

WKU REACH 2018

Research Experience and Creative Heights

48th Annual Student
Research Conference

Saturday, March 24, 2018
Downing Student Union



Abstracts

Explanation of Abstract Listings

The alphabetical abstract listing includes details for each presentation in the following order: presenter, co-presenters (as applicable), co-authors (as applicable), the session title, the mentor for a project, and the abstract. Each WKU student was permitted to serve as the primary presenter on one presentation at the conference. Up to three co-presenters and up to six co-authors could also be listed. A sample is shown below to illustrate the form.

Sample

Presenter Last Name, First Name; Co-presenter 1 Last Name, First Name; Co-author Last Name, First Name; "Title of a Great Presentation" (Mentor First Name Last Name)

Abstract text abstract text abstract text abstract text abstract text abstract text.

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Adkins, Callie "Effectiveness of Western Kentucky University's Child Welfare Certification Program" (Whitney Harper)

The aim of this study was to determine if Western Kentucky University's PCWCP graduates feel that they were adequately prepared for Kentucky's Child Protective Services workforce. The research question for this survey was to assess whether the graduates of Western Kentucky University's branch of the Public Child Welfare Certification Program were adequately prepared to work in the Child Welfare Field. A survey was given to 23 graduates of WKU's Public Child Welfare Certification Program. The participants graduated from WKU between the graduation years of the fall of 2013 to the summer of 2017. The survey being used consisted of demographic questions, scaling questions, and open-ended questions. Overall, the findings were that in general WKU PCWCP Graduates felt adequately prepared for work in the child welfare field, but identified aspects of the program that could have prepared them better. Due to the limited sample size, this study only compared means of the survey responses. Overall, the social work/PCWCP graduates felt prepared to work in the field of child welfare. This included the ability to adequately meet the needs of children who are facing abuse (sexual, physical, emotional) and families facing substance abuse and domestic violence.

Agaba, Peter "Optimal Control Theory and Parameter Estimation of Parameters in a Differential Equation Model for Patients with Lupus" (Richard Schugart)

System Lupus Erythematosus (SLE) is a chronic inflammatory autoimmune disorder that affects many parts of the body including skin, joints, kidneys, brains and other organs. Lupus Nephritis (LN) is a disease caused by SLE. Given the complexity of LN, we establish an optimal treatment strategy based on a previous developed mathematical model. As in Budu-Grajdeanu et al., (2010), our model variables are: Immune Complexes (I), Pro-inflammatory mediators (P), Damaged tissue (D), and Anti-inflammatory mediators (A). The analysis in this research project focuses on analyzing therapeutic strategies to control damage using both parameter estimation techniques (integration of data to quantify any uncertainties associated with parameters) and optimal control with the goal of minimizing time spent on therapy for treating damaged tissue by LN. Our simulated results for LN model will be presented in our talk.

Alenezi, Meshal "Islamic Center" (Neal Downing)

Islam is one of the historical and influential religion in the world and it is one which continues to spread and grow in the United States. In order to accommodate this rising number of Muslim residents, it is necessary to provide new centers in which Muslims can practice their religion and non-Muslims can learn more about Islam. The goal of this project is to meet those needs by designing an Islamic center with a library in downtown Nashville, Tennessee. This central downtown location was chosen specifically to be the most beneficial to the greater population and will have the most exposure thus allowing non-Muslim visitors to feel invited and comfortable. This center will provide Muslim residents of Nashville a convenient place to practice and worship while minimizing their drive. The idea of the design is inspired by nature, so there will be many windows for daylight and green space to feel relaxed in the Islamic center. I am providing the traditional courtyard and orienting the mosque towards Mecca to abide and celebrate the teaching of Prophet Mohammed.

Alexander, Audrey; North, Leslie; "Techniques in Carbon Footprinting: Achieving a Carbon Neutral Conference" (Leslie North)

Large-scale conferences output a large amount of carbon emissions in a short amount of time. The Arctic Science Summit Week, or the ASSW, was used as a case study to determine whether or not a carbon calculator and its interpreted results could be used to determine ways to reduce the carbon footprints of large conferences. The ASSW is a large international network dedicated to the discussion and collaboration for the future of the Arctic. Lowering the ASSW carbon footprint is one way planners and attendees have committed to help create a positive change for the environment and the people of the Arctic. Data of the ASSW potential carbon emissions were collected then applied to the Clean Air, Cool Planet Campus Carbon Calculator. It was determined the use of a carbon calculator provided information needed in order to take steps to reduce the conference's impact. Once the areas needed to be mitigated were finalized, an action plan to reduce the ASSW emissions was developed. By applying the action plan during the planning process, ASSW has the potential to be a leader for organizations around the world to assess their carbon footprint as well as bring awareness to individuals and corporations on the subject of climate change.

Alkadhim, Mohammed "American Museum" (Neal Downing)

The concept behind the American Museum, in Riyadh Saudi Arabia is to bring knowledge about America to Saudi Arabians. The museum is designed with traditional architectural design and will be located at 7685 King Fahad Rd; a densely populated area in the capital city. Many Saudi Arabians have a skewed idea of America and its citizens because most of their exposure and knowledge comes from sensationalized Hollywood movies. As the United States and Saudi Arabia strengthen their relationship with each other, it's important that Saudi Arabians have a more realistic perspective of American life. The museum will also strengthen the relationship between the two countries because Saudis will see the similarities in American culture, making their culture seem more relatable. The American Museum in Riyadh will be the premiere learning institution for all things American. Not only will the museum educate Saudi Arabian citizens, but it will serve as a tourist destination for people from other countries who visit Riyadh; thus serving to educate them as well with interactive galleries and exhibits.

Almazroa, Abdulaziz "The Bowling Green Museum of Arabic Culture" (Neal Downing)

The goal of this project is to develop an Arabic Museum that relates Arabic culture with American Culture where the majority of people are uninformed of each respective aspects. In addition, another goal of this museum is to connect different cultures together and to give Americans and others an idea of the Arabic culture. The more we understand about different cultures, the easier we can connect and relate to each other. Knowledge is very important regarding different cultures; it can make us much more aware and cultured of how we can understand each other and connect. There are many people who are unfamiliar with the Arabic world; how they live, what kind of clothes do they wear, what style of housing do they live in and much more. The Arabic culture is a very big culture; it is expressed in widely diverse countries. At this Museum, people would be able live and feel the experience of being in the Arabic world.

Almutairi, Ibrahim "Al-aqeer Race Track" (Neal Downing)

Racing is a popular activity for so many people in Saudi Arabia. Those who like racing and drifting always practice their hobby in public streets which cause a lot of accidents and they waste money. The purpose of the Al-Aqeer Race Track is to provide a safe venue for the people

who love this sport. The proposed location is Al-Aqeer, a coastal town in eastern Saudi Arabia. The primary features include oval and drifting tracks for the public to engage in this popular sport. Support spaces included a cafe, gift shop and museum to display history of racing and drifting

Almutairi, Thamer "Al-Ula Museum" (Shahnaz Aly)

Museums are considered as one of the essential arts of the society as they provide information to the people about their history. Museums are the places where the ancient things are reserved and exhibited in order to help people to know the history of the place or the people who lived in the specific time period. Museums can help a lot in learning about the lifestyles of people and trends which were practiced in the area in the specified time era. Museums can also help to learn the history of people directly through the things they used. Therefore, museums can teach the history through the things which is not possible with the help of books. That is why project was to design the museum in the one of the oldest place of Saudi. The chosen place for the senior research project is in Saleh, North of Saudi Arabia because it was one of the archaeological sites which did not have any museum or the visit center for the tourists to get the information about the people of this place who lived in the era of Saleh and Thamud, Ottoman and Lihyan era. The project included the visit center, and restaurants to provide the easy access to the museum to learn the history of place.

Alotaibi, Faisal "Alziz Library" (Neal Downing)

Reading is the tool of power we need to feed our minds. I have found reading is the key to knowledge and development; therefore my goal is to encourage people to read. In my country, there are so many people who have not ever read a book except the Quran which is the Holy book, because I was one of those people who had only read the holy book. Diriyah, the original capital, with more than 500,000 residential and visitors in this area is a large town in the south east of the current capital city of Saudi Arabia that has no library. I will create and develop a Library which will contain the traditional method of preserving books from damage by storing them in safe archives while allowing for easy online access to them; thus making this a truly international resource of sharing knowledge.

Alrajhi, Sultan "Riyadh Premium Outlets" (Neal Downing)

Saudi Arabia is changing its economic culture to a more open environment for businesses to thrive. In response, I decided that designing the first outlet mall would provide new opportunities for the consumers and investors. For this new concept to be successful in Saudi Arabia, the following criteria are critical to be met: space and construction efficiency, complemented by a striking architectural form. To create a financially efficient structure, I designed the building out of identical modules; lowering construction time, and hence construction cost. Most people in Saudi Arabia do not spend time outside because of the harsh climate. The exterior space that gives access to each individual store will be designed to control undesired sandy wind, noise, and sunlight. The goal of this project is to create an enjoyable exterior oasis that users can and will be excited to visit for their shopping needs.

Alvis, Madison; Garrard, Tiana; Hughes, Abigail; Hunt, Laura; Morris, Cody; Koester, Megan; Yocum, India; Tinius, Rachel; "Evaluating The Factors Influencing The Retention Of Educational Material On Exercise During Pregnancy" (Rachel Tinius)

Purpose: Physical activity during pregnancy is safe and effective for improving maternal and infant outcomes. Pregnant women report receiving little or no advice about physical activity during pregnancy from their provider. The purpose of this study was to assess the effectiveness of an evidence-based educational brochure on both immediate and two-week retention of knowledge about exercise during pregnancy. **Methods:** 32 women of childbearing age (age: 25.0 ± 4.0 years, body mass index: 29.5 ± 6.5 kg/m²) completed a survey before exposure to an evidence-based brochure regarding exercise during pregnancy. Post surveys were taken immediately after and again 2-weeks later. **Results:** After exposure to educational brochures, survey scores on both surveys were significantly higher immediately-post and two-weeks post compared to baseline survey scores (Survey 1- pre: $78.8 \pm 8.6\%$, post: $92.5.9 \pm 7.2\%$, 2-wk post: $92.3 \pm 6.6\%$, $p < 0.001$; (Survey 2- pre: $65.0 \pm 16.8\%$, post: $81.4 \pm 14.4\%$, 2-wk post: $78.8 \pm 12.4\%$, $p < 0.001$). No significant differences detected between immediate post and 2-weeks post for either survey ($p=0.772, 0.423$); suggesting the information was retained. **Conclusion:** An evidence-based educational brochure is effective for improving and retaining information regarding exercise during pregnancy. Health care providers should consider providing patients with this information in order to improve knowledge and patient-provider communication on this topic.

Alzubaidi, Abdulrahman "Water Waste Management, Infrastructure in Jeddah, Saudi Arabia" (Taha Alyousef)

The goal of this research is finding ways to renovate the water drainage system in Jeddah. Currently, Jeddah has an inadequate drainage system that can flood the streets and the city. In 2009 floods, there was a loss of over 100 lives and billions of Saudi riyals in the form of damage to property, vehicles, and public infrastructure. The solution can be diverting floodwater and runoffs from impervious surfaces such as roads, national highway, and streets into active and passive drainage pathways using precast concrete, similar to Japan giant drain solution. The precast concrete instead of iron pipe will be economical and the water diversion will move from outside of city pathways instead of existing within city street pathways. The current three peripheral water drainage channels need expansions and upgradation to more channels, sewers, outfalls, ditches, and detention ponds for disposal of water via peripheral canals towards the sea. This research will assist in uplifting the already stressed water drainage infrastructure in Jeddah, Saudi Arabia as well as offer opportunity to recycle water for consumption. Moreover, the construction industry can benefit from this research by following the model of water diversion, while saving the environment and precious lives.

