and overall purpose. Four works that have different purposes but use death to convey them are "Ode on Melancholy" (1820) by John Keats, "Indian Woman's Death Song" (1827) by Felicia Hemans, "Ulysses" (1833) by Lord Alfred Tennyson, and "The Cry of the Children" (1843) by E.B. Browning. Close reading and analysis of the contrasting focuses in these works highlight how women are contending with wide-spread social issues while men are exploring internal struggles. The way these authors portray death is a combination of conscious choice and life experience that demonstrates the versatility of death as a metaphor and the different social pressures being exerted on men and women.

**McDowell, Seth** "The History of Psychedelic Drugs Before United States Law" (Patricia Minter)

Psychedelics have been used medicinally and as vehicles for spiritual discovery for millennia. They achieved international notoriety in the decades following Albert Hofmann's accidental discovery of LSD's psychological effects, which spurred an explosion of psychedelic research. While much of the research showed psychedelics

to have tremendous therapeutic potential, some studies declared them to be dangerous. By the end of the 1960s, LSD and other classic psychedelics had become cultural pariahs, linked to hippies, chromosome damage, and birth defects. For this reason, Congress outlawed psychedelics in the Comprehensive Drug Abuse Control and Prevention Act of 1970, which consolidated more than a half-century of racist and xenophobic drug legislation into one law. This essentially strangled psychedelic research with bureaucratic control and rendered reclassification all but impossible, despite promising modern research. Additionally, psychedelic prohibition brought about *Department of Human Resources v. Smith*, in which the Supreme Court severely curtailed First Amendment protections for minority religions. For these reasons, this capstone will consider psychedelic drugs in the context of United States illicit drug policy as a whole and effectively argue that racism, classism, and xenophobia brought about psychedelic prohibition to the detriment of both therapeutic and religious practices.

**McKay, Anna** "Language Sampling with Early Adolescents with Specific Language Impairment" (Janice Smith) One essential component of clinical practice in the field of speech-language pathology is eliciting language to assess an individual's communication abilities. Language becomes more sophisticated during the adolescent stage of development, particularly in the areas of vocabulary and complexity of sentence structures used. The current protocols used to evaluate adolescents are limited in their ability to elicit and analyze language samples, resulting in decreased effectiveness of identifying adolescents with language disorders. Preliminary data was collected at WKU in 2017 regarding a new language sampling technique, the Dixit Method (DM), to elicit more lexically diverse language than standard interview procedures. The purpose of this research is to examine the language production of early adolescents diagnosed with specific language impairment (SLI) compared to typically developing peers on the DM. Language samples were elicited using the DM, a game-style interaction using richly illustrated picture cards, from participants recruited from Warren County Public Schools. Language samples were digitally transcribed and coded into the Systematic Analysis of Language Transcripts (SALT) software for analysis. The DM has potential to elicit more diverse language samples to help guide future assessment and intervention for early adolescents with SLI.

**Meador, Aaron** "June 5-6, 2018 South Dakota Wind and Hail Event" (Joshua Durkee) On June 5 and 6 of 2018 in South Dakota, there was a system that caused wind and hail damage to several properties all across the state, even some in the surrounding states. Most of the wind gust stayed between 60- 70 miles per hour, but some places reached 100 miles an hour. The hail sizes over one inch in diameter, some closer to two inches. What makes this storm different is that there was a ridge axis that just passed over the area and was not that far pass the area when this sparked up. The ridge was between two strong low pressures on either side of it, which made strong jet streak near the area. The area was closer to exit region of the streak which means deceleration of air parcels (Bluestein 1993) p392). Which is more perplexing because there are two factors that resulting sinking air. The answer lays in the Quasi-geostrophic equation (QG), also known as the omega equation. As well as other metrological equations. Looking at this event in a QG perspective, we will see how an upper-level shortwave and a surface boundary made this destructive event.

**Mendis, Ruchini** "Sensitivity Analysis for Tumor Growth Model" (Ngoc Nguyen) This study consists of sensitivity analysis for a previously developed Gompertz tumor growth model. The model is treated in discrete case and model parameters are estimated using the partial-sum method. After obtaining the estimated parameters, frequentist and Bayesian methods are used to construct confidence intervals and credible intervals for the parameters. The major focus of this study is on the Bayesian techniques for sensitivity analysis. Markov Chain Monte Carlo (MCMC) techniques are applied with the algorithm of Random Walk Metropolis with Non-informative Prior to construct posterior distributions and then credible intervals are obtained.

**Meredith, Carson** "Taking Action: A Case Study Analyzing the Deficiencies and Potential Sources of Improvement in the Severe Weather Warning System" (Joshua Durkee) The United States is one of the most prone areas in the world to experience severe weather. A warning system operated by the National Weather Service alerts the public of the dangers of severe weather. The purpose of this project is to analyze the effectiveness of the National Weather Service warning system across Kentucky and Tennessee. A case study of six severe weather events in areas warned by the National Weather Service offices in Louisville and Nashville in 2018 are analyzed for their effectiveness in issuing timely warnings, verification (i.e., whether or not severe weather actually took place), and which office performed better in issuing warnings among other factors. Results from these events are then used to analyze the effectiveness of these warnings and raise questions about any deficiencies that may have been observed in the warning process in this case study. Initial results indicate that while most warnings with these six events were effective in protecting the public, there were still noticeable errors in at least two of these events that exposed flaws in the warning process that must be addressed in order to improve the warning process for similar future events.

**Milden, Ian** "Pirates of the Yellow Sea: Who They Are and Why They Engage in Piracy" (Timothy Rich) Since December of 2015, the International Maritime Organization (IMO) and the International Maritime Bureau (IMB) have received reports of piracy in the Yellow Sea. My research argues that the pirates in the reports from the IMO and IMB are Chinese fishermen. They are engaging in piracy due to northeastern China's poor economy, the Chinese Government's fishing policies, environmental degradation, and South Korea's crackdown on illegal fishing. My research also discusses the limited information on these acts of piracy as well as the things that we still do not know about the pirates and their attacks such as the frequency of the attacks. My research highlights some of the limitations to obtaining information about these pirates and their attacks. There are no previous peer-reviewed articles on this topic.

**Miller, Kendall** "The Effectiveness of Juvenile Drug Courts on Reducing Recidivism: A Meta-Analysis of Research from 1993-2018" (Holli Drummond)  
According to the National Institute of Justice website, juvenile drug courts are provided to qualifying juvenile offenders (aged thirteen to seventeen) with a goal of "reducing recidivism rates and substance abuse." the present research study is aimed at collecting and reviewing all available data regarding the current juvenile drug court practices and their success at reducing recidivism rates. A systematic review and meta-analysis of the available literature related to this subject were performed using research articles published from 1993-2018 with a sample size of at least 50 participants. Using the boundary of recidivism rates of five years or less and an odds-ratio analysis to demonstrate significance, it was determined which courts provide the best results. The data was analyzed to conclude which practices were the most highly effective.

**Miller, Kristen** "Mental Health Stigma in College Students by Academic Major" (Amy Brausch)  
Studies have shown that health care professionals have higher rates of mental illness compared to the general population beginning in medical school (Frank et al.). This study seeks to evaluate if this difference appears in undergraduate studies and to identify student groups with higher risk. A mass e-mail was sent to current Western Kentucky University undergraduate students containing a link to the Qualtrics survey and informed consent form. Students were able to access the survey after giving consent. The study consisted of demographic information and the following scales: CES-D, BAI, Perceived Stress Scale, and SSMIS-SF. After completing the survey, students were presented with a debriefing form and given the opportunity to enter their e-mail address to be entered for a drawing of 5 \$20 Target gift cards. All responses were anonymous and stored in a password-protected database in Dr. Brausch's lab. E-mail submissions were not linked with student responses. Data analysis will be completed once sufficient data is collected. We expect to see that students with more rigorous majors will experience higher levels of perceived stress, anxiety, and depression. It is also expected that academic major difficulty will be positively correlated with higher levels of mental health stigma.

**Miller, Lauren; Furgal, Karen; Tinius, Rachel; Rajendran, Nikitha; Edens, Kolbi; Yoho, Kristin** "Modifiable Factors That Influence Infant Motor Development at 4 and 12 Months of Age" (Rachel Tinius)  
Introduction: The choices a mother makes during pregnancy (diet and exercise) and postpartum (environmental stimuli, sleeping situation, feeding practices) could influence a child's motor skills immediately after birth and into childhood. The objective of this experiment is twofold: 1) to determine factors that may influence infant motor development scores at 4 and 12 months of age, and 2) to determine whether infant motor scores at 4 months of age predict infant motor scores at 12 months of age. Methods: Infant motor development was assessed by a pediatric physical therapist using the Alberta Infant Motor Scale (4 months) and the Peabody Test (12 months). Data on other factors that could influence infant motor behavior were collected via surveys and accelerometers. Results: Thirty-one women-infant pairs participated. Physical activity during pregnancy and tummy time during infancy were not related to infant motor scores at either time point. However, infants who were still breastfed had higher motor scores at 4 months ( $p=0.006$ ). Infant motor development percentiles at 4 months were positively correlated to infant motor development percentiles at 12 months ( $r=0.649$ ,  $p=0.009$ ). Conclusion: Breastfeeding may contribute to improved motor development, and motor development in early infancy may predict later motor behaviors.

**Minton, Alyssa** "Emotionally Evocative Context Influences Emotion Discrimination Performance" (Andrew Mienaltowski)  
Facial expressions contain information regarding one's emotional state or the status of one's environment, particularly when the target's eye gaze direction varies. Emotion recognition abilities have been measured previously using isolated faces. However, it is unlikely that emotional expressions would appear outside of matching emotional contexts. The current study examined how discrimination performance varied when facial emotion similarity, gaze direction, and contextual congruency were manipulated. In Task 1, participants ( $N = 44$ ,  $M = 19.23$ ,  $SD = 1.79$ ) were presented with direct and averted expressions blocked in terms of similarity: anger/disgust (High), sad/disgust (Medium), and fear/disgust (Low). In Task 2, participants were presented with anger/disgust and fearful/disgust expressions with direct and averted gazes in a context that either matched (i.e., congruent) or did not match (i.e., incongruent) the emotional expression. For both tasks, participants

performed more poorly when the facial cues that convey emotion were more similar, and direct gaze led to better performance than averted. Performance was best when low similarity (relative to high) emotions were presented in a congruent context. Contextual information plays an important role in decoding emotional facial expressions: boosting performance when it is appropriate and hindering performance when it is inappropriate.

**Mitchell, Lea;** Kaiser, Rachel; Givan, Ethan; McClanahan, Kegan "Longitudinal Study of Jennings Creek, Bowling Green, Kentucky: A Case Study of Urbanization Impacts on Urban Karst Groundwater" (Jason Polk) Karst groundwater systems, which occur in areas with caves, sinkholes, and underground rivers, are vulnerable to pollution from surface contaminants. Bowling Green, Kentucky is home to extensive caves and groundwater supplies causing immediate transport of organic waste, chemicals, and other pollutants from surface to groundwater. This project examined water quality of urban karst sites in Bowling Green, Kentucky at Jennings Creek, a local primarily spring-fed river. Over summer, six weekly water samples were taken at five sites that were selected based off their proximity downstream from a spring input with a known drainage area and land use. The samples were tested each week for forty-three water quality parameters, such as anions, metal concentrations, total chlorine, and E. coli, among others. The data collected indicate pollutant concentrations based on land use of different spring's surrounding area, with detrimental changes at larger inputs. Areas with mixed land use had more nitrates and phosphate, while urban areas suffered from industrial waste and metal contamination. Nearly every site exceeded EPA drinking water standards for several parameters, including E. coli bacteria, nitrates, etc., indicating more research is needed to address primary causes and better practices to mitigate pollutant inputs into the groundwater system.

**Molchan, Jennifer;** Houle, Jean-Luc "Continuity and Change in Pastoral Lifeways in Mongolia" (Jean-Luc Houle) We present the results of an archaeological excavation conducted in northwestern Mongolia during the summer of 2018. The site yielded circa 10,000 years of recurrent occupation and thus offers a unique opportunity to explore long-term human-environment interactions. The purpose of this research is to better understand mobile pastoralists responses to the effects of environmental change in Mongolia and explore how certain aspects of their lives have changed, while land use and pastoral traditions have endured for millennia. We discuss three components of the archaeological record: site location, environmental conditions, and faunal remains. These provide insights into the conditions under which either continuity and change occurred. The results of this research also shed light on the resilience of one of the last remaining nomadic cultures and the strategies they used to endure through millennia of environmental and political change.

**Montgomery, Austin;** Murphy, Matthew "Data Collection Process for Conducting Safety Evaluation of W-Beam Guardrails in Alabama" (Kirolos Haleem) As part of an Alabama Department of Transportation (ALDOT) grant, undergraduate WKU civil engineering students (under the supervision of a civil engineering professor) are working to assess the safety performance of W-beam guardrails in the state of Alabama. The students are collecting relevant data from reviewing the police reports of five-year guardrail-related crashes (2012-2016). Close to 100 variables are collected by the students from the police reports and Google Maps/Earth. Examples of data collected from the police reports include: crash location, date, and time; crash manner (under-ride, over-ride, or penetration); crash causation; crash type (single-vehicle or multi-vehicle); driver information (gender, age, and driver license state); and vehicle type (passenger car, motorcycle, sport-utility vehicle, and truck). The collected Google Maps/Earth data include: guardrail type (either strong-post or weak-post), guardrail location (median or roadside), guardrail length, latitude and longitude (or milepost) of the crash location, and various geometric variables at the crash location. The geometric variables include number of through lanes, median width and type, left and right shoulder widths, presence of rumble strips, and distance from guardrail to the travel lane. The collected information will be used in the next phase (i.e., crash analysis) to associate such data with crash characteristics.

**Moolani, Satya; Irihamye, Elvin** "L-serine Reduces Reactive Oxygen Species Yield in Cisplatin Treated Zebrafish Utricles" (Michael Smith) Cisplatin is a chemotherapy compound effective against a variety of cancers. However, it can act as an ototoxin and cause hearing loss by promoting reactive oxygen species (ROS) production in auditory tissues. The antioxidant amino acid, L-serine has been hypothesized to lower levels of cisplatin-mediated ROS. In this project, we investigated whether L-serine can reduce cisplatin-mediated ROS production in auditory tissue and potentially act as an otoprotectant during cisplatin chemotherapy. We used a zebrafish utricular tissue culture system and fluorescent ROS indicator dye to spectrophotometrically measure if L-serine could decrease reactive oxygen species levels in cisplatin-treated tissues. We found that cisplatin treatment increased ROS yield in the utricular tissue while L-serine treatment alone did not alter ROS levels. Interestingly, we also found that equimolar L-serine treatment with cisplatin restored ROS to control levels. These results could be due to L-serine acting as a ROS scavenger. However, it is possible that L-serine could chemically inactivate cisplatin in these tissues. Future experiments are needed to see if L-serine can act as an otoprotectant in auditory tissue without mitigating the effects of cisplatin in cancer cells.