Amshoff, Erica "Home" (Shahnaz Aly)

The capstone project involved the design of a community center that connects the Louisville, KY community. One of the main goals was to bring homelessness to people's attention, so the community center also functions as a shelter for those in the community that need a place to live. A community center can bring everyone together to learn what can be done to help the people in the community that need it. While designing research was conducted to understand what others have created in regards to community centers and shelters. Another part of the research has been going on tours of several shelters and learning what is needed to engage and educate the rest of the community on how to help. The community center will include things like work-out areas, classrooms, and counselors. The community center's design creates a place that everyone in the community will feel safe and where people can connect with others and bring people of different

backgrounds together.

Angelle, Sarah "A Comparison of Problem-based Versus Project-based Instruction: Why Should We Be Promoting These Instructional Practices in Stem?" (Lisa Duffin)

With the advocacy of incorporating 21st century skills, technology, and hands-on, minds-on learning, new instructional methods have arisen in classrooms around America. Two similar, emerging methods are problem-based and project-based instruction. What are these instructional methods? What has other research said about these methods and in what areas have these methods been researched? Why should we be promoting these methods in STEM in K-12 schools? These questions and more were researched by examining hundreds of articles in multiple educational databases to determine whether they met the criteria for inclusion in this literature review. The results of the research indicated that project-based instruction has a stronger foundation in research, but that both methods are effective at increasing student motivation and reducing the achievement gap in students of diversity and low-SES backgrounds versus the normative majority. The results indicate that while far more research needs to be conducted in K-12 schools concerning these instructional methods, the research has proven the effectiveness of these methods not only theoretically, but experimentally. The next steps are: furthering research, and changing the minds and hearts of educators to shift towards the new era of student-centered learning.

Antonić, Maja "Female Soldiers and Activists: Anti-fascist Front of Women In World War II 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 paper 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.

Anvar, Lydia "A Kingly Trichotomy: Spiritual Favor, Deeds, and Lineage in *Beowulf* and *The Lord of the Rings*" (Gillian Knoll)

Beowulf and *The Lord of the Rings* both present complex narratives of an individual using spiritual favor, heroic deeds, and a notable heritage to affirm their right to rule as king. By doing a close reading of this ancient epic alongside J.R.R Tolkien's modern fantasy, one can understand the various ways that the kings in these texts have drawn power from these distinct realms of authority. In *Beowulf*, the title character's successful acts of warfare affirm his

spiritual favor, and the poem demonstrates that one can construct a heritage using their self-made reputation. Unlike Beowulf, Aragorn's solidified, sacred heritage in *The Lord of the Rings* is bolstered by his deeds—not created by them. Ironically, the older text possesses more fluid ideas of kingship than the modern by including a deeds-based ascension to the throne in addition to the primogeniture tradition. Though today's rulers seem a far cry from Anglo-Saxon warrior-kings, these core characteristics of spiritual favor, noble acts, and esteemed heritage are still relevant. Studying the ascension of kings in *Beowulf* and *The Lord of the Rings* reveals surprising similarities between modern politics and ancient literature to the 21st century reader.

Appala, Keerthi; Conte, Eric; Kasumba, John; Agga, Getahun E; Loughrin, John H; "Quantification of Tylosin and Tylosin Antibiotic Resistance Genes in Cattle Waste." (Eric Conte)

Presented is the development of a solid phase extraction (SPE) procedure and a liquid chromatography-mass spectrometry (LC-MS/MS) method for quantifying tylosin in cattle waste samples. Tylosin is a macrolide antibiotic found naturally as a fermentation product of *Streptomyces fradiae* and is mainly used in promoting growth and treating infections in animals. Tylosin acts by inhibiting protein synthesis in bacteria. In cattle, tylosin is used for treating bovine respiratory complex, foot-rot and calf diphtheria, while in swine it is used to treat swine arthritis, swine pneumonia and swine erysipelas. The products from antibiotic treated livestock, such as milk, meat (chicken, pork, cattle beef), excreta and manure possess residual antibiotics and resistance genes (ARG's) which are consequently passed to humans. Each year 2 million people suffer and about 23,000 die from infections caused by bacteria that are resistant to antibiotics. New drugs are coming into the market almost daily, but developing renewed resistance is a real problem. One of the reasons for the development of antibiotic resistance is the overuse of antibiotics such as tylosin in animal feed. Furthermore, tylosin resistant genes are also being measured in these waste samples by PCR (Polymerase Chain Reaction).

Aromiwura, Afolabi "Promoting The Arts: Germantown School Of Arts And Design" (Aly Shahnaz)

The project looks at the relationship and effects of the combination of both an art school and public park on a developing community. Gentrification being a major term being thrown around about the development of Germantown a borough of the city of Nashville where this project is located, brought about the major question as to what positive could come of the effect of this development on the neighborhood, which was then tested by developing an art school built around a public park that serves the community. This research highlights the effect of both a learning institution and public park and how a common ground can be met to show positive effects of development.

Aromiwura, Afolasayo; Fields, Christopher; Srivastava, Ajay; "Characterization Of Two Basement Membrane Degraders In *Drosophila Melanogaster*" (Ajay Srivastava)

Basement membranes (BM) are a specialized form of the extracellular matrix that lies between the primary germ layers and connective tissue. Basement membrane remodeling is characteristic of development and various disease pathologies. Through a previously conducted genetic screen, the Srivastava lab identified two unique basement membrane degraders called SNUTS and CP1. The SNUTS protein plays a role in development of the gonadal stem cell, while CP1 serves a regulatory function in the development of the lung analog called the Air Sac Primordium (ASP).

SNUTS and CP1 specific antibodies were developed to further study their developmental functions and cellular localizations. The antibodies were characterized and confirmed using western blots and immunohistochemistry. An immunohistochemical survey of the proteins' spatial and temporal expression patterns is being conducted. The survey will aid our identification of novel developmental functions performed by the proteins. These antibodies will improve our understanding of SNUTS and CP1's functions.

Arthur, Michael; Gani, M. Royhan; "Chaotic Sedimentary Deposits in the Gulf of Mexico and Their Implications for Hydrocarbon Exploration and Seabed Stability" (M. Royhan Gani)
This study investigates chaotic deposits, known as mass transport complexes (MTCs), in the Gulf of Mexico. The ongoing research utilizes a dataset of 635 km² of high-quality 3D seismic, along with wireline logs and biostratigraphic data. This study aims to: (1) characterize external and internal geometries of the MTCs, (2) determine the role of glacioeustatic cycles and halokinesis on their formation, and (3) evaluate the nature of association between channel-levee complexes and MTCs. Preliminary results suggest that a large shelf-attached MTC, presumably formed during a low sea-level stage, is inter-tongued with localized MTCs initiated by rapid salt mobilization. Mapping of mass wasting events suggests that topographic constriction due to salt-induced bathymetrical highs greatly influenced the morphologic parameters of the MTCs. We suggest that the resulting topography created by the deposition of the MTCs likely influenced the development and spatial-distribution of the channel-levee complexes that regionally overlie them. MTCs in the study area display chaotic, low amplitude, semi-transparent reflectors, and coincide with wireline-log intervals that suggest a predominantly muddy lithology. However, potential "surprise sands" (e.g., anomalously high-amplitude reflectors) were observed encased within MTCs. By examining different types of MTCs and related processes in a geologically complex province, this research contributes to the understanding of seal vs. reservoir rock development, and events that can destabilize seabed.

Atici, Enes; Srivastava, Dr. Ajay; "Hemocyte Development in *Drosophila Melanogaster* - Assessing The Role Of Cathepsin L" (Ajay Srivastava)
Appropriate hematopoiesis is critical for normal functioning of the circulatory and immune systems. Anemia, lymphoma, and leukemia are a few of various diseases resulting from erroneous development of hemocytes. *Drosophila* have three circulating classes of hemocytes: plasmatocytes, crystal cells, and lamellocytes. These three classes are similar to monocytes, macrophages, and platelets in humans. Transcription factors regulating hematopoiesis in *Drosophila* are similar to transcription factors regulating hematopoiesis in humans. Using the UAS-GAL4 driver technique and RNA inhibitory system, this research project targeted the overexpression and under expression for Cathepsin L like cysteine protease (CP1). Cathepsins are a class of proteases with a multitude of functions in several organisms. In humans, cathepsins were first discovered as intracellular proteases localizing in lysosomes and endosomes to degrade unwanted cellular proteins, but research later showed cathepsins can function externally. The investigation focused on the role of CP1 during hemocyte development, which is critical to our understanding of blood related disorders. We also assayed for any changes to the numbers of hemocytes upon CP1 overexpression and knockdown. Data from this research will be presented.

Austin, Haley "Landscape Genetics of *Ambystoma opacum* in Mammoth Cave National Park" (Jarrett Johnson)

Landscape genetics describes relationships between landscape variables and genetic variation in plant and animal populations. This has contributed to a better understanding of how environmental changes can affect the genetic composition and survival of a population. Over recent decades, global amphibian populations have been declining. An understanding of habitat structure and connectivity is important to consider in developing effective conservation strategies. The purpose of this study is to investigate the effect of landscape characteristics on gene flow and population structure of the marbled salamander (*Ambystoma opacum*) in Mammoth Cave National Park. This will be accomplished using ResistanceGA, an R package, to optimize the landscape and assign resistance values to five habitat types: wet deciduous forest, dry deciduous forest, coniferous forest, human influence, and river. The program will use coordinate locations from 50 sample sites, pairwise genetic distances between those ponds, and GIS landscape data from the park. Based on previous analysis of these data, I expect river habitat to pose the highest resistance to movement between ponds, and wet deciduous forest to present the lowest resistance. These data will be useful for the development of management plans that maintain gene flow among populations and promote the maintenance of genetic diversity.

Ayres, Gaje; Richards, Jared; "Communication Through the Project Coordinator" (Taha Alyousef)

Communication in the construction industry is vital to the success of a project. Many people are involved in a construction project including the owner, engineer, architect, project coordinator, contractor, sub-contractor, et cetera. Thus, it is critical to establish a clear overall goal to avoid additional costs and any confusion that may arise throughout the duration of a project. This is where this research takes place. All too often there are unclear messages from one party to the next; thus leading to problems in completing the project correctly or worse, costing more money and time. This research will investigate issues like: Why are there so many communication issues and where are they occurring? What is a better way to communicate between parties to cut back costs? What are the reasons for these costs? Are the correct people relaying the message or is it skewed? It is necessary to address the issues for this poor communication and the costs that occur because of it. This research will be conducted for the above topics listed as well as a few other topics until plans/solutions can be made to fix these problems.

Bagwell, Brittany; Morfin-Gandara, Hasum; Moscoe, Carrie; "Hansel And Gretel Gone Wrong" (Liza Kelly)

The goal of our presentation is to explore new aspects of art and live performance by communicating the fairy tale of Hansel and Gretel through the genre of object puppetry. Object puppetry uses everyday objects that one can normally find in a household and transforms them, through personification, into puppets. The materials used will have an important role in symbolizing and portraying the characters. Through movement and the addition of eyes, mundane utensils are transformed into communicating characters. The performance of object theater requires artists to stretch their creative limits and offers a new and challenging experience. The method we will use as object puppeteers is to incorporate performance skills garnered from opera theater class and the puppet workshops we attended at The Center for Puppetry Arts in Atlanta, Georgia. Through these means, we will infuse an inanimate object with the ability to move and communicate emotion. The result of the project will be a collection of household objects that successfully tell the story of Hansel and Gretel to an audience. Overall,

the significance of this project is to display the accessibility and simplistic artistry of object puppetry and its ability to communicate a simple, unique, beautiful, and creative craft.