**Moore, Emma;** Ozer, Ahmet "Creating a Computational Tool to Simulate Vibration Control for Piezoelectric Devices" (Ahmet Ozer)

Piezoelectric devices are elastic laminates with multiple bonded layers, at least one of which is a piezoelectric material, a smart material to develop electric displacement that is directly proportional to an applied mechanical stress. Vibrations on these devices can be detrimental, and often it is not possible to wait until environmental influences dampen them. The vibrations must therefore be insulated by piezoelectric components, which can dampen vibrations by their actuation and sensing capabilities. Existing mathematical models for piezoelectric components and their "unjustified" approximations in literature are derived on the basis of oversimplified assumptions and considering only low-frequency vibrations. This project aims to develop a reliable computational tool to simulate the control of vibrations on a single piezoelectric bar, described by a novel "partial differential equation" model. Our computational tools are developed by an emerging stable approximation technique: filtered semi- or fully-discrete Finite Difference and Finite Element Methods, proved to provide faster and more reliable computation. These methods are simply based on filtering spurious vibrations, and they provide a false stability result. Our computational tool is essential to provide new insights into the active controlling of smart devices involving piezoelectric components, such as cardiac pacemakers or NASA/commercially-operated inflatable space antennas.

**Morgan, Elizabeth; Mahoney, Lorenzo;** King, Rodney "The Discovery and Comparison of Two Novel Microbacteriophages, Fawn and Oznerol" (Rodney King)

Bacteriophages are viruses that replicate in bacterial cells. They comprise the majority of all biological entities, with an estimated  $10^{31}$  particles in the biosphere. However, fewer than 3000 have been characterized genomically. To expand our understanding of phage diversity, two phages were isolated from soil samples collected from different geographical areas in Kentucky. We limited our analysis to phages that infect *Microbacterium foliorum*, a bacterium found in soil and on plants. The microbacteriophages were purified, high titer stocks were prepared and the viral morphologies were compared by transmission electron microscopy. The genomic DNA from each phage was extracted, digested by restriction endonucleases and the resulting products were examined by agarose gel electrophoresis. Our results display that the two phages share similar growth and morphological qualities, such as tail length and capsid size. In addition, similar DNA restriction patterns were observed. However, only DNA sequence analysis can definitively confirm that phages Fawn and Oznerol are related. If these phages are found to share significant DNA sequence identity, our results suggest that certain phages may have widespread geographic distribution.

**Murphy, Matthew;** Montgomery, Austin "Data Collection Process for Conducting Safety Evaluation of Cable Barriers in Alabama" (Kiros Haleem)

As part of an Alabama Department of Transportation (ALDOT) grant, a WKU civil engineering research team are investigating the safety performance of cable barriers in the state of Alabama. The investigation is based on reviewing police reports for the most recent seven-year (2010-2016) crash records that involve vehicles hitting cable barriers. Undergraduate WKU students in the team are collecting pertinent information (around 100 variables) from the police reports and Google Maps/Earth. Examples of data collected from the police reports include: crash location, date, and time; crash manner (under-ride, over-ride, or penetration); crash type (single-vehicle or multi-vehicle); driver information (gender, age, and driver license state); and crash contributing circumstance. The collected Google Maps/Earth data include: cable barrier type (either Brifen, Safence, Gibraltar, or CASS), number of strands (3 or 4 strands), barrier length, and geometric variables at the crash location. The geometric variables include number of through lanes, median width, left and right shoulder widths, presence of rumble strips, presence of signs (exit signs, speed limit signs, and billboards), and distance from cable barrier to the travel lane. The collected information will be used in the next phase (i.e., crash analysis) to correlate such data with crash characteristics (e.g., crash severity).

**Nguyen, Ngoc;** Hill, Lawrence "Synthesis of a Degradable Initiator for Atom Transfer Radical Polymerization" (Lawrence Hill)

Oxidative stress and reactive oxygen species such as peroxide, hydroxyl radical, and superoxide can disrupt homeostasis within the body and cells and lead to diseases if there is hyperconcentration. Polymeric systems of selective delivery can be used to target areas in the body. There are currently few polymeric systems capable of degradation and release when encountering biologically significant concentrations of hydrogen peroxide. We are synthesizing an initiator that will be incorporated with polymers to create materials that can be preferentially degraded by the triggering of the initiator at biologically significant levels of hydrogen peroxide. A polymer coating of a drug that degrades when it encounters a biologically significant concentration of hydrogen peroxide inside the body could be an efficient drug delivery system.

**Nixon, Jediah** "Cryptic Speciation in the *Pseudanophthalmus pubescens* Species Group (Coleoptera: Carabidae: Trechiinae)" (Keith Philips)

*Pseudanophthalmus* is a widespread group of cave-dwelling beetles endemic to eastern North America with surprisingly high species diversity. This presentation will address both the historic morphological and novel

molecular characteristics currently being used to differentiate and describe nine new members of the *P. pubescens* species group. Additionally, how this research will elucidate the mechanisms behind their speciation and current distribution. Also discussed are characteristics of these beetles that make them of great interest to conservation efforts of the subterranean fauna in the karst regions, such as high endemism.

**O'Boyle, Patrick;** White, Austin; Wyllie, Sierra "Survey of Cloud with V.I.C.E and Green Cloud Architectures" (Michael Galloway)

Vertical Implementation of Cloud for Education (VICE) is a cost-effective, cloud-based architecture that serves as an alternative model to traditional computer labs. The project's experimental data compares the setup cost, recurring costs, and power consumption of both lab models. These comparisons demonstrate VICE's benefits, which it achieves through virtualization: desktop computers are not necessary because computation, storage, and execution are handled by a remotely-accessible server. To optimize VICE, virtual machine (VM) migration can be implemented, improving the system's performance while decreasing costs. Though both efforts were separate, VICE would benefit from the methods employed in the Green Cloud project. Green Cloud explores server consolidation as an approach for making data centers more energy-efficient. The results show that Green Cloud's load consolidation algorithm decreases power usage for varying workloads. I will replicate both projects during my survey of distributed computing architectures and techniques. This will set a foundation for a future approach to combine both efforts.

**O'Reilly, Erin** "Clarity for Due Diligence in 401(k) Qualified Retirement Plans" (Ron Rhoades)

My focus for this project is to educate myself and my peers on the process of analyzing a 401(k) plan, specifically the due diligence that should be performed when analyzing a retirement plan. My primary focus for my work will be to explain the different roles needed to administer a 401(k) plan, explain an advisor's role in a 401(k) plan, analyze fiduciary duty levels, decipher fee structures, analyze benchmarking tactics, discuss appropriate types of investments to include in a 401(k) plan, evaluate financial wellness programs available, and conduct a post mortem interview with a past project participant regarding her current 401(k) plan.

**Ogbonnaya, Chisom** "Pedestrian Detection and Tracking - a People Counting Based Application Using Embedded Opencv" (Michael Galloway)

In present days, people detection, tracking and counting is an important aspect in the video investigation and subjection demand in Computer Vision Systems. Providing real time traffic information will help reduce pedestrian and vehicle traffic which is highly essential to identify people and vehicles, and accurately count the number of people and vehicles in real time. To perform the people counting, a robust and efficient system for people Detection and Tracking is needed. This research is aimed at making a pedestrian traffic map overlay for certain areas and buildings around the campus to help ease traffic circulation. Providing this information to pedestrians, through a developed application, which includes image processing with Open Computer Vision (OpenCV), will show the amount of traffic in certain buildings or area over a period. OpenCV is a cross-platform library which can be used to develop real-time Computer Vision applications. It focuses mainly on image processing, video capture and analysis including features like face and object detection. The operations performed were based on the performance and accuracy of the tracking algorithms implemented when embedded in a Raspberry Pi. The Pi Camera was used for real time vision and hosted on a raspberry Pi.

**Ottman, Claire; Sanford, Dylan;** Saidjafarzoda, Ilhom; Kholikov, Khomidkhodza; Thomas, Zachary; Belekov, Ermek; Abdisarov, Bektur "Scalable Patterning Using Laser-induced Shock Waves" (Ali Er) Shape memory alloys (SMAs) are a unique class of smart materials that are currently of great interest in engineering, biomedical and aerospace technologies. An advanced direct imprinting method with low cost, quick, and minimal environmental impact to create thermally controllable surface patterns using the laser pulses is reported. Patterned micro-indentations were generated on Ni50Ti50 shape memory alloys, aluminum and gold using an Nd:YAG laser operating at 1064 nm combined with suitable transparent overlay, a sacrificial layer of graphite, and a copper mesh grid. Laser pulses at different energy densities induce a large pressure on the surface. This large pressure pushes the copper mesh grid onto the surface resulting in a pattern. Scanning electron microscope (SEM) and optical microscope images show that various patterns could be obtained on the surface with high fidelity. Optical profile analysis indicates that the depth of the patterned sample initially increases with the laser energy and later levels off. Our simulations of the laser irradiation process also confirm that high temperature and high pressure could be generated when laser energy of 2 J/cm<sup>2</sup> is used.

**Padgett, Christopher** "A Synoptic Analysis of July 19, 2018, Marshalltown, Iowa EF-3 Tornado" (Joshua Durkee) On July 19, 2018, 19 tornadoes ripped across Central Iowa, with an EF-3 directly hitting Marshalltown, Iowa. The media called this an unexpected event that stunned people of the city. However, this event was well forecasted by the National Weather Service in Des Moines, Iowa, as well as the Storm Prediction Center in Norman, Oklahoma. The Storm Prediction Center issued weather graphic packages such as the Convective

Outlook and Tornado Outlook that covered the focus area of Central Iowa. This study takes a look as to what caused this tornado outbreak, and identifies key meteorological forcing mechanisms. Integrated Data Viewer software was used to create maps representing the meteorological set up with RAP model data. Initial results show that severe weather parameters were present. These specific parameters are indicative of an environment conducive to thunderstorm development.

**Penner, Matthew; Wichman, Aaron** "When the Facts Are Not Enough: Persuasion and Climate Change" (Aaron Wichman)

Past research shows that persuasion attempts that match, or appeal to, an individual's personality are more successful and are met with less resistance than those that do not match. For example, a person who values purity will be more accepting of legislation proposals that they otherwise would not if that proposal is framed in terms of purity. As this effect has not yet been found in regards to right-wing authoritarianism or social dominance orientation (two well established social individual difference variables related to political judgments) I designed an experiment to test this effect. Participants were shown messages regarding three possible climate change mitigating technologies in three different message frames and asked to rate their feelings towards each technology. Each frame was constructed so that people higher on specific personality dimensions would be differentially affected by it. Although no effect was found for right-wing authoritarianism or social dominance orientation, previously observed effects of valuing purity were replicated. Future research should focus on the content of the messages to ensure that they correctly target the desired constructs.

**Poland, John** "Christian Socialism: How an English Theological Movement Led to the American Civil Rights Movement" (Anthony Harkins)

The rise of socialist movements during the late 19th and early 20th centuries were very appealing to the working classes across Europe and the Americas due to rising inequality. Of these movements, Christian socialism was the one that most emphasized the moral values of the time as well as the desire to create a world removed from capital. This essay traces the theological and philosophical roots of this ideology and the practical application of its beliefs. According to the prominent socialist theologian Walter Rauschenbusch this meant the abolishment of the four evils "militarism, individualism, capitalism, and nationalism" and their replacement with the four "embodiments of good", namely "pacifism, collectivism, socialism, and internationalism". While the establishment of communities such as the Christian Commonwealth Colony of Georgia (1896-1900) and the Co-operative Brotherhood of Burley, Washington (1888-1901) were unsuccessful in their attempt to create a stable community they nonetheless promoted the development of new movements such as the Social Gospel and Civil Rights movements that tirelessly sought to actualize the creed of Christian socialism. The importance of this movement lies in the longevity and value of its message and the pragmatic ways that it was and still can be applied to contemporary society.

**Pope, Jackson; Wang, Ban** "Bis(imino)pyridine Iron Catalyzed Cyclopropanation Reaction of Diazo Compounds" (Yongming Deng)

Carbene reactions have many important applications to the production of compounds used in industry primarily to produce pharmaceutical products such as Ritalin. Many of these reactions require metal complex catalyst to enable the reactions. Traditionally these catalysts have been made with expensive precious metals like rhodium, however, it becomes a major obstacle to achieve molecular complexity in an economical fashion. Additionally, use of precious metal catalysts is the major source of metal residues in pharmaceutical products and continues to be a serious safety concern by regulatory authorities. The focus of this research is to develop highly selective iron catalysis. Our iron catalysts are prepared from basic bis(imino)pyridine ligands and commercially available iron salts through coordination. And their catalytic activities and selectivities are evaluated in typical carbene transfer reactions, cyclopropanation. Consequently, a screening of many ligands and counteranion combinations must be tested with various diazo compounds to determine the most efficient catalysts. In particular the N-aryl substituted bis(imino)pyridine ligands act as the catalysts and are, therefore, most subject to variation. Current observations demonstrate the catalytic capability of bis(imino)pyridine Fe(II) complexes for carbene transfer reactions. Further screenings of catalytic carbene transfer reactions of diazo compounds could provide a pathway to the cheaper production of valuable organic compounds, which could be biologically active products and pharmaceuticals.

**Porter, Jocelyn** "The Effectiveness of Minority Party Legislative Strategies in Congress" (Jeffrey Budziak)

This paper expands upon previous research about the tactics minority party members of Congress use to get their policies considered or oppose the majority party agenda. The paper evaluates strategies the minority party uses and their effectiveness. A strategy is effective if the minority party achieves its legislative goals after implementing it. The three strategies I analyze are obstruction, compromise, and persuasion. Minority party members employ obstruct legislation when they take steps to stop majority party bills from moving through the legislature. In contrast, minority party members compromise when they work with members of the majority party to develop legislation. Lastly, persuasion involves convincing majority party members to

take actions that they originally would not consider. I also analyze the impacts of various factors from seniority to ideology on a legislator's ability to employ these strategies successfully. This paper takes into account modern political polarization that has led to gridlock and fewer opportunities for compromise on substantial issues. The data analysis provides insight into the characteristics associated with more effective legislators and attempts to explain those results. This paper offers a new perspective on the way minority party members can represent the interests of their constituents in the legislative process.

**Portmann, Victor;** Lamb, Ryan "Surface-enhanced Raman Spectroscopy with Gold-silver Core-shell Nanoparticles" (Matthew Nee)

The ability to closely monitor a reaction has a plethora of applications, such as identifying compounds involved in photolysis. One method for monitoring aqueous reactions is Raman spectroscopy, which gives insight into the molecular structure of compounds. Surface-enhanced Raman spectroscopy (SERS) is a technique that uses nanoparticles to intensify Raman shift peaks that might otherwise be too subtle for interpretation. Gold nanoparticles are currently used to monitor photolysis, but data collection could potentially improve with the use of silver-coated gold nanoparticles, which have stronger enhancement properties. Silver-coated gold nanoparticles were synthesized and compared to gold nanoparticles in experiments that tested for increased enhancement and sufficient colloidal stability. The relationship between ionic strength and Raman intensity was also investigated, which is important because ionic strength causes particle aggregation. Larger particles have better enhancement, but over-aggregation causes instability. By knowing the ionic strength of the solution and understanding its effect on the nanoparticles, one can determine the ideal amount of aggregating agent to add to the silver-coated gold nanoparticles when using them. If they are found to be more beneficial for SERS, than they may replace gold nanoparticle in projects that use Raman spectroscopy.

**Potter, Abby** "Iconographic and Societal Layers in Bulgaria and Romania" (Elizabeth Gish)

This project, "Iconographic and Societal Layers in Bulgaria and Romania," brings together my photojournalism major and religious studies minor. My presentation discusses my research, and shares my photography, on churches and iconography in Bulgaria and Romania. My work in Bulgaria and Romania is part of a larger research project that explores the intersection of ancient and traditional forms of Orthodox Christianity in Europe in conversation with more contemporary expressions of Orthodox Christianity in the US. It is not only a compelling project to share with the public, exploring layers of meaning in sacred art, but also enriches both the fields of photojournalism and religious studies. My research in Bulgaria and Romania focused on forgotten iconography in churches, but also explored, through photography, the communities and journeys of the people for whom iconography is important religiously and culturally. In exploring the layers of art on church walls, much of which has not been documented/recorded, the research also excavated layers of meaning and history in the communities where this art is or was important. The work foregrounds iconography as an important "text" for religious scholars and encourages the field of photojournalism to better take into account the role of religious commitment and art in storytelling.

**Ramisetti, Hasitha; Danturthi, Amara;** ; Rowland, Naomi; King, Rodney "The Comparison of Two Novel Microbacteriophages from Bowling Green, Krogelio and Xiomara" (Naomi Rowland)

As widely varied biological organisms, bacteriophages are genetically diverse and contribute to bacterial evolution. These attributes are essential to the Genome Discovery and Exploration Program at WKU because of the research conducted on bacteriophages. To find a microbacteriophage, soil samples were enriched with bacterial host *Microbacterium foliorum*. After enrichment, several rounds of serial dilutions and purifications were performed to ensure that only a single phage was being isolated. Lysates were stored to maintain the structural phage body and genetic material for further analysis. Electron microscopy was used to determine the morphology of both phages. Tail lengths and capsid diameters varied; Krogelio had an average capsid diameter of 33.7 nanometers and a tail length of 111.5 nanometers, while Xiomara had a capsid diameter of 43.2 nanometers and a tail length of 104.1. DNA was isolated from both phages and restriction enzymes were used to cut the DNA to create a DNA fingerprint of each phage based on their unique DNA sequences. Krogelio and Xiomara were isolated from the same city, yet had different morphological and genetic variations.

**Ranjbar, Aref;** Kapadia, Mayank; Srivastava, Ajay "Characterization of a Basement Membrane Associated Protein Encoding Gene in *Drosophila Melanogaster*" (Ajay Srivastava)

Basement Membranes (BM) are important for normal development and tumor progression. In order to get a better understanding of BM dynamics we identified genes that encoded BM interacting proteins. One such gene is predicted to be involved in vesicle-mediated transport in *Drosophila melanogaster*. Here we characterize this gene by utilizing molecular biology techniques like immunohistochemistry, RNA in situ hybridization, and Western blot analysis utilizing antibodies generated in the laboratory. Western blot analysis identified this protein to be ~30.8 Kilo Daltons in size. Anti-body staining indicates tissue and cell specific localization pattern for this protein. This pattern is similar to RNA in situ hybridization pattern observed in various tissues. Data related to this proteins' involvement in vesicle-mediated transport will be presented.

**Reagor, JT; Fields, Edwin; Henneberg, Licia; Pierce, Meghan** "A Comparative Analysis of the Carbon Sequestration of Trees in Naturally Regenerated versus Planted Cloud Forest Plots" (Martin Stone)

Trees play a major role in combating climate change by absorbing carbon from the atmosphere and storing it in their trunks. Primary forests are carbon-dense but relatively few survive today. In January 2019, we examined carbon sequestration in two different types of regenerated forest in the Costa Rican cloud forest at CloudBridge Biological Preserve: naturally regenerated and planted. We also collected data from an old growth (primary forest) plot. We sampled tree height and circumference to derive the biomass of trees in each area. Representative core samples were taken from each tree to calculate the full carbon density. The density corresponds to the amount of carbon a tree can hold and thus the impact it has on abating climate change. We found that areas reforested by humans held more carbon than those areas that regenerated without assistance but that both were dwarfed by the carbon sequestered in old growth forests. However, our findings show a promising outcome for efforts in artificially regenerating the Costa Rican cloud forest.

**Reddy, Rithik; Ateyeh, Abdullah** "Finding the Most Influential Factors in the Healing of Diabetic Foot Ulcers" (Richard Schugart)

To formulate a mathematical model that accurately represents the physiology of a wound, the model must easily predict the most influential factors that affect the wound-healing process. Using patient data from a study conducted by Muller et al., a differential equation model was created that describes the interactions among matrix metalloproteinases, their inhibitors, the extracellular matrix, and fibroblasts (Krishna et al.). This work uses both the patient data and the differential equation model, focusing on two approaches using a global sensitivity analysis, aiming to find the most influential factors which control the dynamics of the wound. The first approach is a variance-based algorithm based on Saltelli's work. Using model output vectors, relative "Sobol" or "sensitivity" indices are computed. These were then ranked and using a cutoff, a subset of factors was found to be the most influential. The second approach, Morris Screening, measures the change in the state variables when a specific parameter is slightly modified from the predicted value. Using a sum-of-squares metric, each parameter's degree of influence on the model was found. Finally, using model parameter Markov Chains and posterior densities, the subsets from each approach are analyzed.

**Rehmel, Celeste** "A Handful of Words" (David Bell)

A Handful of Words is a novel (ages 13-18) in which Daniel is your typical son of a Baptist Preacher, in many senses of the term. He is literally the son of a preacher in small-town Kentucky, but he could also obtain the term from his snide, not-always-humorous, comments and almost-rebellious acts (like smoking a few cigarettes mere months before he turns eighteen and saying words that are phonetically similar to curses). Mags is as different as you can get from Danny. She is a Deaf artist and sees the world full of color, with a complete lack of sound. Her colorful, though reserved, view of the world results in a precise routine and a desire for control of her surroundings. When their youth pastor leaves the church under unclear circumstances, it is obvious that both Mags' and Daniel's fathers, the pastor and the elder, are behind it. They have forced out the one person that held their children to the church: Mags' one connection to God through ASL, and Daniel's one connection to what brotherhood really means. The friends face questions they never thought they would ask themselves or each other about faith, family, and growing up.

**Ren, Qizheng; Ashwini, Lokesh; Kukkala, Tejasvi** "Web-Based Website Creator" (Michael Galloway)

Website generators are tools, typically accessible and used with a web browser, that allow the construction of websites without manual code editing. Developers interacting with these tools generally do not need to build or modify the website using languages such as HTML, JavaScript, PHP, etc. Since this is the case, website generators are generally limited in the structure or "look" of the websites they create. The purpose of this project is to build a web-based tool to allow users to create their own website. Users do not need have any background of knowledge in programming languages, and users only follow the designed logic to make up their own website. This website creator tool should meet with certain functional requirements, such as the project should have login system for each user. Also, the website creator tool should meet with certain nonfunctional requirements, such as the project should be implemented on an always-on server located in COHH 2101. Designers should follow the software engineering design process to plan and complete the project. Moreover, designers should follow software engineering ethics during all project process.

**Richards, Cameron** "A Comparative Analysis of Fugal Composition from Baroque to 20th Century Modern" (Matthew Herman)

This paper focuses on analyzing the compositional styles, structures, forms, and orchestration methods utilized in fugal compositions from the Baroque style period, through 20th Century modernist music. The fugue as a compositional style has been used in Western music for over four-hundred years, and this paper is seeking to understand how the fugal style has evolved over time throughout four unique stylistic periods in Western music history. This paper outlines the structure and theoretical model of a fugue in the first chapter, to establish a groundwork for readers unfamiliar with music theory. Each of the next four chapters of this text is a multi-faceted analysis of a fugue that can be considered archetypical for a given style period. J.S. Bach's BWV 578, the

fourth-movement of Mozart's Jupiter Symphony K. 551, the Sanctus from Verdi's Requiem, and the first-movement of Bartok's Music for Strings, Percussion, and Celesta are the pieces used to represent the Baroque, Classical, Romantic, and 20th Century periods respectively. Each of these well-known fugues will serve as an archetypical example of stylistic compositional methods used in their respective style periods for comparison.

**Riggle, Michael; Chebchoub, Fatima; Jaiswal, Dimple** "Biocloud Load Balancing Algorithm" (Michael Galloway) Performing high level genetic processing with help of command line tools every time is very difficult for researchers and also requires use of personal hardware. To ease the job, a standard web interface system was developed called BioCloud, to help researchers to perform bioinformatics job and access data anywhere. The bioinformatics data is very complex and dense and, in order, to add high availability feature, the current system is not efficient in terms of performance and needs fast processing. Thus, designing an algorithm to balance the load on system will substantially result in a more coherent and efficient system. The bioinformatics job are assigned simultaneously in computing cluster environment. This makes scalability difficult to attain and deciding which job to be scheduled first is primary question. Adding a machine learning approach will assist to make wise decisions for scheduling a job. The decision making will be basically based on analyzing hardware utilization of a particular job and then, manipulating resources according to requirement of job. This will lead to dynamic utilization of resources and will gradually enhance the performance of system and build a robust system.

**Ringo, Wyatt; Gupta, Sanju** "Scanning Electrochemical Microscopy of Transition Metal Carbides (Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub>) MXenes Phases with Different Interlayer Spacing for Renewable Energy" (Sanju Gupta) Two-dimensional (2D) layered materials are increasingly studied in effort to discover new compounds and the fascinating properties engineered by their sheet-like structure. Graphene, atomic layer of carbon, is the most researched among 2D materials, albeit limited to just carbon in its composition. Recently, a new emergent family of 2D transition metal carbides and carbonitrides – so called "MXene"- are synthesized that may have wide-ranging applications, including energy storage, polymer nanocomposite fillers, water purification, transparent optical conductive coatings and electronic devices. Nevertheless, before the best application is identified, the fundamental physics of these materials must be understood and therefore synthesis-structure-property relationships must be established. To our expanding interests in this emerging class of materials, we investigate the structure and properties of layered transition metal carbides (Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub>) MXenes phases for renewable energy prepared by collaborator. We employed electron microscopy, optical absorption spectroscopy, Raman spectroscopy and advanced electrochemistry to determine surface morphology, nanoscale structure, lattice vibrational properties and surface sensitive electrochemical properties at solid/liquid interface.

**Roberts, Elizabeth** "Local Radio and Websites: How Radio Stations in the Tri-State Area Use Their Websites and Social Media to Engage Audiences" (Enakshi Roy) This study explores how radio stations are using their websites and their social media pages to disseminate their content and interact with audiences. Websites of radio stations now occupy a prominent position in a station's programming and station managers dedicate considerable resources towards their maintenance. We hence ask these following research questions: RQ 1: What types of information do radio stations include on their websites? RQ 2: Are station websites streaming audio? RQ 3: What levels of interactivity and accessibility are available on the websites? RQ 4: What are the primary purposes for which radio stations use social media posts? a content analysis was done for this study. The sample was websites of 150 radio stations in Kentucky, Ohio and West Virginia that were randomly selected. The period of study was three months in 2018. The findings show most of the stations have the presence of source-oriented information such as information about shows and DJs. However, the stations are lacking in the transaction space which can be used for fundraising and selling station merchandise. Most radio stations are irregular in their social media use and can improve their social media practices.

**Robinson, Taylor; Dobler, Jacob; Gupta, Sanju** "Electrochemical Desulfurization of Molybdenum Disulfide (MoS<sub>2</sub>) Supported on Reduced Graphene Oxide (rGO) as Nanocatalysts for Efficient Hydrogen Evolution" (Sanju Gupta) Recent development of two-dimensional layered materials including graphene-family and related nanomaterials have arisen as game changer for energy, water and sensing applications. While graphene is a form of carbon arranged hexagonally within atomic thin sheet, MoS<sub>2</sub> is becoming a popular, efficient, and cost-effective catalyst for electrochemical energy devices, compared to expensive platinum and palladium catalysts. In this work, we electrochemically desulfurize few-layer molybdenum disulfide (MoS<sub>2</sub>) and aerogels with reduced graphene oxide (rGO) prepared hydrothermally, for improving hydrogen evolution reaction (HER) activity via point defects (S-vacancy). Moreover, the interactions between rGO and MoS<sub>2</sub> components create emergent heterostructures with desirable physicochemical properties (specific surface area, mechanical strength, faster diffusion, facile electron and ion transport) enabled by chemically bridged (covalently) tailored interfaces. We demonstrate that with an optimized number defect density, particularly by exposing the edges of MoS<sub>2</sub> layers and nanowalls in graphene-MoS<sub>2</sub> 'hybrid' aerogels, interfacial processes during catalytic

reactions are accelerated. To understand the effects of defects on HER activity, we varied the applied potential and operating duration for optimized defect density. This study offers a unique method for tuning the properties of layered MoS<sub>2</sub> and hybrids as promising, cost-effective and efficient nanocatalysts and establishes the structure-catalytic activity relationships via scanning electrochemical microscopy at electrode/electrolyte interface besides mapping electrochemical (re)activity and electro-active site distribution.

**Robinson, Tyler** "Revitalization in What Ways Can Architecture Change the World" (Shahnaz Aly)

While the common person may view it as an art form and a use of functionality, architecture itself has more meaning. Some communities in today's society are thriving. The architecture connected with those places display this. However, there are some communities that are not so lucky. Architecture has the power to change this. One of architecture's unique abilities is to revive a dying community. Constructing buildings that not only please the eye but give people a purpose to go to areas that otherwise they would not visit creates opportunity and growth for an environment. The objective of this project is to show that we have a responsibility as humans to shape every aspect of the world we live in positively, and the answer to this is using architecture. The purpose of this project is to revive the Portland area in Louisville Kentucky. The area is dying and for the past 13 years has been listed as a national "Preserve America Community." Through the use of a new recreational facility this will change.

**Rogers, Luke** "October 25-27, 2010 North American Mid-Latitude Cyclone: Reanalysis" (Joshua Durkee)

The Midwest and Northern Great Plains have attributes that sets the regions apart from the other regions within the United States. Some of the attributes that set these regions apart from others, are its continental climate which creates an environment of extremes from hot conditions to brutally cold conditions. As fall transitions into winter across the two regions, cold and dry air masses from Canada and even from the Arctic Circle invade the area from the north. Sometimes as the cold air masses from the north dive south into the United States, they collide with warm and moist air masses from the Gulf of Mexico. The collision between the cold and warm air masses creates a tight gradient of temperature and this area is where the jet stream is located. Low pressure systems form along the jet stream and strengthen depending on different atmospheric dynamics. The main point of this research and analysis is to study and understand the development of a mid-latitude cyclone. This reanalysis of a very strong North American mid-latitude cyclone can help meteorologists understand the development of these types of systems. New opportunities for future work could be a reanalysis of mesoscale development within mid-latitude cyclones.

**Rooney, Brigit** "Assessing the Relationship between Tourism and African Elephant (*Loxodonta africana*) Habitat Use in Zambezi National Park, Zimbabwe" (Bruce Schulte)

As charismatic megafauna and a flagship species, African elephants (*Loxodonta africana*) are vital to the African tourist economy. Conversely, high levels of tourism can induce behavioral shifts that push desired animals into less frequented areas and disrupt natural behaviors. In order to examine this trade-off, African elephant behaviors were studied in Zambezi National Park (ZNP) near Victoria Falls, Zimbabwe. Over the course of 14 weeks during the dry season, in-person observations and camera traps in ZNP were used to collect GPS, behavioral, demographic, habitat type, and environmental data from elephant sightings. As a proxy for human presence throughout the park, GPS data were collected for each vehicle sighted in ZNP. The GPS data of vehicles and elephants were plotted on Google Earth to show a visual representation of their spatial relationship. Analyses found that elephants were more frequently sighted in areas with fewer vehicle sightings and at times corresponding with hours the park was closed. Elephant numbers were also inversely related to vehicles numbers in given locations. These results support prior findings that elephants modulate their movements to avoid areas and times of high human presence. Goals of this work are to inform tourism policy and promote sustainable conservation practices.