Bailey, Heather "Undying Coals: The Resilience of Cherokee Women" (Dorothea Browder)
The plight of Native American women is little understood by those outside the culture. In order for us to understand the issues these women face now we must understand their past as it is integral to their current issues. I chose to focus on Cherokee women in this particular paper. Of particular interests is the impact of European, patriarchal social structures on the matrilineal and matrilineal traditions of Cherokee society and ways in which Cherokee women both chose to adapt and were forced to adapt to European standards in the 1700s and 1800s. In addition, the paper briefly focuses on issues Cherokee women face today.

Baker, Alan "Geothermobarometry of Winslow Point, Maine Schists" (Andrew Wulff)
Geothermobarometry in metamorphism is looking at the diffusion of certain elements into competing structural sites in different minerals over time. These minerals will be used to estimate peak temperatures and pressures during metamorphic process. Garnet schists are considered medium to high grade metamorphism and can be found near Gassetts, Vermont. The schists near Gassetts have been studied and metamorphic conditions are well known from scientific literature and have established geothermobarometric protocols that may be used at WKU. Pressure and temperature estimates were obtained from the Gassetts rocks making thin sections, PLM, photomicrographs, SE-XRF, GASP geobarometer, and Garnet-Biotite exchange geothermometer. Garnet mica schists were collected near Winslow Point, Maine and using the same process for the Gassetts, data was collected over the Winslow Point schists. Textural analysis was also conducted on the Winslow Point schists in order to construct a pressure-temperature-time graph that details points through the rocks history of high and low pressure. Assessment of these textures was done through looking at the minerals in the rocks and seeing which formed early and which formed late. These are measured using back-scattered electron imaging.

Ballentine, Michael; Garcia, Marco; Buzzard, Lydia; Hill, Lawrence; "Imidazolium Ionic Liquids As Multifunctional Solvents, Ligands, And Reducing Agents For Noble Metal Deposition Onto Well-defined Heterostructures, And The Effect Of Synthetic History On Catalytic Performance" (Lawrence Hill)

The ionic liquid 1-butyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide ([BMIM]Tf₂N) was investigated as a multifunctional solvent, ligand, and reducing agent for platinum deposition onto well-defined CdSe@CdS nanorods. Platinum deposition was carried out thermally and photochemically using Pt(acac)₂ as the metal precursor. Thermal deposition was investigated in [BMIM]Tf₂N with and without addition of a sacrificial reducing agent, and product topology was compared with the products obtained from polyol reduction in a non-ionic system using 1,2-hexadecanediol, oleic acid, and oleylamine in diphenyl ether. Photochemically induced platinum deposition was carried out at room temperature in [BMIM]Tf₂N with and without addition of a sacrificial reducing agent, and product topology was compared with the photodeposition products obtained from a toluene dispersion. Thermal deposition of platinum occurred preferentially at the nanorod termini, while photodeposition of platinum was less controlled with particles decorated throughout the nanorod surface. Photocatalytic reduction of methylene blue was studied using these Pt-CdSe@CdS heterostructured nanoparticles, and catalytic performance

was correlated with topology and synthetic history. Recent progress on synthesis, characterization, and performance will be discussed.

Banaszak, Alexander; Gupta, Sanju; "Graphene-mediated Surface Enhanced Raman Spectroscopy and Detection of Biomolecules" (Dr. Sanju Gupta)

In this work, we prepare graphene-mediated surface-enhanced Raman scattering (G-SERS) platforms comprising few-layer graphene nanosheets decorated gold nanoparticle for biomedical and bio-nanotechnology. Raman scattering is surface-sensitive and nondestructive inelastic light scattering vibrational spectroscopy technique. SERS, a specialized form of Raman spectroscopy, is useful for rapid and precise identification of small biomolecules and industrially relevant chemical dyes at ultralow concentration. This phenomenon is due to enhanced Raman signals by several orders of magnitude on the SERS-active surfaces. While the key point of SERS technology is the metal nanoparticles, which generates localized surface plasmon resonances in response to laser exposure and the resulting electromagnetic enhancement, controlling interparticle gap, the diameter of the metal nanoparticles and their ratio on graphene supports offer an advance toward sensitive G-SERS platforms via localized hybridization at graphene-metal interface. We have used low temperature thermal reduction technique to produce few-layer functionalized graphene supports and wet chemistry for size tunable gold nanoparticles as cost-effective facile synthesis approaches for G-SERS platforms. Simple and high-throughput arrays (so-called 'biochip') are developed by decorating graphene nanosheets with gold nanoparticles as well as sandwiching gold nanoparticle and few-layer graphene for cascaded signal amplification to differentiate nucleotide bases (adenine; A, thymine; T, cytosine; C, guanine; G) and to detect beta-carotene and malachite green chemical dye.

Barriere, Kaitlyn; Ferguson, Ava; Brausch, Amy; "Trauma Symptoms, Resilience, and Nonsuicidal Self-Injury and Suicide in Women with Negative Sexual Experiences" (Amy Brausch)

Previous research has identified sexual assault victimization as a risk factor for suicidal behaviors (Ullman & Brecklin, 2002). However, research on nonsuicidal self-injury (NSSI) as an outcome after sexual assault is limited, and the role of resilience in these outcomes is largely unexplored. The current study aimed to investigate suicide and NSSI as outcomes resulting from sexual assault-related trauma. We hypothesized that trauma symptoms in women with history of sexual assault would be associated with NSSI and suicidal behaviors, and that resilience would mediate this relationship. Data were collected from 519 female undergraduate college students (81.3% white) using an anonymous on-line survey. Our findings indicate that among women with a history of sexual victimization, trauma symptoms are associated with an overall higher risk for engaging in NSSI and suicidal behaviors. Additionally, resilience was found to mediate the relationship between trauma symptoms and various NSSI outcomes, but did not associate with lifetime suicide attempt history. Results suggest that self-perceived resilience is important to women who have experienced negative sexual encounters and/or sexual trauma, as it may decrease a woman's likelihood of engaging in NSSI following the trauma. More research is needed to evaluate resilience as a protective factor for suicide risk.

Baugh, James "Underbanking and Its Implications for Household Finances" (Lauren McClain) "Underbanking" is the practice of using financial services outside of traditional banking infrastructure, such as check cashing centers or payday loans. While the importance of bank

inclusion has long been recognized, the implications of being underbanked in relation to aspects of financial stability remains largely unexplored. This article seeks to increase our understanding of the relationship between the use of financial services outside of traditional banking infrastructure and the ability of households to maintain an adequate financial safety net in the case of unexpected or emergency expenditures. This analysis uses data collected by the June 2015 CPS, as well as its Underbanking Supplement, to construct an index of underbanking behaviors, used to measure not only the presence of any such behaviors, but also the amount of these behaviors people exhibit, and how the presence of more or less of these indicators influence the presence of a financial safety net within affected households.

Biechele-Speziale, Dana "Photochemical and Chemical Generation of High-valent Iron-oxo Porphyrins for Biomimetic Catalysis" (Rui Zhang)

High-valent transitional metal intermediates are crucial active oxidants in enzymatic and synthetic catalytic oxidations. Many notable biological oxidants are heme-containing oxygenases, including the family of cytochrome P450 monooxygenase enzymes. This family of enzymes play crucial roles in mammalian, plant and bacterial species, detoxifying foreign substances and controlling hormone synthesis, among other roles. However, much about the nature of these enzymatic processes is still not fully understood. In this project, the oxidation of a P450 biomimetic Iron(III)(TMP)Cl porphyrin via chemical and photochemical methods was conducted to better understand the catalytic oxidation pathways of these high-valent transition metal-oxo intermediates. Iron(IV)-oxo porphyrin radical compounds, suspected intermediates in P450 enzymes known as Compound I analogues, were formed upon oxidation of the Iron(III) porphyrins via chemical and photochemical methods and compared to better understand the nature of these catalytic oxidation processes.

Biechele-Speziale, Dana "Chinese and American Environmental Policies And Implementation: An Analysis" (Ke Peng)

While the majority of people are aware of the pollution hovering atop China's eastern coast, they are largely unaware of the policies and implementation efforts of the Chinese government to reign in the threats of pollution. Several plans have been enacted by the Chinese government to curb pollution, and these policies have been studied in this project. American policies have been used as a comparison tool for those in China, with a goal of understanding the politics revolving around environmental protection in China. The focus of this project is to compare American and Chinese environmental policies, standards and implementation techniques in order to better understand the pollution crisis in China.

Bleam, Sarah; Farmer, Ryan; "The role of Traditional Bullying and Cyberbullying Victimization in Predicting Negative Mental Health Outcomes in Elementary Schools." (Ryan Farmer)

The purpose of this study was to investigate and analyze the relationships between traditional and cyberbullying victimization and negative mental health outcomes in hopes to contribute and support potential school interventions for resilience promotion and bullying awareness in elementary schools. We hypothesized that traditional victimization and cybervictimization (our independent variables) would predict negative mental health outcomes (our dependent variable) in students. 214 4th and 5th grade students, 105 males and 109 females, were surveyed in five elementary schools in Bowling Green, Kentucky. Students completed multiple surveys

measuring demographic information, traditional victimization (Hunters, Peters, & Rapee, 2012), cybervictimization (Cybervictimization and Online Aggression Survey Instrument; Hinduja & Patchin, 2015), and the students' emotional and behavioral difficulties (Strengths and Difficulties Questionnaire [SDQ]; Goodman, 1997). Data was analyzed using a multiple linear regression in SPSS. Our hypothesis was supported; our model significantly predicted negative mental health outcomes in students. Traditional victimization was the strongest predictor on the SDQ in comparison to cybervictimization and self-identifying as 'mixed race,' though all three variables accounted for 33 percent of the variance observed on the SDQ. The findings of this study support the need for social, behavioral, and mental health interventions in schools to combat the risks associated with victimization.

Boggess, Ryan "Application of Metal Organic Framework in Dye Sensitized Solar Cells" (Bangbo Yan)

Dye-sensitized solar cells play an important role in the renewable energy research due to their relatively low production cost, more environmental-friendly manufacture, and mechanical robustness. Recently, our lab has synthesized a series of new metal-organic frameworks ($[\text{Ru}(\text{H}_2\text{bpc})\text{M}(\text{bpc})(\text{Hbpc})_2(\text{H}_2\text{O})]$, $\text{H}_2\text{bpc}=2,2'$ -bipyridine-4,4'-dicarboxylic acid, $\text{M} = \text{Cu}$, Ni , Fe). Their structures contains zigzag chains of $[\text{Ru}(\text{bpc})_3]_n^-$ complex ions linked by transition metal complexes, and shows strong visible light absorption. These framework materials are excellent candidates as dyes in dye-sensitized solar cells because of their visible light absorbing group $[\text{Ru}(\text{bpc})_3]_n^-$ and carboxylate groups in the structures. The focus now has moved to making metal organic frameworks using mainly Fe^{2+} and Fe^{3+} . Properties of solar cells made of titanium oxide photoanode and metal-organic dyes will be presented.