**Ruskowski, Keeley; Stone, Martin** "Heavy Gravity Diminishes Plant Growth" (Martin Stone)

As our civilization explores space, there is a need to examine the effects of gravity on plant growth. We examined the effect of heavy gravity on the growth of the radish, *Raphanus sativus* L. 'Sodbuster'. Plants were grown in 25 cm deep tubes for 49 days while being centrifugally spun constantly on a custom-built device in a heated greenhouse at normal earth gravity, 1G, twice and four-times earth gravity, 2G and 4G, respectively. All aspects of plant growth was diminished as gravity increased including leaf number, plant height, shoot dry weight, and root dry weight. The inverse relationship between plant growth and gravity must be considered if plants are going to sustain life for long periods of time in heavy-gravity space.

**Ryan, Nathan; McKinney, Dallas; Cahill, Olivia** "Using PPGIS in the Mapping and Analysis of WKU's Bike Racks, Stairs, and Walking Paths" (Kevin Cary)

Introduction: This presentation is based off an analysis project me and my group did in Kevin Cary's GISC 417 class. Our goal was to derive network flow around campus by collecting sidewalk, crosswalk, stairs, buildings, and bike rack locations to determine walking distance away from bike racks to highlight areas around campus

that are not bike accessible, and areas without bike racks. Methods: Data was directly collected using PPGIS with Collector for ArcGIS and Survey123 for ArcGIS. Data was then manipulated and analyzed within ESRI's ArcGIS software. Results: Large areas around the football field and around the Kentucky apartments are not currently supported with bike racks. Discussion: We believe that every area around WKU's main campus should be within a 2-minute walk away from the closest bike rack. Having open areas allow for network congestion, especially in hot spot areas. Since data was collected using PPGIS, the data differed dramatically from person to person. And since data was independently collected, brought in bias.

**Ryan, Travis** "Communication Goals of American Universities: A Social Media Content Analysis" (Scott Lasley) Social media is a key communication tool for American universities. This research is an analysis of the social media goals of universities. In particular, this research explores whether universities are promoting academics, athletics, or the arts as a way to recruit students and increase their reputational capital. 3000 tweets were collected from each university in the NCAA Division-1 Football Bowl Subdivision. In total, roughly 400,000 tweets have been scraped and classified using an automated script to assess tweet content for emphasis on athletics, academics, and the arts. In addition to academic quality and net investment into athletics, other variables included in regression analysis include school location, size of school, and on field success. Results indicate that schools with smaller athletic budgets are communicating more about athletics on social media as a way to gain reputational capital. This research provides insight into what role college athletics plays in university communication and how these universities portray themselves to stakeholders. Particular emphasis was given to the concept of university rebranding as a broader marketing strategy for student enrollment.

**Sage, Emily; Bell, Savannah; Gipson, Hunter; Cason, Brendan;** Seged, Maor "2019 SoutheastCon Robotics Competition" (Mark Cambron)

The 2019 SoutheastCon Hardware Competition is based in the year 2069, where mankind has colonized the Moon and Mars. The increased space travel has resulted in a hazardous amount of debris. Thus, mankind is in need of a device to clean space debris to ensure the safe continuation of space travel. The situation will be modeled by a flat playing field. The goal of the project is to create an autonomous device that efficiently cleans enough debris to ensure safe conditions on the playing field. Success will be defined by meeting the following requirements: 1) the robot is fully autonomous, 2) the robot accurately detects debris color, 3) the robot disposes of debris in the corresponding color base, 4) the robot returns to the correct home base and raises flag, 5) the robot avoids collisions. The project will be completed using Systems Engineering techniques to effectively apply and integrate mechanical and electrical systems. Based on the V-Model Project Lifecycle, we will develop thorough design documentation to aid seamless fabrication. Parallel development of a mechanical systems prototype and navigation prototype will evolve into the final, integrated robot. The device will compete in Huntsville, AL on April 12.

**Sairajeev, Sasha;** Williams, Kevin "Synthesis of Platinum Anticancer Compound Oxalato(1,4-dimethylpiperzine)platinum(II)" (Kevin Williams)

Cisplatin is a platinum-based chemotherapy drug that targets breast cancer, head and neck cancer, lung cancer and testicular cancer. It is found to be very effective in treating testicular cancer with a maximum success rate of up to 85%. This research involves the synthesis of a compound that is structurally similar to cisplatin, oxalato(1,4-dimethylpiperzine)platinum(II). The structural differences from the original cisplatin compound can lead to a preference for DNA targets over the more abundant but less active protein targets. The compound has a piperazine ring that forces the methyl groups to be directly in the platinum coordination plane, unique from other compounds we have studied. This compound was made to be more water soluble by replacing chloride with oxalate. Moving forward, the reactivity of this compound will be tested with readily available biomolecules methionine and guanine, which are the primary protein and DNA targets for platinum compounds. The compound will eventually be tested for toxicity in cancer cell lines.

**Sauer, Robert** "Scalable Containerized Security Training Environment" (Guangming Xing)

The primary issue with testing security vulnerabilities is the hands-on availability to manipulate sensitive data and the reproducibility of the training environment. The intent of this project is to develop a portable application which is hosted on a server to provide an environment to safely conduct security training methods and protocols. The project will be scalable to handle from a few to a multitude of users concurrently using a single server. For many students to perform security training simultaneously, each student must be directed to a sandbox environment, a container, where one student's actions do not affect the website or database of other students. Furthermore, such environments should be readily deployable into any environment to suit the needs of the instructors. The anticipated outcome will be to provide a useful educational tool to enhance cybersecurity education with hands-on, interactive learning for professors at universities and high schools.

**Scanlon, Kyla** "The Impact of Terrorism on Consumer Sentiment: Evidence from Twitter Data" (Lily Zhuhadar) There is significant research in determining after-effects of terrorism on GDP and the stock market but current literature lacks a qualitative look at the emotional stance of the consumers after attacks occur. This project

attempts to link the impact of attacks to consumer responses on social media sites. In this research I conduct a sentiment analysis on textual data surrounding terrorist attacks, with data collected from Twitter. The questions asked are (1) can we track an emotional stance of the public and (2) can social media predict a numbing effect / desensitization? RapidMiner was used to conduct a sentiment analysis on tweets collected from different terrorist attacks over the course of 2011 – 2018. I first examined the affective state of the sentences through topic sentiment analysis, then implemented frequency tracking to determine the most used keywords. That was followed by text clustering to determine the central point of the conversations, and a mapping of polarity over time. The results show that there are keywords that become central to conversation, and enable continued discussion. However, there is a subsequent numbing effect that occurs, as the polarity diminishes over time. There is an ongoing process of desensitization, evidenced across social media platforms.

**Schlabach, Kenneth;** Ha, Dat Thinh; Moon-Soo, Kim "Specific Gene Detection and Quantification via Zinc Finger Protein and Quantum Dot Complex with Graphene Oxide Nanosheet" (Moon-Soo Kim)

With the accelerating threat of antibiotic resistant pathogens, rapid specific gene detection has become critical in healthcare. Current methods suffer in time constraints as well as requiring specialized equipment. This research uses Zinc Finger Proteins (ZFPs), which can bind to specific sequences in double-stranded DNA, to detect antibiotic resistant genes (ARGs). ZFP construct tetM-1332 was engineered to bind tetracycline resistance gene (tetM) and cloned into a pMAL vector. The ZFP was expressed in E. coli and then purified using an amylose affinity column chromatography via maltose binding proteins in the pMAL vector. The ZFP was labeled with quantum dots (QDs) (photo-fluorescent nanoparticles) and was adsorbed onto graphene oxide (GO) two-dimensional nanosheet that quenched the quantum dot fluorescence. In the presence of its target DNA sequence, the ZFP-QD complex detaches from the GO upon binding to its target DNA, restoring the fluorescence. The limit of detection was determined with different concentrations of target DNA. This system allows for accurate detection of ARGs faster and simpler than traditional methods. Overall, the combination of ZFP detection specificity and GO shows promise for this novel technology in a point-of-care application.

**Schulte, Sarah** "Sound and Emotion: The Use of Music in the Cinematic Experience" (Matthew Herman)

In an effort to portray the radical importance of music in stimulating emotion within cinema, to appeal to an audience's selective attention to sounds, and to detail the process of creating an original film score, I have scored WKU student Tori Mills' short film "Come Up for Air." Film music is originally defined as any music which accompanies a film, though in modern times it is more specifically music intended to advance the film's narrative. Music has played an increasingly important role in transmitting emotion to film audiences, feeding the psychological connection between spectator and on-screen action. To achieve this emotional connection, a film composer is faced with compositional choices with regard to harmony, rhythm, and instrumentation choices, as well as technical options ranging from virtual instrument manipulation to live orchestral recording. In composing the original score for "Come Up for Air," I used a hybrid of virtual instrumentation and live recording coupled with specific harmonic, rhythmic, and instrumental choices to convey the protagonist's shifting mood from frustration to understanding, and from youthful hope to defeat, thus facilitating empathy by the audience toward the main character.

**Scott, Jamie; Parker, Olivia** "Mirror Mirror: A Look into Muscle Dysmorphia" (Frederick Grieve)

Muscle dysmorphia (MD) is a subcategory of body dysmorphic disorder. With MD there is an extreme desire to gain body mass, and this is characterized by many psychological and behavioral symptoms. Olivardia (2001) proposed that mirror checking is a symptom of MD. The purpose of this study is to continue the investigation into mirror checking as a diagnostic symptom of MD. Our hypothesis was that participants who score higher on a scale of MD will spend more time looking in a mirror, and will look more often, than those who score low on the scale of MD. Participants were males enrolled in Psychology courses at Western Kentucky University. Participants were placed in front of a full-body length mirror and completed questionnaires regarding levels of MD. The session was recorded to allow coding for mirror-checking behavior. Whereas our hypothesis was not supported, we did find that participant scores on the Drive for Muscularity Scale were correlated with mirror checking behaviors. This correlation can be used to improve diagnostic criteria through more well defined observable behaviors. Data collection is still ongoing. We predict that with more data the trends will increase in strength and more statistically significant correlations will be produced.

**Scott, Morgan** "Fighting Addiction through Design" (Shahnaz Aly)

I am proposing a rehabilitation center for the city of Louisville, Kentucky to serve as a facility specifically for the treatment of substance abuse and behavioral health. As substance abuse and mental health have become a national crisis in the United States, thousands of people are suffering daily to fight a battle against addiction and themselves. Given the circumstances currently effecting our society, it is crucial to understand the need for treatment against this nation wide epidemic. A rehabilitation center located in Louisville, Kentucky would provide the best efforts of recovery. Through investigation of current rehabilitation facilities, the focus of my design was to demonstrate a deinstitutionalized method with design features that contribute to best healing

efforts. To deinstitutionalize the design of treatment facilities, this project expresses a space of a sustainable, homely, comfortable solution for rehabilitation health services. By implementing elements that comply with healing, the architecture allows the occupants to connect to the spaces. This project concludes a design solution to welcome healing and make an impact towards the best methods of therapeutic practice.

**Seaver, Hannah;** Wininger, Steven "Effects of Multitasking on Self-Selected Pace and Distance while Walking" (Steven Wininger)

**Problem** This study examined the effects of multitasking (i.e. texting) on a motor task (i.e. walking or running). The main objective was to determine if there is an adverse effect of multitasking on self-selected walking pace/distance. **Hypothesis:** Participants in the control trial will walk or run at a faster pace, thus traveling a longer distance. **Subjects:** Seventy undergraduate students completed the study (52 females & 18 males). **Procedure:** During session one, participants were screened using the ACSM risk appraisal form. Only participants classified as low risk were allowed to participate. Participants completed a 3-minute step test (to estimate their VO<sub>2</sub>max), a working memory test, and demographic questionnaires. **Results** Participants walked/ran at a faster pace during the control trial as compared to the texting trial. A repeated measures ANOVA for the main DV of distance completed showed participants assigned to the control condition of no cognitive task performed best (longer distance) compared to those who were texting ( $F(1,69)=56.67$ ,  $p < 0.001$ ,  $\eta^2=0.45$ ). **Conclusion:** The results from this study show that attempting to simultaneously engage in exercise and a cognitive task lowered performance on self-selected pace during exercise. The results offer important insight to athletes, physical therapists, exercise practitioners, and/or physicians with regard to a key factor involved in regulating exercise intensity.

**Sellers, Emma** "Energy Efficient Water Desalination – Challenges and Opportunities" (Farhad Ashrafzadeh)  
**Fresh water:** the often-overlooked life-force and foundation of our socio-economic and industrial development. This study will explore some of the steps being taken to create energy efficient ways to turn salt water into fresh water using the process of desalination. As the world reaches higher levels of industrialization and the population continues to increase at a steady rate, potable water is becoming a scarcity at an alarming rate. Accessible fresh water makes up only 1% of the world's water resources. The fact that saline and ocean-based water make up the rest of the earth's water supply necessitates the development of innovative energy-efficient methods of desalination. In this paper, we will give a brief overview of desalination systems as a whole: intake to waste management – looking at the fundamental aspects of these systems. Then we will contrast and compare some of the most utilized desalination methods in an attempt to improve upon their pitfalls and build on their strengths, functionality, and energy efficiency. Finally, we will explore a cost-effective, small-scale water desalination method that uses renewable energy sources to supply clean drinking water in underdeveloped and disaster-stricken regions.

**Sennett, Madison** "Enclothed Cognition: How Clothing Can Affect Human Behavior" (Carrie Cox)

The way one dresses can directly correlate with how one feels, how others perceive that person, and the success of an individual. This is called enclothed cognition (Blackeslee, 2017). While wearing certain garments, the psyche will be influenced and may alter the individual's performance. By wearing professional garments, psychological processes manifest that cause the wearer to conform to professional behavior. In this way, the clothing becomes powerful and important. Clothing affects individuals' behaviors, as well as how others perceive one another. The way one dresses can reflect an individual's personality, interests and professionalism. Putting an outfit together takes time especially when we need to look professional. Little things can make a huge difference in success. Test scores, confidence, and actions can be altered simply based on wearing professional clothing. Dressing well boosts individuals' confidence and success. While studying for exams and being prepared influence success, clothing choices impart professionalism and confidence. For additional impact on our ability to perform professionally, an individual must remember to dress professionally and appropriately for his/her job, event, interview or occasion. In doing so, dressing well will ultimately lead to performing professionally.

**Severs, Rachel** "A Collaborative Perspectives Approach for Understanding Effective Care Coordination in Autism Spectrum Disorder" (Ronda Talley)

Autism spectrum disorder (ASD) is a neurodevelopmental disorder that causes significant impairment in social and communication areas. The severity of the disorder can often result in a substantial degree and amount of service access and expenditures relating to a child's needs. This study examines the experiences of how family caregivers and service providers of children with ASD view service delivery using a basic qualitative research design. Ten participants (5 family caregivers and 5 service providers) were interviewed for the study. Interview data were collected and coded to produce a qualitative analysis of the experiences of these individuals who either care for, or deliver services to, children with ASD. Results indicate the top five themes for service providers and family caregivers included areas of: a) collaboration, b) education, c) family support, d) child-centered care, and e) accessibility and availability. These findings can inform and improve future service delivery to support family caregivers and their children with ASD.

**Sheppard, Lauren** "Teacher Intervention: Responding to Depression in Adolescents" (Jane Fife)

In recent years, there has been a sharp rise in reported cases of teen depression with no conclusive causation for the staggering increase. I examined the limited literature pertaining to intervention, and how teachers and schools may combat the rise in depression among adolescents. It is clear that teachers and schools must provide essential intervention services to their students. Such services may take various forms. Schools may implement universal school-based mental health awareness programs, which differ in structure; for example, some aim to increase mental health literacy among students and teachers, while others aim to provide students with coping mechanisms should they experience intrusive thoughts. However, the ultimate goal is to decrease stigma. Teachers may also establish classroom expectations regarding speech about mental illness so as to remove stigma, thereby creating a safe space for students who are neurodivergent. More specifically, however, teachers must become familiar with the signs and symptoms of depression that depressed teens may exhibit so that they may appropriately intervene should one of their students display such behaviors. Therefore, teachers must become aware of the various ways to effectively intervene, which may include holding a private teacher-student conference or simply suggesting further assistance via the school counseling center.

**Sheth, Arpan** "Intrahepatic Cholestasis as High Risk in Pregnancy" (Xiuhua Ding)

Intrahepatic cholestasis of pregnancy (ICP) is defined as cholestasis in which bile flow was stopped or reduced and serum bile acid level elevated during pregnancy due to the increased pregnant hormones. It most commonly occurs in the third trimester of pregnancy. Most common symptoms for ICP are severe itching in hand and feet, especially during the nights. Other symptoms include dark urine color, pain in the upper right quadrant because of gallstones, fatigue, loss of appetite and depression. Physicians will diagnose ICP when maternal serum bile acid level is greater than 10  $\mu\text{mol/L}$ . ICP occur by various factors like environmental factor, hormonal balance, and genetic component. Women with ICP will have a higher risk of premature deliveries, stillbirth, and fetal distress. In Cholestasis, pregnant women have chances of 19% to 60% of premature deliveries, 0.4% to 4.1% stillbirth. And 22% to 33% of cases suffer from fetal distress due to serum bile elevated level. Currently, Ursodeoxycholic acid (UDCA) is used as a drug of choice. ICP usually does not cause harm to the mom, and the symptoms usually disappear after the delivery.

**Shifflett, Thomas; Nisbet, Daniel; Saunders, Brady; Driver, Caleb**; ; Young, Sonia "Reliability of the Modified Clinical Test of Sensory Interaction on Balance Using a Virtual Balance Device" (Sonia Young)  
Introduction the VirtuSense VirtuBalance System™ is a balance assessment device that provides information about postural sway. The Modified Clinical Test of Sensory Interaction on Balance (mCTSIB) is a commonly used measurement of balance in clinical settings that has been shown to have excellent reliability and validity. The purpose of this study was to evaluate test-retest reliability, minimal detectable change, and standard error of measure of this device while assessing balance using the mCTSIB. Methods This study is a methodological, one group design with participants performing the mCTSIB protocol using the VirtuSense VirtuBalance system™. Mean center of gravity sway velocity will be measured on two separate occasions. An intraclass correlation coefficient (ICC) and paired t-test will be used for analysis. Results Data collection is currently ongoing with this study with 27 of the 54 participants already completed. Discussion There have been few studies conducted involving the VirtuSense VirtuBalance System™. Increased portability and significant cost savings could lead to the opportunity of this being an alternative device to assess postural stability in more clinics as well as research environments.

**Siewers, Anna**; Brausch, Amy "Non-Suicidal Self-Injury, Suicide Attempts, and Resilience in Ethnic and Sexual Minority Groups" (Amy Brausch)

Objective: Non-suicidal self-injury (NSSI) and ideation are known predictors of suicide attempts. Adolescents minorities are at greater risk for suicidal behavior (Cheref et al., 2015). However, these groups are understudied (Cha et al., 2017). The goal was to examine minority experience's role in NSSI, suicide attempts, and protective factors. It was predicted that minorities would be more likely to report lifetime NSSI or suicide attempts than non-minorities. It was also predicted that minorities would report lower levels of resilience, life-satisfaction, and subjective happiness compared to non-minorities. Method: Data were collected from 2820 college students. Participants answered questions about demographics, NSSI, suicidal ideation/attempts, resilience, life satisfaction, and subjective happiness. Results: Chi-square analyses found that Hispanic/Latinos and Native Americans were more likely to report NSSI and suicide attempts, and all sexual minority groups were more likely to report NSSI and suicide attempts. Heterosexuals had higher scores on all protective factors than all sexual minorities, but differences between ethnic groups were only significant for resilience and life satisfaction. Conclusion: Minorities reported a higher likelihood of suicide attempts and NSSI than non-minorities. Life satisfaction and subjective happiness were reported at lower levels for all minority groups, while ethnic minorities reported higher levels of resilience. Future studies can focus on resilience and differences in suicide attempts/NSSI between minorities and non-minorities.

**Sims, Draven** "EBSCoR Student Internship for Journeyman Tool and Design, LLC" (Kevin Schmaltz, Troy Robertson)

During summer 2018, I collaborated on a project between Journeyman Tool & Design, LLC and WKU's School of Engineering and Applied Sciences through an internship program funded by Kentucky NSF EPSCoR. The goal of this internship program is to augment student experiences and better prepare the future professional workforce in manufacturing and engineering environments. My poster will detail the results of this internship. My activities within the project focused on developing tooling processes needed to manufacture automotive fittings. Typically, fittings complexity requires tooling components for the production castings that have very accurate dimensional tolerances to hold the fittings during the manufacturing process. Prototype tooling samples require numerous iterations to experiment with the form, fit, and functionality of the design. Both 3D printing and CAD software are used in the design and redesign of the tooling inserts to meet required manufacturing fabrication tolerances. My summer project resulted in several successful tooling designs proofed for manufacturing. The complexity involved in developing the final tooling design proved to be a full-capacity project for the scope of my internship. My involvement and learning experiences provided me with successful exposure to a real industrial application that required hands-on engineering and design.

**Slaughter, Mariah** "Determination of Madtom Shelter Preference" (Philip Lienesch)

Madtom catfish, members of the genus *Noturus*, are common in the waters of the Southeastern US. A previous study observed that madtoms in the Green River, Kentucky, preferred to shelter within old mussel shells compared to the rock cervices. A laboratory study on the Carolina Madtom (*Noturus furiosus*), found that they did not utilize mussel shells and preferred rocks as shelter. I conducted a similar laboratory study to determine which microhabitats the Mountain Madtoms (*Noturus eleutherus*) prefer. Shelter preference was determined by offering the madtoms shelter options (rocks or mussel shells) in 10-gallon aquaria. After the animal had acclimated to the tank for 24 hours the tank was inspected, and the animal's shelter choice recorded. Based on results from preliminary trials the Mountain Madtoms selected to use the mussel shells over the rocks. Freshwater mussels are one of the most endangered taxa and are currently declining throughout their range. If madtoms rely on mussel shells for shelter, the loss of freshwater mussels may cause a decrease in madtom populations within Kentucky waterways, negatively impacting the overall ecosystem.

**Smith, Jonathan** "A Description of the Axolotl Inner Ear" (Michael Smith)

The goal of this research paper is to provide a more in depth description of the Axolotl (*Ambystoma mexicanum*) inner ear. While it is known that salamanders are able to regenerate their hearing capabilities it is not know how exactly they accomplish this. One way that hearing loss can occur is if there is damage to the hair cell patches that are located within in the inner ear of both salamanders and humans. These patches transmit sound from the ear to the nervous tissue and then to the brain. When these patches are damaged it can cause partial if not complete deafness in humans. It is hypothesized that this may also be the case for axolotls as well. By being able to provide a full description of where all of these patches are located within the inner ears of axolotls these patches can then be studied in further experiments. Hopefully future research will be able to determine how these animals are able to restore their hearing and be able to emulate these actions in mammals such as humans to possibly one day find a way to cure those who have gone deaf due to hair cell damage.

**Spalding, Helen** "The Valley of the Fallen: The Intersection of Religion and Nationalism in a Spanish Civil War Monument, 1939-1980" (Tamara Van Dyken)

Nestled in the Sierra de Guadarrama mountains of Spain in northwest Madrid is the Valley of the Fallen (El Valle de los Caídos). This Spanish Civil War monument was originally constructed in 1940 as a celebration of the fascist victory of the war over the radical leftist republicanos. The monument made clear the Catholic ties that dictator Francisco Franco's regime planned to uphold through its religious spaces such as an abbey and basilica. Since the monument's construction and into the present day, the public eye has mainly associated the Valley of the Fallen with the Francoist dictatorship. However, this paper argues that analyzing the Valley of the Fallen from a religious perspective can help historians to better understand Spanish historical memory of the Civil War and the Francoist regime. I argue that although it is impossible to separate the Spanish Catholic Church's association with the Francoist regime, they are not one-and-the-same. The Church during and after the regime sought its own identity within and apart from Francoism which is evident in the reputation and character of the Valley of the Fallen. This can help historians to better understand the complex role of religion in twentieth-century fascist regimes.

**Stackhouse, Shakira** "Forecast Analysis of the Ozarks Flood of April 2017" (Joshua Durkee)

During the last week of April in 2017, a devastating flooding occurred in the Missouri Ozarks which. A total of 86 million dollars of damage and costs resulted from this flooding event, proving it to be a dangerous and powerful storm. The purpose of this study was to analyze synoptic weather variables that contributed to this event to discover the cause of the event. By analyzing a variety of pressure maps and satellites, the synoptic weather variables that were involved in this event were able to be identified. These variables included

vorticity, divergence/convergence, relative humidity, temperature advection, thickness, the omega equation, fronts, jet streams, etc. These variables led to the conclusion that moisture was being brought into the Missouri Ozarks from the Gulf of Mexico for a long period of time due to a stationary front, which led to torrential rains. A line of storms that made their way through the Missouri Ozarks and overflowing rivers also contributed to the flood. With all of these factors coinciding in the forecast area over a time span of three days, a historical flood resulted.

**Stephens, Graham** "Investigating the Correlation between Depression and Word Usage" (Lance Hahn)  
In recent years there has been a rise in researchers looking for ways that word usage relates to mental illnesses. This particular research attempts to expand upon and replicate the findings that an increased use of absolutist words (Al-Mosaiwi & Johnstone, 2018) and first-person pronouns (Brockmeyer et al., 2015) are indications of clinical depression. Approximately 5,000 text posts from various internet forums were gathered, and these posts were categorized as either depressed or non-depressed, based upon their content and forum of origin. A database of keywords with a hypothesized link to depression was created, and a neural network was developed to distinguish between depressed and non-depressed posts by analyzing the frequency of occurrence of these keywords. This study hypothesized that absolutist word usage would possess a strong relationship with depression, first-person pronoun usage would possess a modest correlation, and depressed-emotion words would possess a weak correlation. These hypothesized associations and the effectiveness of the neural network at categorizing the text will be described. Potential applications of this work will also be discussed.

**Stevens, Bailey** "An Analysis of the Severe Weather and Tornado-Producing Supercells in Syracuse, KS on May 18, 2018" (Joshua Durkee)  
Although the 2018 tornado season was relatively quiet, strong and unique storm structure was still observed throughout the month of May. While participating in the WKU Field Methods in Weather Analysis and Forecasting course, students had many opportunities to analyze and document severe storms across the Great Plains, also known as Tornado Alley. The purpose of this study is to reveal the weak atmospheric circulation that remained favorable for severe storms and ultimately, the formation of two tornadoes on May 18, 2018. This study provides a thorough analysis on the large and local-scale conditions favorable for this event to occur. The data and methods included analyzing radar, satellite, and various lower and upper-atmospheric features to gain a better understanding of the storm's maturing and decaying stages. While the overall impact was minimal due to its location, the various outcomes that this storm produced gave insight on the relatively weaker storm ingredients that took place during this event. Regardless, despite these weaker conditions, this study shows that conditions remained favorable for the formation tornadoes and other widespread severe weather conditions.

**Stewart, Alexander** "De Novo Prediction of the Tail and Capsid Structure of Mycobacteriophage MooMoo" (Claire Rinehart)  
Despite the prevalence of isolated Mycobacteriophages, surprisingly few have had their structure characterized. The purpose of this study was to reconstruct the structural elements of Mycobacteriophage MooMoo using the molecular modelling systems I-TASSER and Rosetta. MooMoo is a singleton cluster siphovirus with a prolate capsid that has an approximately 4:1 length-to-width ratio. Prediction of the major capsid protein structure revealed possible similarities to the icosahedral capsid of HK97. Prediction of tail structure was consistent with other studies on Mycobacteriophage structure, with an  $\sim 28.5^\circ$  rotation and  $\sim 37$  Å between tail hexamers. Based on these findings, although MooMoo has a vastly different morphology, it may be similar to presently characterized phages. Further EM research is required in order to verify these predictions.

**Stivers, Abigail** "Scaffolding Students to Math Mindfulness" (Janet Tassell)  
Elementary students are increasingly developing anxiety and nervousness surrounding math: learning it, performing and solving it, and especially testing in it, even when low math ability is not the culprit. Negative math attitudes affect student test scores and achievement and are not beneficial to learning. Math anxiety disrupts cognitive processing and influences scores that show students' math learning. Math mindfulness is the state of being aware of math learning and attitude and emotions one has while engaging in mathematical thinking. I analyzed case studies and research in the field of math-related anxiety from the perspective of elementary students. In this research I argue that teachers, parents, and students can all have a role in developing positive math attitudes and helping students reach math mindfulness. Teachers and parents must first recognize their own math anxiety and learn how to model positive math attitudes, scaffolding students to positive math behaviors. Classroom setup can contribute to confidence in math, as well as teacher support and early parent intervention through the form of spatial awareness and number talks. The goal of decreasing math anxiety is scaffolding to math mindfulness, which students can use as a tool to promote positive math attitudes for life.

**Stone, Kelly** "Debt Accumulation and Economic Growth in Emerging Market Economies: Is Debt Promoting or Hindering Growth?" (Shannon Vaughan)

The International Monetary Fund (IMF) recently warned of the growing accumulation of debt in emerging market economies (EMEs) and the potential for debt crises, a clear warning for investors (Allen, 2018). While the IMF suggests investors may be better served elsewhere, EMEs hold an integral role in the international market as consumers, producers, and entrepreneurs. Despite regular research on advanced economies, middle-income countries like EMEs are often ignored. As EMEs grapple with their inability to overcome the current increase in the value of the US Dollar, this study works to understand how debt impacts economic growth and other governance indicators hindering growth through regression analysis. Analyzing EMEs will include variables drawn from World Bank and IMF databases including central government debt, regulatory quality estimates, and corruption control estimates. The results will assist in determining what policy options are best to promote economic stability in EMEs, an important task as their impact on the global economy continues to grow. This study will be part of a growing body of research aiming to help EMEs become fully advanced economies.

**Strunjas, Anna; Mishra, Ila; Ashley, Noah** "Effects of Sleep Fragmentation and Chemical Sympathectomy on Microglial Cells" (Noah Ashley)

An increase in obesity has led to a higher incidence of obstructive sleep apnea, which often leads to extensive metabolic, cardiovascular, and neurobiological damage and morbidities. Obstructive sleep apnea is associated with fragmentation of sleep due to repeated end-apneic arousal throughout the night. This study's focus was to observe possible effects that acute sleep fragmentation had on microglial cells and whether chemical sympathectomy could combat these effects. Mice were injected with vehicle (phosphate-buffered saline) or were given 6-hydroxydopamine (6-OHDA) and were then sleep fragmented for 24 hours. There was also a control group in which mice were injected with either vehicle or 6-OHDA but did not receive the sleep fragmentation. 6-OHDA is an agent used for chemical sympathectomy. It was hypothesized that if the adrenergic system is shut down, the proposed increase in microglial activity associated with sleep fragmentation will not occur. Immunostaining was performed to visualize the microglia in the hippocampus, Preoptic area, and cortex of the brain to assess the effect of sleep fragmentation on the number of microglia, microglia area, and ramification. Sleep fragmentation affected cell count in all three areas and cell area in the Preoptic area but had no effect on cell ramification. 6-OHDA was shown to have worked in combating the microglial activation caused by acute sleep fragmentation.