Bowden, Shelby; Gani, Nahid; Alemu, Tadesse; Abebe, Bekele; Tadesse, Kirbie; "Evidence For East African Orogenic Transpression And Extension In Neoproterozoic Basement Rocks, Northwestern Ethiopian Plateau." (Nahid Gani)

Ethiopian basement formed from the East African Orogen (EAO), with U-Pb dates ranging from 850 to 500 Ma. Northern Ethiopia is composed of the low-grade Arabian-Nubian Shield (ANS), while southern Ethiopia is made of crystalline basement from the Mozambique Belt (MB). The junction between the ANS and the MB occurs in central Ethiopia, and forms structurally complex accreted terrains composed of gneiss and granite intrusions. The study area encompasses parts of an accreted terrain called the Western Ethiopian Shield (WES) within the northwestern Ethiopian Plateau. Basement samples were collected in a 450 m vertical transect from the Didessa River canyon wall. Both compressional and tensional strain from the last 850 Ma is recorded in outcrop, hand samples, and thin sections, revealing north striking folds related to E-W compression with wavelengths ranging from 10s of cm to 10s of m. Some folds have a transpressional component, resulting from right-lateral movement during compression. Feldspathic strained microcline and augens in thin section agree with compressional stress directions observed at larger scales. Extensional features in outcrop analysis include normal faults, while thin sections show tensional gauges in a roughly NW-SE direction.

Bowers, Delainey "Tick-tack, Flutter-mill, And Rozum: Gordon Wilson's Linguistic Atlas Of The Mammoth Cave Region" (Ann Ferrell)

As a renowned 20th century folklorist, ornithologist, newspaper columnist, and devoted department head at Western Kentucky University, Gordon Wilson's endeavors, both scholarly

and amateur, had a significant impact on the shape of Kentucky's cultural landscape. In 1959, Wilson began interviewing residents of the Mammoth Cave region concerning their patterns of folk speech, including pronunciation, grammar, and vocabulary. His efforts led to the collection of more than 18,500 index cards amassed from 240 participants. In 1963, Wilson incorporated the use of reel-to-reel magnetic tape to record the interviews he had started four years earlier. These interviews, which are housed in the Manuscripts and Folklife Archives, amount to almost 80 recorded hours and transcend beyond Wilson's original linguistic undertakings to include concepts and themes relating to folk beliefs, folk medicine, weather lore, proverbial lore, and folk literature. Unfortunately, due to the age and instability of the audio recordings, Wilson's efforts are at risk of deteriorating. This proposal, then, seeks to emphasize the necessity of properly digitizing and preserving these reel-to-reel interviews, as well as highlighting and exploring the traditional folkways that once flourished, and continue to flourish, throughout the state of Kentucky.

Brewer, Kia; Helton, Kimberly; "Title: Under Pressure: The Effect Of Crisis Volunteering On Continued Community Engagement" (Gayle Mallinger)

This past summer, four hurricanes made landfall in the United States. In addition, there have been numerous wildfires across the California, Idaho, Washington, Montana, and Oregon. These tragic events have inspired numerous individuals to volunteer their time and resources. Little, however, is known about whether these altruistic activities are continued after a crisis. This study explores connections between volunteerism during a critical event and sustained community engagement. Informed by Aizen's theory of planned behavior, this study examined the predictive power of attitudes, subjective norms, and perceived behavioral control on intent to continue community engagement.

Bridges, Katy; Bell, Andrew; "Reinforced Concrete Beams With High Strength Rebar" (Shane Palmquist)

Bridges, Katy; Bell, Andrew; "Reinforced Concrete Beams with High Strength Rebar" (Shane Palmquist) As the American economy evolves, the demand for more efficient, environmentally conscious, and sustainable infrastructure becomes more prevalent. The development of ASTM A1035 Steel Reinforcing Bar has introduced a product that is more resistant to corrosion and can withstand greater tensile stress. This presentation analyzes the effects of utilizing this high strength rebar by exploring the design process of reinforced concrete beams and the behavior of this composite structure under failure.

Brooks, Hannah; Yan, Bangbo; "Carbon Dioxide Reduction Photocatalyzed By Metal-organic Framework Materials" (Bangbo Yan)

This project is aimed at designing new materials that show photocatalytic activity on carbon dioxide reduction. The greenhouse gas carbon dioxide is believed playing an important role in climate change and environmental problems. Our research is to synthesize new photocatalytic metal-organic framework materials consisting of 3d transition metal ions and ruthenium polypyridyl complexes. Our synthesized material, [Ru(H2bpc)Cu(bpc)(Hbpc)2(H2O)] (H2bpc=2,2'-bipyridine-4,4'-dicarboxylic acid), can be used as catalysts for carbon dioxide reduction to formate. The structures of the catalysts contain zigzag chains of [Ru(bpc)3]ⁿ⁻ complex ions connected to copper complex ions, and show significant visible light absorption.

Brown, Ethan "Isolation Of Viruses Infecting Free Living Amoeba From Water" (Simran Banga)

Amoeba, especially those of the Acanthamoeba genus, can often act as harbors for numerous types of intracellular and opportunistic pathogens. These pathogens, which include organisms such as Legionella sp., often can survive and even proliferate within these amoebal populations and have the potential to spread into human populations, potentially causing infection. In addition to the normally expected bacterial infections, Acanthamoeba sp. are also host to a specific clade of viruses which are among the largest viruses that have ever been discovered. These viruses, which are known as nucleocytoplasmic large DNA viruses (NCLDVs), can reach up to 1500 nm and have genomes larger than the smallest bacterial genomes. These viruses have been studied extensively in Europe, North Africa, and in the Caribbean, but until now research about these viruses has been sparse in North America. The foremost goal of our project is to isolate viruses of A. castellani from environmental water samples collected in Bowling Green, KY, and to then characterize isolated viruses through DNA sequencing and electron microscopy

Brown, Franklin "The Cruise" (Neal Downing)

The establishment of a unique classic cars venue to expand on the historic aspect of a famous community event; Somernites Cruise. In small-towns across the United States, community events play an extensive roll in the development and expansion of their culture. It is the same in Somerset, Kentucky where Somernites Cruise brings a classic car show and "cruise" on the 4th Saturday of the month between April and October. The goal for this project is to develop a classic car venue focusing on a showroom that will expand the historical aspect of this car show and will promote year-round events as opposed to the seasonal cruise. The design of this project will incorporate a mid-century modern style; finished in corrugated metal siding and Neoprasies paneling. Accommodating interior areas will be a showroom, restoration shop, café, and rooftop suites that provide luxury housing for special guests from classic car TV shows and well-known car enthusiasts who often attend these events.

Brown, Sarah "The Good, The Bad, And The Big Mouth" (Kristi Branham)

This presentation analyzes one of Netflix's most recent original programs, Big Mouth (released November of 2017). The series, created and written by Nick Kroll and John Mulaney, follows a group of middle schoolers as they navigate the uncomfortable transition that is puberty. Relying on interdisciplinary research methods, primarily from the fields of sociology and communications, and an analytical examination of the TV series' key episodes, this presentation evaluates how Big Mouth both upholds and rejects aspects of masculinity that exist within our society today. As indicated by Mazzarella (2010), media constructs meaning in our society; therefore, it is important to understand how media depicts certain concepts. In this presentation, I argue that Big Mouth contains both problematic and progressive media that could potentially impact viewers' impressions of certain notions of hegemonic masculinity in the world around them.

Brown, Tomo "Fostering Peace And Leadership: A Project For The Black Mamba Anti-poaching Unit" (Anthony Paquin)

Introduction: The Black Mambas are members of a majority-female anti-poaching unit in South Africa that preserves wildlife in the world's most severe site for rhinoceros poaching, and the organization's director seeks to develop a system for replicating similar units throughout Africa,

as well as investigate a leadership issue within the unit. **Methods & Intended Results:** I will travel to South Africa mid-March to assist in actualizing these ambitions through the fulfillment of four objectives: first, an appropriate method of resolving the unit's leadership issue will be identified and integrated; second, a job analysis will be conducted to create a list of goal-oriented measures for the unit; third, job descriptions, selection and training strategies will be modified; lastly, a resource-extension network to disseminate information necessary to reproduce similar units will be organized. **Methods** will include observing practices of the Black Mambas, interviewing unit rangers, directors, and community members, and developing systems for the unit in accordance to information collected. **Discussion:** The Black Mambas have been recognized internationally and even awarded by the United Nations for their efforts in protecting rhinoceroses, and it would prove beneficial to further their successes on an organizational level so that rhinos may continue roaming the Earth.

Brown, Trevor; Staggs, Chandler; Whitesel, Colin; Thomas, Jamie; "BioCloud - Developing a Software-as-a-Service Cloud for Bioinformatics" (Michael Galloway)

Biologists and bioinformatics researchers use many tools to perform analysis on DNA, RNA, and other biological data. These tools (QIIME 2, FastQC, CruzDB, and Bowtie2, among others) typically require knowledge of computing beyond using an operating system beyond a graphical user interface, typically found in Windows and macOS. This other interface type - the command line interface (CLI) - is very archaic, and requires more advanced knowledge of a computer. Additionally, if the software is not installed, the user will need to install them. While not impossible to do, it is definitely time consuming for individuals trying to accomplish research and other work. BioCloud strives to resolve these issues. BioCloud is an endeavor to create a Software-as-a-Service (SaaS) cloud computing system around bioinformatics utilities. By implementing BioCloud as a SaaS cloud, a graphical, web-based interface can be provided to biologists and bioinformatics researchers to interact with the bioinformatics software, instead of a CLI. BioCloud can also be accessed anywhere an internet connection is available. By using additional system-level software, such as virtual machines and Docker, the bioinformatics tools can be packaged, and distributed across machines. This creates a stable environment that can support multiple users at once.

Brumley, Jacob; Lienesch, Philip; "Use Of Dead Mussel Shells By Madtom Catfish" (Philip Lienesch)

The Green River in Kentucky has high fish and macroinvertebrate diversity. As both fish and macroinvertebrates have evolved together in this system, symbiotic relationships have developed between species. One type of relationship is commensalism, where one individual benefits, while the other is not affected. Commensalism has been observed between madtom catfish (*Noturus* spp.) and mussels in the Green River, as the madtom individuals use dead mussel shells as cover while not actively hunting. In the falls of 2016 and 2017, surveys were conducted to determine if madtom catfish prefer hiding under dead mussel shells or rocks of similar size. The data was collected at four separate sites along the Green River, each sampled each year. Three 12-meter by 12-meter plots were sampled at each site by snorkeling upstream in the plot searching for madtoms in the dead mussel shells and under the rock substrate. Madtoms were found under a larger percentage of available mussel shells than under rocks of similar size. The density of madtoms was also higher at sites with higher density of mussel shells. Madtoms tend to prefer the shelter of dead mussel shells when the shells are abundant and competition between

individuals for cover is low. When shells are not readily available, the madtoms gravitate toward using the rock substrate as shelter.

Bryar, Michael; Vernon, Caleb; Ray, Aaron; "High Rollers Automated Dice Rolling Machine" (Warren Campbell)

Gaming dice are mass manufactured by the hundreds of millions each year and put to use by serious gamers and casual family players each day. The games that involve rolling dice rely on the idea that the dice are fair with equal probabilities for each side. However, these mass manufactured dice are subject to imperfections that are only apparent by close physical examination or by testing. Some imperfections can only be seen with varying density test or cutting open the dice. As a part of a senior engineering project, a dice testing machine has been designed and built capable of roll testing dice thousands of times, using computer vision to identify each roll, recording the roll in a data base, and presenting a graphical output of results that can be interpreted at a glance. The machine is capable of analyzing many types of dice including the most common 6 sided dice with pips (spots) or polyhedral dice with printed numbers or other characters. The primary method of analysis is a running chi square goodness of fit test. For fair dice the curve of the chi square statistic shows a random variation with no trends. Unfair dice show a linear trend on the running chi square statistic. The steeper the slope, the more unfair the die.

Bulut, Rajna "The Lost River Society: A Study On Social Architecture" (Shahnaz Aly)

The concept of this project is the creation of a social center: a place where friends and family can bond over a variety of activities and entertainment. The Lost River Society is intended to be a convenient venue that aims to revamp Bowling Green's social life. With the help of research of successful entertainment venues such as bars and arcades, the design of this building comes together in a way that makes sense functionally and aesthetically. Its design provides an effortless way for patrons to eat, unwind, and socialize all underneath one roof. The significance of this project lies in its unique interpretation of the entertainment industry and how it can have a positive impact on a tight-knit community. Overall, it is a fun destination for any occasion and a staple for the growing town it calls home.

Bunch, Garrett "Physiological And Emotional Responses To Musical Auditory Stimuli And Its Relation To Lyric" (Ted Hovet)

Music has a unique ability to trigger memories, awaken emotional responses, and to intensify social experiences. My study looked at the physical responses to music and lyric, such as goosebumps, chills, and frisson, as well as looking at the individual, subjective nature of the human response to music and why it affected them in that degree. I specifically focused on the brainstem reflexes during listening, emotional contagion, and the usage of musical expectancy and violations to produce frisson. This project is split into a paper dedicated to the physical responses and reactions of the brain during listening sessions, a survey and interview session with fifty people learning their specific frisson-inducing music and why it effects them, and an auditory experience using excerpts of "When David Heard" by Eric Whitacre and "Black is the Color of my True Love's Hair" cover by Avi Kaplan and Peter Hollens. We do not need to be musically trained, or even have the proclivity for music to understand or enjoy its profound effects both on the body and mind.

Buzzard, Lydia; Ballentine, Drake; Garcia, Marco; Hill, Lawrence; "Synthesis of Functionalized Ionic Liquids for Nanoparticle Shape Control in Catalytic Reactions" (Lawrence Hill)

This project focuses on the synthesis of ionic liquids (ILs) to be used as ligands in nanoparticle chemistry. In catalytic nanoparticle research, traditional ligands with inert hydrocarbon chains and Lewis basic sites have been shown to effectively control particle shape, limiting particle aggregation. However, these traditional ligands also bind tightly to nanoparticle surfaces, decreasing the surface area available for reactions. ILs, in contrast, bind more loosely to nanoparticle surfaces, leading to greater surface availability, higher yields, and faster reactions. The goal of this project is to synthesize and characterize two IL solvents whose structures include the same hydrocarbon chains and Lewis basic sites as traditional, non-ionic solvents in an effort to increase catalytic activity of nanoparticles while still controlling their shape. Target molecules for this synthesis are 1-butyl-3-methylimidazolium tetrafluoroborate, an amino-functionalized IL, and 1-[3-(thioacetyl) propyl]-3-alkylimidazolium bromide, a thiol-functionalized IL. Currently, 1-butyl-3-methylimidazolium tetrafluoroborate has been synthesized with only a 36.9% yield, while synthesis of 1-[3-(thioacetyl) propyl]-3-alkylimidazolium bromide is still in progress. Once both syntheses have been completed, the two ILs will be characterized by NMR and purified before being applied to nanoparticle reactions.

Byrd, Lindsey "A Synoptic Approach of the January 2016 Blizzard Using Satellite and Radar Imagery" (Joshua Durkee)

The January 2016 Blizzard was a category 4 winter snowstorm that affected the eastern coast of the United States from January 19th through January 24th. This snowstorm brought record snowfall with accumulations totaling as much as 42". In addition to record snowfall, the blizzard also brought severe thunderstorms and tornadoes to the Gulf Coast. The Storm Prediction Center archive data provided information used to characterize the general magnitude, dimension, and path of the system. Imaging from the GOES-13 satellite was used to illustrate the strong warm conveyor belt, cold conveyor belt, dry slot system, and cold front which developed around the low. Three satellite bands were utilized for viewing the water vapor, longwave IR, and visible wavelength ranges of the system. Radar imaging allowed for precipitation types in the environment to be distinguished given the large melting layer present. The KLIX radar site provided the necessary data to analyze the severe weather in the south prior to the winter storm. Components of the radar analysis include the use of base reflectivity, base velocity, storm relative velocity, correlation coefficient, and differential reflectivity.

Campbell, Jennifer "Arabidopsis as a Plant Model for Cystic Fibrosis" (Chandrakanth Emani)

The focus of this bioinformatics study is to trace the Molecular Evolution of CFTR gene with a focus on the gene analog found in Arabidopsis thaliana. The mutated CFTR gene has been linked to the cystic fibrosis disease. The bioinformatics analyses of the CFTR domains in the mammalian and plant kingdoms will be followed by the study on seeds of CFTR-mutant Arabidopsis. Specifically, the effect of potent anti-cancerous phytochemicals (basil, ginger and tobacco) will be examined on the CFTR-mutant Arabidopsis to see if there occurs any mutant reversion or the gene expression. This enables the adaption of Arabidopsis as a plant, or more specifically, as a non-human model for many genetic diseases.

Carroll, Caleb "Plum Springs Community Facility Center" (Shahnaz Aly)

This senior research project focused on the design and development of a community facility which focuses on bringing local communities together by providing a protected place for locals to come and interact. This facility is intended provide a space for adults of the community or adolescents of the local schools to have a place to go when school is not in session to grow, learn, and interact in recreational or classroom areas. There is currently not an area facility of this type to provide these things. Due to lots of recent development and large development plans in the future, this center will be able to serve and protect the area with the integration of a fire station into the community center. A lot of the research conducted looked at how to combine these two different types of facilities together. To do this several different fire stations and community centers were looked at, and then a design was developed to incorporate and combine the main areas needed to make them function as one. The research also looked at how a center can bring different communities together by giving them a central place to interact.

Carter, Trason; Saidjafarzodaa, Ilhom; Kholikov, Khomidkhodza; Thomas, Zachary; Cooper, Lauren; Er, Ali; "A Multi- and Few-layer Graphene Growth on Si(100) by Pulsed Laser Deposition" (Ali Er)

Graphene layers were successfully prepared by pulsed laser exfoliation of highly ordered pyrolytic graphite (HOPG) using nanosecond Q-switched Nd:YAG laser. The effect of laser energy density, substrate temperatures, wavelength, and background pressures were investigated. Scanning electron microscopy (SEM) and atomic force microscopy (AFM) were used to analyze the topography and thickness of the films. AFM and SEM measurements showed that amorphous carbon, few-layer graphene and thin graphite films were formed as the laser power increased. 532 nm pulses produce better quality films compared to 1064 nm pulses. This study presents new insights to better understand the growth mechanism of graphene via laser exfoliation, an alternative, controllable and efficient synthesis route.

Carter, Tyneshia "“lifting As We Climb”": Pre-womanism in Black Women's Activism during the Nineteenth Century" (Dorothea Browder)

Womanism is a contemporary term coined by the African-American novelist, Alice Walker. The social theory of womanism quickly shifted to a movement that emphasizes black women's empowerment and destroys the double burden of racism and sexism in America. During the nineteenth century, womanism applied in protest and scholarship. Black women fought for their own rights and freedom and fought for other marginalized groups. They supported the 15th amendment, though the law only recognized black male suffrage. And they advocated for women suffrage while being racially discriminated by their white counterparts. During a time of thick racial and sexual distinction, black women thrived. The abundance of black writers, educators, politicians, and daughters, created a movement in the nineteenth century that many historians depict as the “The Black Woman’s era.” Maria Stewart, Frances E. W. Harper, and Anna Julia Cooper are just a few of the countless black women that greatly contributed to the black community and women’s history. My paper will demonstrate how black female activism uplifts the black community and embrace the female domain. Though unacknowledged and unrecognized in American history, black women in the nineteenth century achieved a pre-womanist movement through literature, scholarship, community uplift, and political activism.

Carver-Dickens, Krystal "From Education to Incarceration: A Study of School Process Affecting Disproportionate Minority Contact within Hardin County’s Juvenile Justice System"

(Holli Drummond)

This study seeks to understand how school processes affect disproportionate minority contact within the Hardin County Juvenile Justice System. A study completed by Lovell & Drummond (2015), in conjunction with the Hardin County BRIDGES council and permission of Hardin County Judges, is used as the foundation for the proposed research. Their study, along with several others, examines disproportionate minority contact (DMC) after the student has been referred from their respective schools to the juvenile court system. The current study will investigate added school data prior to referral to identify points of DMC within the school system that set the student on the school-to-prison pipeline trajectory and ultimately led to their referral to the juvenile court system. Critical Race Theory will provide the theoretical foundation for this study. Bivariate analysis will first demonstrate the relationship between the independent variables and race as well as between the independent and the dependent variable (i.e., who referred the case to the juvenile justice system).

Cecil, Wendy "A Study of Mercury in Bald Eagle Feathers and Quills" (Cathleen Webb)

Methylmercury is a naturally occurring and toxic form of mercury which may biomagnify through the food chain and bioaccumulate in individuals. This study examined a full body loading and mercury analysis for 33 feathers from an individual bald eagle (*Haliaeetus leucocephalus*). An AMA 254 Mercury Thermal Analyzer was used for feather tissue and quill analysis. Feathers are commonly analyzed for contaminants in avians. Quill analysis has not been reported in any related literature. This study is the first study to report analysis of feather quills for mercury in bald eagles or in any other avian species. An implicit assumption of the literature may be that the quills are of no significant interest because the mercury levels are low. This study reports elevated levels of mercury in both bald eagle feathers and quills. Feathers ranged in mercury concentration from 7.8 ± 1.6 ppm Hg to 30.4 ± 5.2 ppm Hg. Feather quills ranged from 8.0 ± 2.3 ppm Hg to 34.3 ± 10.9 ppm Hg. The average quill mercury concentration, 15.1 ppm Hg, is quite high and is, for individual feathers, correlated with the mercury levels in the vein of the feather. The discovery that feather quills contain measurable concentrations of mercury may revolutionize feather analysis and has the potential to expand opportunity for future research.

Chapman, Joe "Machete Lore in Jamaica" (Ann Ferrell)

During my time in Jamaica, it was not unusual to see many people nonchalantly wielding a machete. Through fieldwork, I found that most people own one and sometimes multiple machetes. A farmer named Dwight told me he started letting his son wield a machete at the age of three, because he wanted him to learn correctly. I saw it used to cut lemon grass, chop down trees, dig up vegetables, hammer in nails, plant pineapples, split coconuts, and heard various other purposes for the tool. Through quotidian practice, machetes were described to me as an extension of the hand, a friend, and a brother. It is even common for people to name their machete. The nature of work over time shapes the machete's blade. In a community, how you work often reflects your character. In this way, machetes were seen to me as a reflection of one's work ethic and character in a community; through work, the machete and the user are connected. People of Jamaica use the machete to coexist within nature, as an embodied work performance, and as an everyday cultural expression.