**Suarez, David** "Using Quantum Entanglement and Teleportation to Detect Stealth Objects by Radar" (Keith Andrew)

A quantum-based radar antenna's detection limits far exceed its classical counterpart through the quantum entanglement and teleportation of photons, the extent to which can be seen by a comparison of their respective Radar Range Equations (RRE). Here, we investigate the detection limits of quantum radar transmission, a process in which entangled photon pairs interacting with a local thermal environment are sent and reflected off of a stealth-based target cloaked with a low-reflectivity surface. The entangled-photon system preparation process utilizes a quantum circuit consisting of reversible operations performed on a two-qubit quantum state by a set of quantum logic gates. We model how the entangled photon - thermal environment system evolves over time using a Schrödinger-evolved X-state density matrix and a laser system with a finite decoherence time. Quantum correlations in entangled photon pairs received by the radar enhance the relative signal-to-noise ratio in the Classical RRE (CRRE). Quantum teleportation of the photon pairs is used to enhance the classical gain by effectively increasing the gain factor and resolution in the CRRE. Incorporating these effects into a Quantum RRE, our findings suggest that the extensive preparation of stealth-based surfaces fails to provide significant cover from an inevitable detection.

**Suggs, Michael; Wulff, Andrew** "An Analysis of Molybdenum Ores" (Andrew Wulff)

The Quartz Hill porphyry molybdenum (Mo) deposit in SE Alaska contains one of the world's largest concentrations of Mo in a multiply-altered quartz monzonite stock. The stock is cut by a variety of other igneous rock types and crops out over an area of several square kilometers. Ore minerals are generally found disseminated and in quartz veins that are randomly oriented throughout the intrusion. Samples were obtained from several locations and analysed using methods that mirror procedures commonly used in on-site investigations. Samples were catalogued and photographed at different scales to determine how the minerals (mostly Molybdenite) were distributed in the host rocks. Whole rock analyses and approximate modal concentrations were obtained using powder x-ray diffraction, employing a basic Rietveld approach. Mineral compositions were identified using reflected light microscopy, Raman microscopy and SEM-EDS. Emphasis was placed on identification and characterization of different hosts for Mo (and Cu) mineralization, and modelling ore paragenesis.

**Tadakaluru, Apoorva;** Reece, Michelle; Mkanta, William; Alamri, Abeer; Pope, Darnez; Thakur, Niyati; Ibrahim, Abdulgafar "Providers' Perspective on the Association between Acculturation and Substance Abuse Behavior among Refugees" (Michelle Reece)

Background: Refugees and immigrants to the United States experience various mental health difficulties and behavioral problems in the process of resettlement. Acculturation is a process of incorporating new cultural norms, language, and behaviors of a host country by immigrants. The corresponding issues related to the acculturation can aggravate mental health issues like substance abuse, and often provide distinct challenges for the providers in refugee health services. Purpose: to outline the relationship between the acculturation and substance abuse behavior among refugees from a provider's perspective. Methods: Mixed methods study, triangulated both quantitative and qualitative data collected during provider's survey, focus groups, and site visits to resettlement facilities and refugee health centers. Results: Substance abuse is one of the top three major health behaviors associated with refugees and their families according to providers' needs assessment. Besides, all the prior stress and trauma, social factors such as coping with a new healthcare system and culture, unemployment and low income, poor housing and neighborhood conditions, domestic violence and poor family relationships, help create the situations where refugees engage in substance abuse. Conclusion: The acculturation process combined with other complex, social factors exacerbates substance abuse behavior among refugees in America. Family based therapies and other culturally tailored interventions are needed to address substance abuse behavior among the refugee families.

**Tawasha, Isabella** "Inconsistency and Inaccuracy of Sizing within the Fashion Industry" (Carrie Cox)

The fashion industry strongly influences today's consumer. Specifically, the way a brand chooses to size their clothes has a direct impact on the way a customer views the stores where they shop and themselves. The issue here lies within the lack of choices women have access to find flattering and fashionable clothing. Although many companies will showcase models who are size 0-4, a study published by Deborah A. Christel and Susan C. Dunn of Washington State University found that, "The average American woman's (AAW's) clothing size is... between a Misses size 16-18, which corresponds to a Women's Plus size 20W." in another study, "Exploring Apparel Purchase Issues with Plus-Size Female Teens" by Laurel Dawn Romero and Young- a Lee, they found that clothing options are limited for teenage girls who are plus-sized or not the size of the "average" tween. Clothing is more than just something worn on bodies, it is a way for people to express themselves. This paper explores sizing strategies in the fashion industry and how widely inconsistent and inaccurate sizes are from brand to brand, thus many people struggle to find clothes that fit their body type.

**Thakur, Niyati;** Reece, Michelle; Mkanta, William; Tadakaluru, Apoorva; Ibrahim, Abdulgafar; Pope, Darnez; Alamri, Abeer "Oral Health Concerns in Refugees and Perceived Barriers to Care" (Michelle Reece)

Oral health needs among refugees is an enduring concern. Refugees are a high-risk population for developing oral diseases due lack of access to oral healthcare, dental products, nutritious food, and clean water leading to poor oral health status. Refugees face challenges in navigating unfamiliar healthcare systems in the host country. The purpose of the study is to assess the oral health concerns in the refugee population and the perceived barriers to care. Data from surveys and focus group discussions from Kentucky, New York, and Minnesota were used to identify the oral health problems from the consumer and the health provider's perspectives. History of access to dental care in country of origin, limited emphasis on oral health, perceptions of dental illness in the face of more critical care and life issues, cultural norms, and cost of care were found to be contributing factors to poor oral health. Oral health education, assistance with navigating the US healthcare system to access oral health care, along with routine counseling sessions and timely interventions can help reduce the disparities surrounding oral health needs and increase awareness of importance of good oral health to overall health and wellbeing.

**Therrien, Ilana;** Morris, Kate "ARM Architecture Support for Virtualization" (Jeffrey Galloway)

Virtualization has enabled the dissociation of software dependency from hardware. A host computer can present a guest, virtual, computer in an enclosed environment. Thanks to this process ARM architecture has become ubiquitous in commercial and professional computing platforms such as smartphones, tablets, and gaming or streaming hardware to name a few popular devices. Through the use of the low-cost Raspberry Pi computer, we evaluated the contrasting benefits and shortcomings of containerization versus hypervisor configurations. The changes in hardware resource utilization, overall power consumption, encapsulation, and accessibility were monitored. The results of the benchmark testing provided insight into how each method affected the hardware and ideal configurations demonstrating why virtualization has become proliferate.

**Thomas, Elizabeth** "Language and the Courtroom: Linguistic Strategies of Lawyers in Trials" (Ashley Stinnett)

Using language as a tool to assert social power has been a point of interest among linguists and linguistic anthropologists (Chu 2015, Phillips 1998). One area of particular focus is how language is used in the courtroom. During a case, lawyers must take a stance and assert themselves as authoritative and competent to their clients, the witnesses, the jury, and judges. One primary way lawyers achieve this is through

language. For this research project, I ask: What strategies do lawyers use when addressing different parties involved in a trial? in order to investigate this linguistic process, I conducted semi-structured interviews with prosecuting lawyers and located transcripts of public records of past murder and assault cases. I then performed a discourse analysis of the trial transcripts and the interview transcripts. My results show there is a correlation between the language strategies lawyers use, their perceived authority in the courtroom, and case outcomes. Additional findings suggest that lawyers also acknowledge the authority of other parties involved in a trial, such as the judge and jury, through their language choices.

**Thomas, Jamie** "Bioinformatics Services through Cloud Computing" (Jeffery Galloway)

This paper discusses BioCloud, a project with the intent to develop a deployable and highly scalable platform to support a wide variety of BioInformatic related tasks and greatly reduce the requirements for completing them. The platform achieves this by being designed and implemented using concepts of Cloud Computing which allows BioCloud to address the issues of large data storage and high processing requirements that cause a significant increase in complexity when dealing with BioInformatics. BioCloud simplifies the challenges of organizing this data using the file manager Gluster and handling the individual BioInformatic jobs by using containers generated and controlled by Docker and Kubernetes. BioCloud eases the process of using BioInformatic tools by offering a clean and straightforward web interface that follows modern design standards and allows users to navigate and comprehend without unneeded explanation while also being robust enough to function with the large variety of BioInformatic scripts that exist. In addition, this paper will also address the planned future of BioCloud including potential testing in a class environment and the integration of a self optimizing job handler.

**Thompson, Amanda; Willis, Morgan** "Chemical Protection of Ascorbic Acid and Incorporation into a Monomer" (Lawrence Hill)

In order to synthesize a polymerizable monomer containing ascorbic acid, TBS-protected ascorbic acid was first synthesized. Ascorbic acid was combined with tert-butyldimethylsilyl chloride in order to protect sensitive ascorbic acid functional groups along with triethylamine, N,N-dimethylaminopyridine, and dichloromethane and left to stir overnight. The crude product was filtered, washed in a series of base and acid washes, and rotovapped down to a yellow oil. Nuclear magnetic resonance (NMR) and thin layer chromatography (TLC) were conducted to determine purity of the product. The peaks from the NMR spectrum corresponded to the peaks expected, DCM, TMD, chloroform-D and either silanol or a fourth protected hydroxyl group. A small portion of the product was further modified with methacryloyl chloride and triethylamine to synthesize the monomer form of the compound. The monomer structure is still under investigation. The significance and implications of the project will be discussed.

**Thompson, Bailey; Thompson, Briley;** Rinehart, Claire; Rowland, Naomi; Staples, Amanda "Discovering and Comparing Bacteriophages Cici and Malec" (Claire Rinehart)

Bacteriophages are considered the most abundant living entity on the planet, yet relatively little is known about their genomic characteristics. Scientists believe that they could be a key alternative in cases of antibiotic resistance. The purpose of our analysis was to gain better insight into the vast diversity of bacteriophages. Using the host Mycobacterium smegmatis, phages Cici and Malec were isolated from enriched soil samples found within a 30 mile radius of Bowling Green, Kentucky. The morphology of the virus particle of each was determined by electron microscopy, while the genomic DNA was purified and analyzed through DNA restriction analysis and gel electrophoresis. The DNA was also sequenced, and the genomes annotated. Malec seemed to have a unique restriction pattern, unlike any other phage in the mycobacteriophage database. However, after genomic sequencing, it was determined that Cici and Malec both belong to different subsets of the a cluster. We compare similarities and differences between these two phages.

**Thornsberry, Brooke** "The Potato Chicken Game: Serious Music Pedagogy and the Benefits of Orff-Schulwerk" (Liza Kelly)

There are many types of music education pedagogy. One approach is Orff-Schulwerk, created by German-born composer and music pedagogue Carl Orff. Orff-Schulwerk is characterized by incorporating improvisation, body movement, visual art, and vocal or instrumental exploration. Through Orff-Schulwerk, foundational musical concepts are presented to children in the form of what comes most naturally: play. The goal of my presentation is to demonstrate that a quality, holistic music education can be formatted in a way that imitates playing. The method by which I will reach my goal is to guide the audience in an Orff-based lesson. The exercise will include materials such as a stuffed pumpkin, picture cards, and a set of xylophones. I will walk the audience through the lesson and challenge them to channel their inner child; they will improvise movements, sounds, and even instrumental ostinati or repetitive themes. The result, or significance, of my presentation will be to provide the audience with a firsthand experience of learning through play, and demonstrate the positive effectiveness of Orff-Schulwerk in a music classroom.

**Twidwell, Robert;** Hahn, Lance "The Impact of a Therapist's Use of Language in Computer-Mediated Communication" (Lance Hahn)

With technological improvements in written communication, using computer-mediated communication (CMC; e.g. text messaging) has become common. As healthcare fields adapt to use technology in practice (e.g. CMC therapy), it is important to understand communication practices of practitioners and the communication's effectiveness. Previous research (e.g. Al-Mosaiwi & Johnstone, 2018; Dirske et al., 2015) has explored how individuals with symptoms associated with mental illness (e.g. anxiety, depression) use CMC and the implications of their word usage in CMC, but little research has focused on therapists' language in CMC. This study examined the effects of jargon, layman language, and text speak on a CMC therapist's perceived attractiveness (i.e. likeability), expertness, and trustworthiness. To our knowledge, this study was the first specifically designed to exam therapist language in CMC-based interventions. Participants were 278 of Amazon's Mechanical Turk workers recruited because of their familiarity with technology and being located in the United States (age: M=36.40; gender: 43.2% female, 55.8% male, 1.1% other gender variant). Text speak negatively affected the perception of therapists compared to the other conditions (p

**Van Antwerp, Jennifer** "Winter Storm Benji in Northern Georgia" (Joshua Durkee)

December 8-9, 2017 brought one of the worst snow storms in history to northern Georgia. This storm, named Winter Storm Benji, shut down much of northern Georgia, left one person dead from electrocution, hundreds of thousands of people went without power, and Hartsfield-Jackson airport had to cancel hundreds of flights, leaving many people stranded in one of the world's busiest airports. The purpose of this study was to determine the dominant atmospheric forcing mechanism(s) that caused this event to happen. The data for this study is in the form of various maps showing different attributes of the atmosphere at varied levels in the atmosphere. Each map was analyzed according to the Quasi-Geostrophic theory and associated the associated Omega and Geopotential Height Tendency equations. In the end, all of the characteristics found in the maps were put together to diagnose the atmosphere and the main contributions to this event. Results showed that there was no dominant large scale forcing according to the Quasi-Geostrophic Theory Omega equation, but the corresponding Geopotential Height Tendency equation was followed properly. This event should be examined on a smaller scale to see the influences that small scale weather and geographic features had on the event.

**VanMeter, Nicholas** "Placental RNA Concentration in Relation to Peripheral Blood Factors in Lean, Overweight, and Obese Women" (Rachel Tinius)

Background: Maternal obesity is a serious health concern contributing to unfavorable maternal metabolic health and subsequent negative neonatal outcomes. Metabolic processes in the placenta could contribute to outcomes; however, little is known about the RNA concentrations in placental tissue. Purpose: The objective of the study is twofold: 1) to examine differences in RNA concentrations (particularly those involved in metabolism and inflammation) from placentas from lean, overweight, and obese women, and 2) to determine the relationship between RNA concentrations within placental tissue and peripheral blood factors. Methods: The participants were part of an ongoing pregnancy study in which peripheral blood analyses were performed during late pregnancy to investigate calcium, glucose, insulin, free fatty acids, cholesterol, triglycerides, C-reactive protein, interleukin-6, and interleukin-8. Placentas were obtained at delivery, processed, flash frozen with liquid nitrogen, and frozen at -80°C. Maternal placental RNA will be isolated using the Trizol Method and analyzed using a plate reader. Results: A total of 10 participants completed the study (lean: 8, overweight: 1, obese:1). RNA in the placental tissue is currently being analyzed. Discovering a relationship between maternal peripheral blood and placental RNA concentrations could eventually lead to non-invasive clinical methods for determining metabolic abnormalities in the placenta.