Childers, William "Language In 360: Developing Environment in Virtual Reality to Assist in

Second Language Acquisition" (Ashley Stinnett)

Virtual reality (VR) is an exciting new medium almost exclusively utilized for entertainment, yet the application of VR as a pedagogical tool is becoming more apparent. The nature of VR dictates an experience in which the user feels immersed in a simulated environment. These sensory principles have applications in anthropology as a method of creating and experiencing immersive ethnographic space. It is also relevant for linguistics in the application of linguistic relativity in a pedagogical environment. By utilizing omni-dimensional camera equipment and VR technology it is possible to blend cultural environments with linguistic ideologies and practices necessary for the acquisition of language. This project explores whether classroom filmed VR modules are more successful than established language learning platforms in the acquisition of second language skills. The VR footage was edited into segmented modules designed to present specific language principles necessary in learning French. These virtual modules were also designed to parallel an online language learning platform (Duolingo). Non-French speaking research participants experienced either the immersive environment or the online environment. After completion of the modules, participants' comprehension was assessed. These research results will be presented alongside the virtual modules, allowing attendees to experience the VR classroom setting.

Chiu, YukFong "Maiden's Love Wedding Center" (Shahnaz Aly)

This project's goal was to provide a professional wedding planning, wedding venue, and wedding clothing rental complex and to offer professional facilities and amenities to Chinese couples by presenting them a great variety of choices in their wedding plans. For this project research was carried out into aspects of couple's wedding plan choices and preferences based on their religion, race, income, age, pre-marriage status, and other relevant attributes. The research group is subject to collect experimental data generated from weddings that will be taking place in this venue complex. All data served to create a database that generates the best wedding plan with given conditions from the new couple. The primary research subjects are set to new couples in Hong Kong. Most Chinese couples demand a high budget wedding. They believe weddings only happens once in a lifetime, therefore, it deserves to be expensive. With the aid of a wedding planning specialist and a studio's profession equipment, we will guarantee the new couple experience an outstanding wedding with minimum labor and maximum satisfaction while adding valuable data for optimizing the database.

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 deposition from nearby coal-burning power plants. Atmospheric mercury is transformed to methylmercury in the environment and may impact reproductive success, growth, and survival. Bat hair samples are analyzed using the LECO AMA-254 Mercury Analyzer which reports mercury levels in parts per million. A total of 31 hair samples from bats were analyzed. Of those samples 2 were female, 4 were of the Big Brown species, 5 were of the East Red species, and 3 were of the Indiana species. 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. Females average a concentration of 0.69ppmHg, while males typically have a concentration greater than 0.80ppmHg. In a prior study, juveniles showed the lowest levels of mercury of all the samples

due to their age. Results indicate that abnormal levels of mercury also varies with species. Big Brown samples average concentration is 1.66ppmHg. East Red samples average concentration is 0.85ppmHg. Indiana samples average concentration is 3.61ppmHg.

Clark, Sydney "Emergency and Disaster Management: Disability and Inclusion" (Marilyn Gardner)

An estimated 20% of Kentuckians have a Disability, compared to 13% nationwide. During emergencies and disasters, people with disabilities (PWD) experience greater risk of harm when steps aren't taken to ensure that information, modes of communication, and shelters are made accessible for all. The purpose of this research was to investigate the presence and knowledge of existing emergency preparedness plans and policies that address the needs of PWD. Archival research of state plans was conducted along with semi structured interviews with members of the Kentucky's Functional and Access Needs Collaborative. Findings revealed gaps addressing disability needs in preparedness plans as well as disparities by type of disability. Changes to state and local preparedness plans are needed to ensure equal access and protection of PWD.

Clark, Trevor "The Medical Center Children's Hospital" (Neal Downing)

The goal for The Medical Center Children's Hospital is to create a family-oriented care facility to promote the child's well-being. Being sick as a child can be terrifying, but when surrounded by family and friends in a comfortable environment, children will often show as much resolve as any other patient. With the closest hospital for children an hour away, parents are more likely to not take them because of the extra stress it will be for everyone involved. Kids are more likely to experience fundamental setbacks when they are admitted. Being close to their home life is essential to the recovery process. I am designing a pediatric hospital located on The Medical Center campus in Bowling Green, Kentucky. The hospital will consist of the following: administration wing, emergency department, food areas, with the other floors containing operating rooms, ICU, and Med/Surg. The goal for Rooms designed for activities such as movies and games is to provide a more normal lifestyle to help with recovery. Single rooms make patients feel comfortable because the family will be able to spend more time there. Bright colors, natural lighting, and fun activities are essential for the children.

Coffell, Jared; Arnett, Scott; "What are the Effects of Cluster Sets during the Deadlift Exercise?" (Scott Arnett)

The aim of this study was to investigate the effects of cluster set training on weightlifting performance (e.g., bar velocity and acceleration), compared to traditional set training. Twenty college-aged, resistance-trained males participated in this study. In the first session, participants completed a one-repetition maximum (1RM) deadlift test. During the second session, participants performed one set of five repetitions, at 85% of 1RM, for each condition, counterbalanced, with a rest break between sets. Cluster sets utilized a 30-second rest interval between repetitions and traditional set repetitions were performed consecutively. Barbell position data were analyzed using MaxTRAQ software, then smoothed, and average and maximum bar velocity and maximum positive and negative acceleration were calculated. SPSS software was used to conduct paired t-tests. A significant difference existed between cluster and traditional conditions for maximum negative acceleration ($p=0.011$); however, no significant differences existed between conditions for average and maximum velocity and maximum positive acceleration. Accordingly, the effects of cluster set training do not appear to enhance lifting

mechanics in the deadlift exercise except for deceleration of the bar near the end of a repetition. These findings may be due to the force-velocity characteristics of muscle contraction and deadlift exercise not being an explosive movement.

Comer, Kaitlyn "Museum Earth" (Neal Downing)

Creating the beautiful future of tomorrow starts with the educated younger generations of today. These generations will be the ones to discover ways humans can positively interact with our home—Earth. Museum Earth is a new earth science museum for the city of Bowling Green, Kentucky catered towards children and young adults. The museum will be a civic addition to “The Hub” development on Lovers Lane to bring the public of the surrounding regions into the development. Museum Earth is centered around the earth sciences and creates a space of inspiration for visitors to pursue these fields. The structure will employ several sustainability components, including a green roof, recycled materials, colored photovoltaic glass cells, and permeable concrete. Museum Earth will have exhibit areas focused on the five earth sciences including geology, climatology, oceanography, meteorology, and botany. The museum will also have an exhibit area for promoting sustainability. Exhibits will include interactive and display-only for both children and adults to enjoy. There will also be exterior activity areas to serve as outdoor classrooms for special events associated with the museum.

Comstock, Lilly "Gaga: A New Approach to Movement" (Meghen McKinley)

As a WKU Faculty-Undergraduate-Student-Engagement Grant recipient, I have had the opportunity to study Gaga—a movement method that uses imagery and sensations to foster therapeutic, natural movement. The creator of Gaga, Ohad Naharin, resides in Israel, so this dance form is inaccessible to most dancers in the United States. Because this style of dance activates such a deep internal and external awareness, Gaga instructors and classes are becoming increasingly sought-after. My goals throughout this research have been to experience Gaga, to gain an understanding of its fundamentals, and to reflect, record, and share this innovative movement approach with my dance community. To achieve these goals, I traveled to Tel Aviv, Israel to participate in a Gaga intensive course with Ohad Naharin. Working in this intimate setting with Naharin and his company allowed me to receive specialized attention, to ask questions, and to engage in “methodics” classes. Since then, I have taught a free Gaga-inspired class titled “Israeli-based Movement Study” to WKU students from which I received positive feedback that I will share on March 24th. I have also choreographed a dance, “Gangang,” for the student choreography showcase, Dance Project, where approaches and fundamentals of Gaga are evident throughout.

Conte, Maxwell "Molecular Dynamics Modeling of Atmospheric Sulfur Dioxide-water Interactions at the Interface" (Matthew Nee)

Atmospheric aerosols are nanoscale particles formed as by-products from natural or man-made processes, and they serve as cloud condensation nuclei for cloud droplets, scatter sunlight, and are sites for atmospheric reactions, altering their kinetics in select processes, including those leading to ozone (O_3) depletion in the stratosphere. Dimethyl disulfide (DMDS), released from biochemical reactions in aquatic ecosystems, is oxidized in the atmosphere to sulfur dioxide (SO_2), which acts as a cloud condensation nucleus. Uncertainties in the kinetics of this mechanism have led to the development of models in the Nee Group to explain experimental data. To explain kinetic models for the rates at which SO_2 is taken up into the aerosols from the

gas phase, molecular dynamics (MD) simulations of SO₂ -water interactions were performed with Amber14 through the Western Kentucky University High Performance Computing Center. These simulations will allow the determination of the nature of interaction, including whether the SO₂ -water interaction occurs in gaseous phase, liquid phase, or at their interphase. Preliminary results of these simulations will be discussed.

Cook, Margaret "Influence of Arsenic on Lanthanide Bioaccumulation in *Nephrolepis Exaltata* and Related Effects" (Yan Cao)

This study focuses on the interactions between Arsenic and 5 lanthanides (Europium, Terbium, Neodymium, Gadolinium, and Yttrium), and how it affects uptake, biomass, and chlorophyll. The results are indicative of the notion that the presence of Arsenic in the soil positively affects uptake of the tested lanthanides. This is hypothesized to be due to the plant willingly opening its ligand receptors to the Arsenic molecules and incidentally allowing in lanthanide molecules as well. As a result, the plants with a higher concentration of metals in the soil were generally paler and sparser. Regardless of what this visual implies, there was seemingly no certifiable correlation between metal uptake and chlorophyll or biomass.

Cooper, Lauren; Kholikov, Khomidkhodzha; Ilhom, Saidjafarzoda; Thomas, Zachary; Smith, Skyler; 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 is desirable to increase effectiveness of the therapies. In this work, a graphene-based biomaterial was produced as a less-toxic alternative to other photosensitizing agents. Methylene blue was used as a photosensitizer for comparison to evaluate the total effectiveness of the graphene in bacterial elimination. Graphene quantum dots (GQDs) were synthesized by irradiating benzene and nickel oxide mixture using nanosecond laser pulses. GQDs were prepared at different laser powers, wavelengths, and times. 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 show that photodeactivation of *E. coli* can be achieved with MB-GQD. The results of these studies can potentially be used to develop therapies for the eradication of pathogens in open wounds, burns, or skin cancers.

Corneal, Kevin "BRCA1 and Its Analog in *Arabidopsis Thaliana*" (Chandra Emani)

purpose of this study is to trace the molecular evolution of BRCA1 with particular emphasis on the analog gene found in *Arabidopsis thaliana*. BRCA1 provides instructions for making a protein that acts as tumor suppressor by repairing damaged DNA during cell division. Mutations in BRCA1 increase the risk for breast cancer as well as ovarian cancer. A bioinformatics analyses of the BRCA domains in the mammalian and plant kingdoms will be followed by the study on seeds of BRCA1-mutant *Arabidopsis*. AtBRCA1 is expressed ubiquitously in plant tissues. Potent anti-cancerous phytochemicals (basil, ginger and tobacco) will be examined on the BRCA1-mutant *Arabidopsis* to see if any mutant reversion occurs in gene expression. This enables the adaption of *Arabidopsis* as a plant or more specifically as a non-human model for many genetic diseases.

Couch, Bennett "Scream for the Camera: Found Footage Films as the New Format of Epistolary Horror Novels" (Timothy Evans)

Found footage films have arisen from the shadows to tell even more chilling stories through modern forms of technology. Novels may have once used letters and journal entries to achieve a similar effect on the reader's perspective, but found footage films perform the same function of epistolary novels in a different format: both are found and consumed by an outside audience, but the form is determined by the technology available to the characters at the time. Now, viewers have become a part of the story, engaging with a tale that some mysterious circumstances have left behind. Found footage horror films such as *Paranormal Activity* and *The Blair Witch Project* play with new elements of perspective and immersion, making use of them in the same manner as the documents in classic epistolary horror novels such as *Frankenstein*, *Dracula*, and *The Strange Case of Dr. Jekyll and Mr. Hyde*.

Couch, Brandon; Kasumba, John; Loughrin, John; Conte, Eric; "Extraction and Quantitation of Tetracyclines Antibiotics in Anaerobic Swine Wastes using Spe, Hplc-ms, and Hplc-pda" (Eric Conte)

Tetracycline antibiotics are commonly used in the agricultural industry as disease prevention and growth promotion agents. Undigested antibiotics are released into the environment through animal waste, contributing to the growing health concern of antibiotic resistant bacteria. Anaerobic digestion is one of the methods used to reduce the concentrations of antibiotics and antibiotic resistant bacteria. In this study, tetracycline antibiotics (tetracycline, oxytetracycline, and chlortetracycline) are spiked into cattle, swine, and poultry manure and placed into air tight PVC tube benchtop anaerobic digesters. The concentrations of the tetracyclines and their main metabolites are monitored over a 64-day period by collecting samples every 8 days. The tetracyclines in the manure are extracted using a mixture of methanol and a sodium-EDTA buffer. The tetracyclines were trapped on polymeric weak cation cartridges and analyzed using Liquid Chromatography-Mass Spectrometry (LC-MS). The anaerobic degradation rates of the tetracyclines used in this study will be presented.

Covert, Marshall "'Turn in Your Bibles to...': Examining Rhetorical Agency in Sermonic Discourse" (Helen Sterk)

Rhetorical agency is an ideologically contentious facet within communication and rhetorical research. While its importance in scholarship can be traced back to early works by Kenneth Burke and Pierre Bourdieu, debate continues to rise regarding the source of agency, how it is enacted in rhetorical application and communication, and who/what can claim responsibility for the communication practices one may utilize in enacting their respective levels of agency. Thus, the ways in which the rhetoric of popular, influential individuals/antecedents affects the rhetorical agency and invention practices of those without significant levels of influence must be examined. American Christianity, in particular the culture created through heavy use of televised and web-media (televangelism), provides an excellent context to examine this subject. The present pages discuss relevant literature to the topics of rhetorical agency, invention, and antecedents, as well as American Christianity, televangelism, and the changes that have occurred in religious rhetoric within the culture. Additionally, research questions are posed which guide the collection and analysis of interview data, which lays the groundwork for deeper

understanding of how popular rhetorical antecedents effect the agency of individuals without the same levels of influence.

Cowles, Melissa "Potential Impact of the New Medicaid Waiver on the Homeless Population" (Grace Lartey)

Homelessness in America is a continuing problem, a problem that is closer to home than many people realize. There are over 600,000 homeless individuals on any given night in the United States (US). This population includes families, unaccompanied young adults (age 18 to 24), children, and veterans. Even though most people are spending the night in short term transitional housing or homeless shelters, an estimated one-third of them are living unsheltered. This includes individuals living in cars, homeless encampments and under bridges. Approximately 4,025 individuals are homeless in the state of Kentucky currently. In 2017, HOTEL INC alone served 1,033 people experiencing homelessness or precariously housed. Based on the data provided by Salvation Army, BRASS, HOTEL INC, and the school systems, it is estimated that there are 400-600 people that are homeless or unstably housed in our community (Bowling Green/Warren County) on any given day.

Cox, Delson "How do the Characters of Persona 5 Reflect Gender Expectations in Gaming Culture?" (Nicolette Bruner)

The purpose of this essay is to explore how a video game's depiction of male and female characters reflects expected gender norms in gaming culture as a whole. I do this by looking at the 2017 game Persona 5 and how it depicts both the player character and Ann Takamaki. By looking at this material I am hoping to demonstrate how games can reinforce gender norms and explain why these gender norms are harmful to members of the community. Over the course of playing this game and writing this essay I found that the game condones the objectification of women to a point. Through the player characters actions along with the games writing, costume design and camera work the game tells the audience that it's ok to objectify women as long as you believe you are acting to establish social order. I then end the essay by discussing how this behavior is reflected by two events that have focused on the objectification of women in the gaming community in the past few years and how these expected gender norms condones the behavior of some members of the community who value male opinions over female.

Crowdus, Nathan; Mahmood, Rezaul; "Elevation and Mesoscale Temperature Variations" (Rezaul Mahmood)

The Kentucky Mesonet is a research-grade world class weather and climate observing network of 69 stations that provides quality assured 5 minute temperature, precipitation, solar radiation, relative humidity, dew point temperature, wind speed and direction data. However, with 68 of these stations distributed throughout the Commonwealth, Mesonet enables one to take note of localized variations in weather and climate as well. This research observes the mesoscale temperature variations among several mesonet stations in Kentucky. Specifically, we have investigated data from six stations which constitutes three pairs. These pairs are: Cumberland and Metcalfe Counties, Lewis and Mason Counties, and Marshall and Graves Counties. Again, in any pair, one station is located at a slightly higher elevation compared to the other. It is found that, for example, the Cumberland County site consistently experienced much cooler minimum temperatures with an elevation about 500 feet lower than Metcalfe County. It is suggested that topography of the landscape is responsible for this mesoscale temperature differences. High

spatio-temporal density of Kentucky Mesonet stations allowed us to identify and quantify impacts of small elevation variations on temperature. It is also found that there is seasonality in these differences, and the fall season recorded largest differences. We have also analyze data for maximum temperatures, wind speed, solar radiation, and precipitation.

Crume, Allie "The Impact of an Individual: James Madison and the Framing of the Constitution" (Marko Dumančić)

The Constitution's significance and continuing relevance raises the question of how such a critically important document was influenced by the actors who wrote, edited, and supported it, and in what ways their participation bears responsibility, alongside the document itself, for shaping the United States as we know it today. In such a discussion, James Madison is a particularly distinguished and influential figure for a host of reasons. His impact on the proceedings, his role on the committee that assembled the final draft of the document, and his famed notes on the Convention all mark Madison as significant in the creation of the Constitution. The question remains: in what ways would the Constitution, and our nation, be different without him? By examining primary and secondary sources on Madison's personal background, the ideology that he espoused, and his involvement in the Constitutional Convention, I argue that without his careful study of past governments and integration of republicanism into the system that the young country ultimately adopted, along with his arguments for proportional representation and popular sovereignty, the Constitution and the society we know today would have likely been fundamentally different.

Dahmer, Loandria "The Diplomatic Recognition of Taiwan as it Relates to Central America" (Timothy Rich)

What explains Taiwan's ability to maintain formal diplomatic relations with countries in Central America despite China's continued efforts to exert political and economic influence in this region? Currently, Taiwan maintains diplomatic partnerships with only 20 countries around the world. The largest geographic concentration of these partners is in Central America. Since the onset of the One-China Policy, countries have been forced to choose between recognizing China and Taiwan. Thus, many countries have shifted diplomatic recognition from Taiwan to China as the PRC exerts greater global economic influence. Despite China's increased ability to poach allies from Taiwan, six countries in Central America continue to recognize Taiwan. The three greatest factors which contribute to Taiwan's success in the Central American region are trade, aid and investment, and Taiwanese involvement in regional international organizations.

Darling, Anna "Violin Education in Moshi, Tanzania" (Ching-Yi Lin)

This project, funded by the Faculty-Undergraduate Student Engagement (FUSE) grant, focused on teaching violin through the Daraja Music Initiative (DMI) at Primary and Secondary Schools in Moshi, Tanzania. The goal was to create a learning experience that encouraged present and future academic and overall successes in these students. I studied the teaching methods of Shinichi Suzuki, Paul Rolland, and Ivan Galamian with Dr. Ching-Yi Lin and Mr. Ed Sprunger (Suzuki Book One training) prior to going to Africa. Daily lessons were conducted in three groups of approximately fifteen students each and involved rhythm and ear training activities, review of previous content, and introduction of new concepts and repertoire. Outside the classroom, DMI students and other members of the Moshi community planted trees in schoolyards and engaged in other activities promoting conservation. The impact of the project

was far-reaching. The community benefited from public performances by the DMI students and faculty, and will benefit from the fruit and Mpingo trees planted through this project. Many students learned how to play a musical instrument for the first time. They grew in responsibility through the expectations set for them, and they gained a greater consciousness of their environment and community.

Davis, Andrew "Testing the Accuracy of a Density-Dependent Leslie Matrix Model" (Bruce Kessler)

Population models are important tools for predicting the future trends of a population, and they are used to help determine resource allocation for species like humans or hunting season spans in deer. It is important to have models that are accurate while still computationally efficient. In this talk, I will describe a density-dependent Leslie matrix population model that gives us the freedom to choose the final population age distribution, developed with my faculty research supervisor and published in *The Mathematical Scientist* (December 2016). I will then describe an algorithm for using pseudo-random data to compare its accuracy with that of a density-dependent Leslie matrix model using a given distribution throughout, and show that the increased freedom allows for a better fit to the data.

De Brito, Lucas "Citylights" (Shahnaz Aly)

Nashville has recently experienced an exponential growth in almost all of its sectors indicating that it's in a trajectory to reach a metropolitan status in a recent future. Aiming to analyze the new aspects and needs of an up-and-coming mega-city, my goal for this project is to create a high-end hotel/entertainment building that will add to both the complex skyline of the city, as well as the engaging nightlife happening at the street level, creating a landmark in a city that is on track to become wildly recognized. Background research shows the city heading towards the direction of up-and-coming metropolis, with some studies attributing the change to the 60 months of uninterrupted growth in the Hotel Service Industry. This project is a culmination of all topics analyzed in the architectural science program, with a focus on how vertical development can add to the architectural value of a city and its identity.

Deller, Emily "Sheltering the Homeless" (Shahnaz Aly)

In the past few years, the city of Lexington has seen an increase in the number of unemployable homeless people. The panhandling by the homeless has become an alarming problem in our community. The central goal for this project is to bring attention to the homeless population, to retrain them and enable them to reenter the workplace. This facility will help the community in several ways. First, it will assist in lowering the homeless population and give them a place to live. Second, it will provide them with an opportunity to learn a new trade to make them employable in today's new job market. Through extensive research, the facility has been designed to meet and exceed usage requirements compared to other shelters. Designing this facility has been accomplished through studying and learning from other homeless shelters in the area as well as nationwide and finding their strengths and weaknesses as an establishment. By completing this research, the facility's design will meet the needs of all those who inhabit it. In conclusion, this building's design will provide a safe space for those less fortunate, and the facility will give back to community and make Lexington a better place to live for everyone.

Dhaduk, Parshad "An Association between Systemic Health and Oral Health: Measuring an

Impact of Periodontitis on Diabetes." (Michelle Reece)

“Focal infection theory” was the first theory that established an association between systemic health and oral health (Patel and Barnes, 2013). Oral diseases can cause several systemic diseases or at least plays a major role in developing those disease, such as, infective endocarditis, cerebral ischemia, diabetes etc. In this study, we used data from the National Health and Nutritional Examination Survey (2013-14). Several factors except periodontitis that affect diabetes are also included, such as race, gender, age, physical activity, weight history, alcohol consumption, cigarette smoking, and depression. We performed a binary logistic regression analyzed by using SPSS 24. Results shows that periodontitis is significantly associated with diabetes ($p < 0.05$, CL=95%, OR=1.801) after controlling all other covariates. This result shows that around 80% of the individuals with periodontitis develop diabetes. However, more research need to be done in future to strengthen the results because periodontitis may be the risk factor of diabetes and not the cause. We also recommend conducting a longitudinal study since periodontitis and diabetes both are chronic diseases.