**Vaughn, Samantha;** Collings, Colten "Studying the Perceived Outcomes of College Students Who Believe They Learn in Only One Way" (Lisa Duffin)

The purpose of this research was to develop an instrument that could systematically assess students' qualitative data examining the perceived outcomes of learning as a result of believing individuals only learn in one way. Development and validation of the instrument occurred through two experiments with two different groups of participants. The first group consisted of 231 early career college students with a variety of majors represented; the second group consisted of 90 pre-service teachers. In the final iteration, the instrument resulted with ten coding categories (9 viable) -- eight were negative and one was positive. After coding the two data sets with the newly developed instrument, a pattern became evident. In both studies, the four largest categories were negative: Limited Strategies (Study 1 = 28.16%, Study 2 = 33.33%), Poor Performance (Study 1 = 20.94%, Study 2 = 20.83%), Lack of Engagement (Study 1 = 20.22%, Study 2 = 23.33%), and Perceived Failure (Study 1 = 14.08%, Study 2 = 11.67%). Replication of results from Study 1 to Study 2 indicates a viable instrument for use in future research, and reflects a larger problem for college student learning. Implications will be discussed.

**Veletanlic, Vanesa** "Efficacy of Novel Platinum Compound 1,1-cyclobutanedicarboxylato(ethylenediamine) platinum(II) in Mammalian Cancer Cells" (Blairanne Williams)

Several platinum-based compounds have been approved by the FDA for treatments of different types of cancers, one of which is carboplatin. It approved for the treatment of ovarian, lung, brain, and neck cancer. These approved compounds vary in the types of cancer they efficiently treat, which may be due to structural differences in the leaving and non-leaving ligands. We predict that these changes affect the efficacy of the compound's toxicity on different cell types. Using novel platinum compound, 1,1-cyclobutanedicarboxylato(ethylenediamine)platinum(II) (pt(en)CBDCA) in a mammalian cell culture model, the effect of non-leaving ligand structure can be explored and compared to carboplatin that has a similar leaving ligand. Human embryonic kidney (HEK-293) and testicular carcinoma (NTERA-2) cell lines will be individually treated with increasing concentrations of the compound, and cell survival will be analyzed at 24 hours. Preliminary results show the IC50 for the HEK293 cell line is in the range of 30 to 60  $\mu$ M. The IC50 for the NTERA-2 line is still being investigated.

**Vickers, Sarah**; Carini, Michael "The Variability Timescales of the Binary Black Hole Blazar OJ 287" (Michael Carini)

Blazars are extreme examples of Active Galactic Nuclei (AGN). AGN are the nuclei of galaxies where there is a constant stream of material flowing into a disk feeding a supermassive black hole and producing bipolar jets of material moving at nearly relativistic speeds. In the blazar class, the relativistic jets are pointed nearly along our line of sight, and they dominate the observed emission at all wavelengths of the electromagnetic spectrum. A defining characteristic of blazars is that their brightness changes constantly in all parts of the electromagnetic spectrum. The goal of my project is to create a long term (20 year) light curve of OJ 287, utilizing data obtained with WKU's Robotically Controlled Telescope. This data will provide information on the long term, months to years) variability characteristics. I will then combine this data with data from NASA's K2 and TESS missions which provide information on variability timescales from minutes to months to create a comprehensive view of the nature of this blazar's variability on timescales from minutes to decades.

**Vowels, Lily**; Brackman, Thomas; Kambesis, Patricia; May, Mike; Meier, Albert "Effects of Subsurface Water Availability on Tree Growth in a Bottomland Plantation along the Green River" (Albert Meier)

Water below the root zone can have a pronounced influence on tree growth. This was observed in a bottomland hardwood plantation on the Western Kentucky University, Green River Preserve. Previous research at the study site found that the plantation is located on a sinuous uncontained aquifer, meaning there is no rock layer preventing groundwater from reaching the surface. We conducted a survey of substrate conductivity of the field to measure subsurface water availability. We also collected data from the trees in the field, including diameter at breast height, tree height, and chlorophyll fluorescence (a measure of photosystem II efficiency). We found that there is a relationship between below the root zone conductivity and tree growth. We also found a correlation between tree height and chlorophyll fluorescence in two of four species tested three days after 0.05 cm rainfall and seven days after a 0.2 cm rainfall. No correlation was detected six days after a 6 cm rainfall.

**Ward, Zoe** "Ground Truth Observations of Blazars Observed with NASA's K2 Mission" (Michael Carini)

Blazars are extreme examples of Active Galactic Nuclei (AGN). AGN are the nuclei of galaxies where there is a constant stream of material flowing into a disk feeding a supermassive black hole and producing bipolar jets of material moving at nearly relativistic speeds. In the blazar class, the relativistic jets are pointed nearly along our line of sight, and they dominate the observed emissions at all wavelengths of the electromagnetic spectrum. A defining characteristic of blazars is that their brightness fluctuates constantly in all parts of the electromagnetic spectrum. My project is to compare the optical variability of a set of blazars observed with NASA's K2 mission with contemporaneous ground based optical observations obtained with WKU's Robotically Controlled Telescope (RCT) in order to calibrate and validate the variability observed in the K2 data. I am reducing an analyzing the RCT observations of 5 blazars observed with K2. In this presentation, I report the current status and results of my study.

**Wasilewski, Brandon** "June 26, 2018 Eastern Tennessee Wind and Hail Event: A Synoptic-Based Case Study" (Joshua Durkee)

On June 26, 2018, hail and damaging wind-producing storms tracked across the Mississippi Valley and progressed into eastern Tennessee, an area that often sees lessened severe weather occurrences compared to areas west. The event provided the author with beneficial forecasting experience and possessed a large spatial scale across the United States. The purpose of this study is to diagnose the synoptic, or large scale factors that allowed for these storms to develop and progress across the central and eastern United States into the region during a time of lessened severe weather frequency. This study will examine the scale of the event, diagnose large scale conditions in different levels of the atmosphere, and utilize the fundamental equations of meteorology. Data from reanalysis models, weather models, and satellites will all be utilized. After analysis of the event, it was found that many different synoptic-scale factors allowed for these storms to develop. The

study will examine the degree to which each of the factors played a role in the event using analysis of maps with respect to these fundamental meteorological equations.

**Watson, Hayley** "The Evolution of Fairy Tales" (Ted Hovet)

Fairy tales have had a lasting impact as they have influenced popular culture through continual adaptations in literature, film, and television shows. My research aims to address how European fairy tales have evolved from the early 18th century to the 21st century and how the tales have been modified to meet the expectations of modern audiences. For this research, I read and analyzed the original tales along with scholarly articles that examined the history, cultural impact, and evolution of fairy tales. I did a comparative analysis of a selection of the original tales with their modern adaptations, and I studied the changes to determine potential causes for them. My findings suggest the intended audience does affect the tales' content as seen by the recent addition of more realistic elements in modern adaptations such as the Disney films and more realistic movies based on fairy tales like *Splash* (1984) and *Maid in Manhattan* (2002). This research is significant because by studying how fairy tales have adapted to the views and values of the intended audience and time period, we also study the evolution of our culture.

**Wells, Hannah** "Family Literacy: A Framework" (Alison Youngblood)

The purpose of this project was to construct a framework for a family literacy program that would inform parents of Native English Speakers and English Learners on literacy practices and allow time for families to practice literacy together. The family literacy program consists of three sessions, each comprised of a 20-minute presentation to parents and a 30-minute parent-child literacy activity. Each session covered a different topic: early literacy practices, technology and literacy, and advocating for student success. The program was implemented in an adult literacy center, where parents who attended classes at the center and parents in the surrounding community could bring their families to participate in the program.

**Whalin, Symone;** Dobrokhotov, Vladimir; Novikov, Ivan "Comprehensive Ultra-Sensitive Leak Analyzer for Prevention of Product Loss in Oil and Gas Industry" (Vladimir Dobrokhotov)

API analyzer is a compact, portable and robust battery-powered analytical instrument for analysis of complex multicomponent gaseous mixtures. The device is based on principles of analytical gas chromatography (GC) and utilizes a novel highly-integrated multisensory detector. Thanks to the implementation of a multisensory detector, the device is collecting multiple chromatograms in a single run. The sensors in the integrated MEMS platform are near-orthogonal and possess very distinct catalytic properties. Hence, the time separation by chromatographic column is complemented by catalytic separation by a multisensory detector. The outcome of this GC/MEMS hybrid technology, is the ability to monitor a very broad range of analytes from light to heavy on a relatively short and compact GC column in a short period of time of 12.5 min. Also, the device can perform the analysis in a broad range of concentrations from sub-ppb to hundreds of ppm.

**Wheeler, Nicholas** "Effects of Alpha and Beta-Adrenergic Receptor Blockade upon Inflammatory Responses to Acute Sleep Fragmentation" (Noah Ashley)

Sleep is a recuperative activity, however, when dysregulated, there are cognitive, metabolic, immunological, and inflammatory consequences from sleep loss. Understanding sleep-immune associations has important public health consequences due to the increasing prevalence of sleep loss in modern society, particularly in close association with individuals afflicted with obstructive sleep apnea. This novel study tests the influence of the sympathetic nervous system on inflammatory responses to sleep loss, female C57BL/6 mice will be injected with a single injection of a non-selective  $\beta$  adrenergic receptor antagonist propranolol, a non-selective  $\alpha$ -antagonist phentolamine, or saline. Thirty minutes later, mice will then be exposed to 24 h of SF or control conditions. After SF for 24 h or control conditions (6 h SF/18h rest), mice will be killed for assessment of cytokine inflammatory gene and protein expression using RTPCR, ELISAs, as well as data analysis. Preliminary data suggests that mice that subjected to acute sleep fragmentation experience an increase in mRNA expression of the pro-inflammatory cytokine, IL-1 (interleukin 1) in white adipose tissue, heart, and brain. These results indicate that catecholamines play a regulatory role to inflammation induced by sleep fragmentation. Its anticipated catecholamines will increase central and peripheral inflammation.

**White, Austin;** Galloway, Micheal; O'Boyle, Patrick; Wyllie, Sierra; Wrentmore, Rocco "Survey on the Impact of DDOS Attack on Docker Containers Compared to Virtual Machines" (Micheal Galloway)

A DDOS, Distributed Denial of Service, attack is consists of many individual computer systems simultaneously overwhelming a single computer network with information, thereby hindering its ability to function. Comparing the abilities of a Docker Container to that of a Virtual Machine to withstand a DDOS of attack will demonstrate the advantages of each. This is necessary when designing a cloud system as the chances of that system being compromised is vital to its operation. The experiment was performed by having several clusters as "Attackers" that worked together to perform a DDOS attack on the single machine, the "Defender," running the Docker Container or Virtual Machine. As the Defender was undergoing the DDOS attack, its performance was measured over time in the areas of CPU, GPU, networking bandwidth, and memory.

**Whitesel, Daniel** "July 20, 2018 Severe Weather Event" (Joshua Durkee)

On July 20, 2018, a strong tornado tore through Harrison County; this tornado lasted for 16 minutes and injured a volunteer firefighter, damaged four barns, and threw a truck and horse trailer 50ft in the air. Along with several other tornadoes and numerous hail and wind damage reports, this tornado was part of a series of severe thunderstorms that had struck mainly Kentucky, Indiana, and northern Tennessee. The purpose of this research presentation is to give a comprehensive analysis using principles of synoptic meteorology of a significant severe weather event. Analysis of synoptic storms was conducted using interpretation of maps using Integrated Data Viewer (IDV). The aforementioned software was used to create maps from the Rapid Refresh (RAP) dataset, which allowed for creation of maps and soundings. With various maps such as a 700mb vertical velocity map and a surface  $\theta_e$  map, it was determined that the minimum required for thunderstorm formation had been achieved. The ingredients for severe thunderstorm creation had a high enough presence needed for storms to be very powerful. This analysis will allow for further analysis of this severe weather event using principles of mesoscale meteorology.

**Whittle, Megan;** Gani, Nahid "River Bed Analysis in the Mammoth Cave Area" (Nahid Gani)

Currently, Mammoth Cave is the longest cave network in the world. It encompasses numerous tributaries of the Green River (GR) that flow into the Ohio River. Numerous faults systems within the Rough Creek Graben continental rift crisscross Mammoth Cave and GR tributaries. These faults and how recent tectonic activity affects the area is poorly studied. Thus, the objective of this research is to investigate changes in river beds to determine what geologic activity is occurring in the Mammoth Cave area, and if the faults are controlling cave distribution. This research uses high resolution Digital Elevation Model data from the United States Geological Survey. This DEM is processed and used to extract river beds from GR network utilizing ArcGIS software and MATLAB codes. These integral techniques of ArcGIS, MATLAB codes and river bed extraction allow for analysis and generation of river maps, flow direction, flow accumulation, and watersheds to look for knickpoints within the data set. This knickpoint data is used in further analysis to determine the cause of the knickpoint, and the river beds response to the faults. Results of this study provides better understanding on the GR tributaries response to faulting in controlling the spatial distribution of the Mammoth Cave.

**Whorrall, Kyle;** Philips, Keith "Exploration of the Hidden Diversity of Spider Beetles (Coleoptera: Ptinidae) in Western South America" (Keith Philips)

The spider beetles of family Ptinidae comprise a small but highly diverse group which has remained curiously understudied by coleopterists. This diversity is not merely morphological but also behavioral, including such disparate lifestyles as coprophagy, leaf mining, and myrmecophily. These reclusive habits along with small size are likely factors leading to poor records by collectors not specializing in the group. Particularly understudied is the spider beetle fauna of western South America. The Andes Mountains separate this arid coastal strip of land from the tropical rainforests to the east. Spider beetles show particular diversity and adaptations to arid climates, including globular shape and wing reduction. Currently, this area has five species representing four undescribed genera known. To increase our understanding of the diversity in this region, a proposed future survey of the guano islands and inland valleys southern Peru this June will be done and is predicted to result in the documentation of additional new genera and species. Additionally, phylogenetic analysis of populations within isolated valleys will shed light on patterns of dispersal and isolation that have led to speciation in this group.

**Wilham, Mary** "The Contemporary Female Influence on Tap Choreography" (Amanda Clark)

This project studies the influence of contemporary females on tap dance choreography. The goal of this project is to use the methods and ideas from contemporary female tap dance professionals to influence my own tap choreography that will be presented on April 12th at Contemporary Connections: A Dance Research Showcase in the Gordon Wilson Hall Lab Theater. Initial research was conducted through reading several tap dance history books in order to identify when the contemporary era began and who the leading female figures are. Investigation of contemporary styles continued at the Big Apple Tap Festival in New York City through participating in movement exploration within various workshop classes and attending history talks with leading female figures. Videos of tap dances created by these major figures were also instrumental in identifying individual styles and choreographic methods. These processes were critical in discovering how contemporary female artists contributed to the survival of tap dance as an art form and its development into a concert dance style.

**Williams, Abigail;** Polk, Jason; Kambesis, Patricia "Analysis of Cave Sediments in Cave Valley Cave, Nevada" (Patricia Kambesis)

Cave Valley Cave, located in the Eastern Great basin in Nevada, is situated within a north-trending valley that is surrounded by Egan and Schell Creek mountain ranges. An active cave spring 500 meters southeast of the Cave Valley Cave entrance flows all year round. The purpose of this study is to establish the relationship between the cave and cave spring, and to determine if they are/were fed by basin fill vs. carbonate rock

aquifers. This project used standard field survey methods to geologically map the cave and the cave spring. Both entrances and other related karst features were georeferenced to identify the geospatial relationship of the features. Sediment samples from the cave and cave spring were collected and analyzed to determine composition and point of origination of the sediments. The geologic features, rocks types, sediment composition and the shape of a cave provide evidence on how the cave formed in terms of geologic influence and hydrogeology and will determine the relationship of the cave to the spring. These data, in concert, provide a better understanding of the local hydrogeology of the eastern Great Basin. Better insights into arid-basin hydrology will provide important data for water resource management.

**Williams, Joseph** "Virtual Reality in Architectural Design" (Fatemeh Orooji)

The architecture industry significantly relies on visual communication. Virtual reality helps designers create a greater sense of realism and a better understanding of a project by designing while immersed in them. The recent technological advancement has a potential to improve the design process. If the academia is aligned with industry, students will be better prepared for integration into the workplace. As a result, the integration of virtual reality into architecture school is an educational imperative. This study describes the overview of the ongoing integration of virtual reality (VR) environments within the Architectural Science program. A pilot study was conducted on a group of students prior to incorporating VR into the classroom to investigate the value and the challenges of integration of virtual reality system in design education. This research details and analyzes the experience of a junior student by applying VR to facilitate learning in the context of architectural design. The student applied Virtual Reality to become immersed in the designed building through the use of a headset and hand controllers. Based on the collected experimental data, the authors investigate the practical application of VR in the learning environment and demonstrate the effectiveness of this advanced technology in pedagogical practice.

**Williams IV, Roy** "Second Language Acquisition Theory in the Real-World Language Classroom" (Elizabeth Winkler)

Try as we may, there is often some delay in applying the results of research to the field. In the case of L2 or ESL classrooms, this can directly affect the potential of students to acquire the language they are learning. One historically significant example of this is shown in the persisting, common misconception that language is a behavior, a habit to be learned. This is not always explicitly stated, but behaviorist methods of language teaching are what many students are still used to, despite research and solid evidence that conflicts with behaviorist language theory. This is not a ubiquitous problem, but the truth stands that there is often a delay in getting research-backed theory and methods out into the classroom. Is this a problem at Western Kentucky University? How effective are we at "practicing what we preach" in terms of language learning?

**Wilson, Paul** "Danish Hygge in Virtual Reality" (Helen Sterk)

Since 2012, the United Nations annual World Happiness Report has ranked Denmark one of the top three 'happiest country in the world'. It is commonly known that hygge (pronounced "whoguh"), a Danish cultural term meaning living in a comfortable atmosphere, is the main factor in Danish happy living. Hygge is often depicted as a warm room with soft lighting and cozy fabrics. Hygge can also be described as the habits that make one's day-to-day life calm, often considered as surrounding oneself with good people and food. Collectively, I will build a profile of comfortable living, using Danish habits of hygge-living as a lens, and draw connections between Danish hygge and American lifestyle habits. I will identify feasible habits and spacial/ environmental aspects of comfortable living habits that anyone can adopt to live a more comfortable life. This profile, interview audio, and visuals will be the framework for the design of a virtual reality experience. This virtual reality experience will allow anyone to hear/ see/ explore what hygge means, habits for comfortable living, and commonalities between Danish and American comfortable living habits.

**Wine, Matthew** "August 2018 Flooding in Dane County, WI" (Joshua Durkee)

Knowing the meteorological requirements for a severe weather event to occur increases the ability of meteorologists to better inform community members how to prepare for such events. The flooding in Dane County, WI, was far more extensive than that seen in any of the surrounding counties and amounted to far more than \$100,000,000. The purpose of this study is to determine what combination of large-scale, small-scale, and antecedent meteorological conditions created the intense flooding in Dane County and not in nearby counties. Data gathered from the National Centers of Environmental Information will be rendered in Integrated Data Viewer to show the relevant meteorological components at each layer of the atmosphere. Archived rainfall amounts from the National Weather Service in Milwaukee, WI, will also be used to determine the antecedent rainfall at multiple locations throughout Southern WI. Preliminary results suggest that the combination of city layout, multiple recent, heavy rain events, and abundant atmospheric lift provided the necessary components for such an extreme flood event.

**Woggon, Erin** "Gender, Region, and Perceptions of Candidates: Results from an Experimental Survey in Germany" (Timothy Rich)

This piece of undergraduate research seeks to understand public perceptions of female politicians in Germany and is specifically seeking to understand regional differences that occur between opinions from the East and West. While there is much literature regarding evaluation of political candidates by gender, there is a lack of research of this topic in relation to the previously split state of Germany. Because of the research that suggests the impact communism had in East Germany on attitudes toward women in society, specifically in the workplace, our main hypothesis for this study was that the respondents in the East would have more egalitarian opinions of female politicians. After conducting an original survey and analyzing existing survey data, we found that the greatest difference in responses occurred when separated by gender not geography. The data still suggests an inherent bias against women in these political positions, extending all the way up to the office of Chancellor.

**Woodward, Kelsey;** Elder, Sarah; McBride, Robert; Henry, Shelby; Teeters, Jenni "Rates of Campus Sexual Assault among Minority Groups" (Jenni Teeters)

Background: Campus sexual assault (CSA) is a national public health concern. The majority of studies on CSA focus on traditional, white, heterosexual, female students. The present study aimed to examine prevalence rates of CSA in minority groups. This study focused on the LGBTQI community and racial/ethnic minority groups. Method: Amazon Mechanical Turk was used for participant recruitment. Participants were eligible to participate if they were over 18-years-old and had attended college in the United States. Participants completed a battery of validated measures that assessed demographic variables and unwanted sexual contact during college. 472 participants completed all survey measures. Results: A one-way ANOVA was conducted to determine if experiences of campus sexual assault differed among racial/ethnic minorities. No significant differences were found between groups. A chi-squared analysis was conducted to determine if experiences of CSA differed among LGBTQI individuals vs. non-LGBTQI individuals. LGBTQI individuals reported significantly higher rates of campus sexual assault (p

**Wrentmore, Rocco** "Impact of DDoS Attack on Different Resource-intensive Computing Tasks" (Jeffrey Galloway)

Distributed Denial of Service (DDoS) attacks occur when multiple systems, or attackers, attempt to flood a computing resource with requests for information or bandwidth, affecting the usability of that resource. The impacts of such an attack are typically felt by cloud systems, which rely on network connections to store and retrieve data. The three types of DDoS attacks are types 1, 2, and 3, which target networking bandwidth, the CPU, and both the memory and CPU respectively. To measure the actual impact of a DDoS on a system, different tasks will be created that utilize different resources, and then data will be collected as the system is attacked while running one of the tasks. Any patterns that emerge in benchmarks during the attack can be used to help the system detect whether or not it is under attack, and if so, discern which resources are under attack. Then, the system can attempt to minimize the effects of the DDoS by managing that resource in a way that does not render it unusable.

**Wright, Benjamin; Coolbaugh, Collin; Alshammary, Rakan** "Sensorless BLDC Motor Control" (Farhad Ashrafzadeh)

There is an increasing demand for brushless direct current (BLDC) motors in commercial applications, as manufacturers seek to incorporate motors with improved reliability, efficiency, and power density. BLDCs are also used in electric vehicles and wind turbine generators. The control techniques for BLDC motors are more complex than traditional machines. The operation of BLDC motors requires rotor's magnetic position in real-time. Such an information is normally provided through hall-effect sensors in commercial products. This project aims to develop a sensorless algorithm for a BLDC motor used an electric lawn mower. Eliminating these Hall-effect sensors reduces production costs and requires fewer electrical connections, leading to increased reliability. Due to the high-current requirements of the BLDC motor used in electric lawn mower, a power electronic board from Texas Instruments was selected to replace the production controller board. Using this board, along with its compatible software and graphic user interface available for PC, the motor successfully runs without any feedback from the Hall-effect sensors. The sensorless algorithm uses the induced voltage in stator winding of the motor to estimate the rotor speed in real-time. Sensorless BLDC technology could make brushless DC motors an even more competitive option in commercial applications such as power tools, electric vehicles, and other common household products.

**Wyllie, Sierra** "Meta-Heuristic Approaches to Dynamic Load Balancing" (Jeffrey Galloway)

Load balancing is a vital and complex problem in distributed computing. Cloud/Distributed computing is well established among high-performance computing systems, and is known for scalability and focus on efficiency. Load balancing is the process of evenly distributing tasks across the nodes of the machine in an effort to ensure efficiency, and is one of the most important criteria for the performance of the system. Unresolved issues in load

balancing lead to major inefficiencies in reliability, computation time and energy consumption. There is a need to develop and utilize algorithms that address the complexity of the problem and tailor load balancing for the type of tasks at hand. Recently, modern studies have used metaphorical optimization algorithms to solve similarly complex problems. This paper studies several popular and robust meta-heuristic algorithms; the genetic algorithm, simulated annealing, and tabu search; and provides their comparative analysis.

**Yoho, Kristin;** Maples, Jill; Edens, Kolbi; Blankenship, Maire "Changes in Resting Metabolism from Pregnancy to Postpartum" (Rachel Tinius)

Introduction: Postpartum weight retention has been shown to have lasting implications. Therefore, the postpartum period is a critical timepoint for a new mother to return to and maintain a healthy body weight. Methods: Changes in resting metabolic rate of the mother were assessed at 34-36 weeks of gestation and at ~6 months postpartum (n = 24). At each visit, fasted participants had a baseline blood draw, followed by metabolic assessments (i.e. resting metabolic rate (RMR) and substrate utilization) taken via indirect calorimetry. Participants also filled out surveys and questionnaires regarding demographic information and lifestyle choices at each time point. Results: RMR was significantly lower in the postpartum group ( $p < 0.001$ ). After accounting for body weight, the difference in RMR between groups remained significant ( $p=0.034$ ). Interestingly, relative RMR was significantly higher in the "good sleepers" than the "bad sleepers" during the postpartum period ( $p= 0.016$ ). Conclusions: Resting metabolic rate decreases from pregnancy to postpartum, which could contribute to the prevalence of postpartum weight retention. Sleep quality could be a factor contributing to altered metabolic rate after pregnancy.

**Young, Jacob** "Synthesis of a Water Soluble Platinum (ii) 1,10-phenanthroline Complex" (Kevin Williams) The Williams Biochemistry Laboratory is working to create a water-soluble Pt(II) 1,10-phenanthroline (phen) complex which have been shown by Barnham, et al. To reduce Amyloid- $\beta$  aggregation in the brain. A $\beta$  plaques are considered to be a leading contributor of the neural degeneration caused by Alzheimer's and related dementias. To synthesize compounds, the original complex was reacted with various silver compounds. We have synthesized a Pt(II)-phen oxalate complex and begun cataloguing the compound and various reactions by Nuclear Magnetic Resonance (NMR). Other potential candidates are being pursued and tested simultaneously. In the future, the reactions will begin targeting specific A $\beta$  complexes and associated macromolecules. If promise is shown at this stage, the compound may be introduced to a biological model such as mice or zebrafish to determine the interactions with a live neural system and if the use of the complex is feasible for future biomedical research, potentially serving in the extreme far future as a therapeutic drug, though this is not the aim of the project.

**Youngquist, Claire; McNeil, Erin; Raymer, Clint;** ; Young, Sonia; Youngquist, Claire; McNeil, Erin; Raymer, Clint "Immediate Effects of Low Frequency Whole Body Vibration on Dynamic Balance in Individuals with Parkinson's Disease" (Sonia Young)

Introduction: Balance and stability problems are common symptoms of Parkinson's Disease (PD). Evidence exists for positive effects of Whole Body Vibration (WBV) on balance with PD, yet there is limited evidence on the effects of low frequency WBV. The purpose of this study is to examine the immediate effects of low frequency WBV on dynamic balance in individuals with PD. Methods: Data collection is ongoing with seven completed participants currently. Subjects must be stages I-III on the Hoehn & Yahr scale and be clinically diagnosed with idiopathic PD. Low frequency WBV will be performed as the intervention at 6 Hz for 5 minutes with 1 minute rest after each minute. Balance will be assessed using limits of stability pre and post intervention to determine benefits of low frequency WBV. Results: Statistical analysis will be performed using paired t-tests. Discussion: WBV has demonstrated positive effects on dynamic balance, but low-frequency WBV has limited evidence. It is possible low-frequency WBV can offer similar beneficial effects. This study will investigate the potential benefits of low-frequency WBV as an intervention to improve dynamic balance in idiopathic PD.

**Zaczek, Joshua** "Argument through the Ages" (Kelly Reames)

While there is a great deal of literature detailing the thought of prominent political and philosophical figures from Socrates to present day thinkers, there is little work on the connections between them. This paper analyzes the influences that the debates between Socrates and the Sophists had on philosophical and political arguments through time – even extending into the modern day. Beginning with Plato's work the Republic, which details the ideas of Socrates and his critics, this paper will discuss how the Socratic and Sophist arguments presented in Greece in 470 BC still persist to today. This paper follows chronologically the works of philosophers through time that, directly or indirectly, were influenced by Socrates and the Sophists. This chronological analysis shows the links between ancient Greek and modern day arguments. Understanding the origin of popularly debated ideas serves to give us insight on the answers to those debates, and why they are critically important.

**Zambrano, Max** "Analyzing Memoir's Structure and Purpose in Life" (Ted Hovet)

This paper serves to address the importance and purpose of memoir as a genre of literature. In recent decades, memoir's popularity has grown as writers branched out from religious figures to entertainers or well-known public figures. Memoir, although it can bend time and reality for the benefit of theme and storytelling like in fiction, remains as nonfiction. In turn, a successful memoir engages the reader in a story that is not of their own so they can learn more about their own life and the context surrounding it. From analyzing a global subject developed by a man involved with the 9/11 Commission to more intimate stories like Joan Didion's *The Year of Magical Thinking*, this paper highlights how memoir helps people answer deeply-rooted questions about life. It also explores how older and younger generations benefit from memoir—older ones attempt to write and make sense of their life while younger ones read in order to anticipate their future. Although fiction too can inspire readers to reflect on life, memoir gives real accounts for people to grasp, and a good memoir allows people to gain a perspective that would be impossible to achieve otherwise.

**Ziege, Nicole** "The Importance of Clothing in 1960s Protest Movements" (Rich Shumate)

Clothing has been an underrated tool utilized in American social and political protest movements, and its use became most prevalent in the 1960s, as defied the traditional standards of American life, ideologically divided the younger and older generations, and created one of the most tumultuous decades in American history. My research examines protest movements that sparked and continued during the 1960s, including the Civil Rights movement, the anti-war counterculture movement, and the women's rights movement, and how these movements incorporated clothing, like bell-bottoms, leather jackets, and bras, into their protests in order to support their causes, defy the expectations of the previous generations, make a statement about their views on society and the government, and create community among themselves.

**Zwa, Kyaw** "Regal Franklin Stadium 44" (Shahnaz Aly)

The project involved the design of a movie theater/entertainment center in Franklin, KY. As of now, the city of Franklin does not have a single modern standard movie theater town. I think having a movie theater with entertainment center is a good way of upgrading on movie-going experiences and the community would gladly welcome the idea of having a upgrade on entertainment side of things for the townspeople. My goal is to provide a convenience and reachable movie theater for people of Franklin to enjoy in their off days, instead of having to drive all the way to another city, per se, such as Bowling Green. Not only this project will benefit the City of Franklin, it may as well be beneficial for other nearby cities like Portland, TN, as they will now have one more option of theaters to choose from, add to the fact that Franklin is right next door and it's fairly close to get to. I believe that this is a nice little project for movie lovers and their community, since they live in a small city with no modern theater to provide them with up-to-date entertainments.