Diaz, Gerardo “A Case Study of Wintertime Meteorological Forcings and their Effects on Surface Pollution Levels in the Cache Valley” (Rezaul Mahmood)

Animal land-use and waste play a major role in catalyzing chemical reactions that create new compounds, which get emitted into the air. Several emission types are released by animal lots in the western US, ranging from methane to organic compounds. Under certain weather conditions these compounds, including particulate matter, can be dispersed over fairly large areas, posing several health and environmental risks on a regional-scale. And while regulations have been set in place, there is still much to learn about how these emissions spread. It's well-understood that atmospheric motions can help in scattering emissions away from their source but these forcings become less able to do so in the mountain west, especially during the wintertime, due to inversion layers and orographic constraints. Furthermore, the mountain west is prone to large winter-weather events, leaving several valleys covered in large amounts of snowfall. Currently, it's not well-known just how much snowfall can influence the spread of pollutants over an area. As such, my current hypothesis is that snowfall, due to its moisture content, will make local pollution values worse during periods where inversions and cold valley-enhanced air masses are over areas with concentrated feedlot operations.

Dillingham, Megan; Kitchens, Cydne; "Potential for the Green Alga *Chlamydomonas Reinhardtii* to Produce Biofuel through Lignin Degradation" (Sigrid Jacobhagen)

Plants can be degraded to produce biofuels, an alternative energy source. A component found in the cell wall, lignin, may be degraded for biofuel production. Laccase proteins can degrade lignin and are of interest for biofuel use. The green alga *Chlamydomonas reinhardtii* has genes very similar to laccase genes, suggesting the alga may degrade lignin by secreting laccase protein into the environment. In this study, we tested for the production of laccase by testing for laccase enzyme activity in the media of *C. reinhardtii* control, wood, and lignin cultures. To this point, we have measured laccase activity in a control alga known to produce laccase using our assay but could not detect activity in *C. reinhardtii* cultures. This suggests *C. reinhardtii* may not be able to degrade lignin. We are currently analyzing whether the laccase genes are expressed by testing for their mRNA.

Dolan, Angela; Swierkosz, Michael; Bell, Michael; Story, Katharine; "The Influence of Sport-

specific Experience and Skill on Rates of Injury in Taekwondo Athletes" (Cody Morris)

The purpose of this study is to examine the potential risk factors in World Taekwondo participants in order to determine if a correlation exists between injury rates and experience in the sport. This will be assessed by considering ability and/or experience to evaluate whether this influences the risk of experiencing an injury and a secondary purpose will be to assess if prior injury influences the risk of experiencing a subsequent injury. The methods utilized in this study was a three part confidential survey, with participants who were 18 and over recruited from various Taekwondo tournaments, testings, and schools. The Pearson correlation showed a significant and strong correlation ($r = 0.607$, $p < 0.0005$) when comparing number of years practiced Taekwondo and injuries in a tournament, as well as showing a significant and moderate correlation between belt rank and injuries that occurred in a tournament ($r = -0.482$, $p = 0.001$). In conclusion, the greater the number of tournaments competed in, the greater likelihood of experiencing an injury. Also it appears that the higher the belt rank, the greater the number of injuries experienced. This could perhaps be due to participating in a higher level of competition.

Doshi, Akash "Association between Sleep Problem and Moderate Physical Activity" (Colin Farrell)

Sleep problems are becoming an emerging issue in the United States. Most of road fatalities occur due to sleep problems. There are many kinds of sleep problems such as insomnia, hypersomnia, narcolepsy, Non REM sleep disorder, REM sleep disorder, and sleep apnea. Literature shows that those who do physical activity have lower chances of getting sleep problems in comparison to those who do not do physical activity. This study was conducted using NHANES dataset 2013-14 and running logistic regression by using variables such as, demographics (age, gender, race), alcohol consumption, use of fruits and vegetables, obesity, physical activity, and depression. The study result found significant relationship between moderate physical activity and sleep problems. The study result found that those who are obese have higher chance of getting sleep problems in comparison to those who are not obese. According to the study, increase in a depression scale would also increase in a sleep problem. There was no association found between number of alcohol intake and sleep problems, which contradicts literature.

Dosier, Caden "Forest Understory Biodiversity of Cloudbridge Nature Reserve" (Martin Stone)

Over the last three decades, there have been many efforts to reforest Costa Rica's damaged lands. In 1983, the rainforest cover had been reduced by 47% compared to fifty years earlier. During the past fifteen years, volunteers at Cloudbridge Nature Reserve, located in the cloud forest ecosystem, have been planting tree species to help reestablish the native ecosystem. Our goal was to document the relationship between the diversity of herbaceous understory plant species and the age of the forest stand in which they grew. In order to do this, we measured the herbaceous plant diversity in nine square foot quadrats in each age stand. Diversity indices were calculated with the Shannon and Species Richness indices. Plot ages ranged from less than one year old to roughly 100 years old; the oldest plot yielded values of 1.485 and 0.869 respectively. Forest stands 15 years old exhibited the greatest diversity with values of 2.942 and 3.233. We believe that early successional diversity was reduced due to a lack of colonization and in older forests, diversity decreased due to light and root competition. Stands of moderate age, 15 years, were the most diverse due to moderate competition and time for multiple colonization events.

Dowell, Libby; Chambers, Jazmin; Miller-Reeves, Mac; "A Mother's Loved and Lost" (Liza Kelly)

In the world of puppetry, the Japanese style of Bunraku is able to depict strong emotion through fluid and expressive puppet movement. We propose to combine the power of music with a Bunraku puppet to exude a more commanding presence and captivate the audience's emotions. We will utilize the song as a reflection of emotion the puppet is experiencing, instead of the puppet acting out the lyrics. The materials used for the project would include fabric, stuffing, and weights to construct a Bunraku inspired and a sound system to provide music. The result of the performance will be a deeper comprehension of human expression through movement and sound via the medium of puppetry. This piece collides the two art forms of physical and performance art, when most times than not, they are thought of to be separate - breathing in both forms of art as one.

Earley, Danielle "The Antagonist of the Sino-children" (Timothy Rich)

My research question analyzes the effects of the One Child policy on foreign adoption with my hypothesis being Chinese adoptees have similar patterns of behavior, such as unique identity issues, despite different life experiences. In addition, I researched effective coping mechanisms for adoptees and hypothesized that conversing and openness with adoption is beneficial. This topic is crucial for aiding scientific understanding of psychological processes in adopted individuals as well as aid others and adoptees themselves on how to effectively cope with the unique adoption experience. I personally deem this topic important not only because I was born in China, but also because the One Child Policy personally affected me by causing me to attain orphan status which led to my adoption. Using my adoption status, I interviewed around 50 other Chinese adoptees and analyzed existing research in attempt to understand the broad impact on these adoptees. I am aware that others have researched this topic, but most focus on ramifications in China of the One Child Policy, not the impact it has on those adopted abroad. Furthermore, most adoption work are written through the adopted parents' perspective. My work will solely be based on adoptees' experiences focusing on coping mechanisms.

Edens, Kolbi; Schafer, Mark; Crandall, Jason; Lyons, Scott; Vondy, Robert; Olenick, Alyssa; Blankenship, Lydia; "Impact of Utilizing Sit-stand Workstations for 10 Weeks in University Staff Members" (Mark Schafer)

PURPOSE: The purpose of this study was to determine the impact of utilizing sit-stand workstations throughout the workday on stress, focus, and productivity when following sit-stand progression protocols for 10 weeks. **METHODS:** 60 participants were randomly assigned to three groups. Group 1 and 2 followed a progressive protocol up to 30 and 20 minutes of standing per hour, respectively. The protocol consisted of reminder emails to reinforce prescribed standing times. Group 3 was instructed to sit and stand ad libitum. Stress, focus, and productivity were measured using the visual analogue scale (VAS) at the end of each day for the sitting and standing conditions. Data were analyzed using mixed ANOVA with significance set $p < 0.05$. **RESULTS:** For each group, stress was significantly lower and focus and productivity were significantly higher standing compared to sitting ($p = 0.00$) over the 10 weeks. **CONCLUSIONS:** The results indicate an increase in focus and productivity and reduction in stress when standing compared to sitting throughout the workday. Furthermore, there was no influence of standing time progression throughout the 10 weeks or total standing time per hour. Future investigations should examine the long-term utilization of the workstations and the potential impact on overall

health.

Edwards, Trevor "The Lunar Effect: A Study of Choreographic Storytelling and Dance on Film" (Meghen McKinley)

The Lunar Effect: A study of choreographic storytelling & dance on film was the final presentation of my research conducted through the WKU FUSE Grant. This half-hour length dance production combined the field of dance on film and postmodern choreographer Anna Halprin's choreographic storytelling, to reveal a personal depiction of human sensitivity with regard to loneliness. My research was presented for The Department of Theatre & Dance, Dance Project at WKU on February 9th-11th, 2018. The research for my final product was compiled in New York City. I attended the New York Dance Film Festival in February of 2017 and the Anna Halprin Exhibit: Radical Bodies housed in the New York Public Library of the Performing Arts in August of 2017. Through the investigation of modern dance performances and scholarly resources, combined with performance analysis, I produced a full-length production featuring the elements of cinematography and fable explanation through dance. My work demonstrates choreographic storytelling and how the growing field of dance on film contributes to articulate and present a clear choreographic concept to my audience.

Ellzey, Benjamin; Fan, Xingang; "Impacts of El Nino Southern Oscillation to Spring Tornado Outbreaks in the United States" (Xingang Fan)

Spring tornado outbreaks in the United States were studied to determine their connection to the El Nino/Southern Oscillation (ENSO), using Nino 3.4 region sea surface temperature (SST) anomaly data and National Center for Environmental Information (NCEI) severe weather data from 1978 to 2017. The data were statistically analyzed to show a connection to ENSO phases, i.e., El Nino, La Nina, and Neutral phases, in terms of the location, frequency, and strength of outbreaks during the spring months of March, April, and May. The analysis showed an increase in outbreak frequency during the La Nina phase, especially in the South Eastern United States. The El Nino phase on the other hand showed a decrease in outbreak frequency, except in the Rocky Mountain States. Possible mechanisms in terms of large scale weather patterns are discussed.

Evans, Brendan; Meek, Romney; Henson, Alex; Gupta, Sanju; "Multiple Roles of Surface Functionality of Graphene-family Nanomaterials on Electronic and Phononic Properties for Applied Electrochemistry" (Dr. Sanju Gupta)

We present optical and lattice vibrational properties of a range of functionalized graphene-family nanomaterials using UV-visible absorption, photoluminescence excitation (PLE) and micro-Raman spectroscopy techniques. Various functionalized graphene nanomaterials include few layer graphene oxide, reduced graphene oxide, graphene quantum dots and three-dimensional scaffolds graphene aerogel and their nitrogenated functionalized counterparts. Raman spectroscopy (RS) provides lattice dynamical structural characterization at nanoscale revealing collective atomic/molecular motions and localized vibrations. The role of oxygen epoxy (C-O-C, carbonyl, C=O) and nitrogen (pyridinic and graphitic/pyrrolic) functionalities and corresponding bonding configurations with quantum size effects are emphasized in view of understanding physico-chemical properties for biosensing and water desalination. While first- and second-order phonon modes are analyzed in terms of Raman intensity, band position (intrinsic mechanical strain) and intensity ratio (structural disorder, number defect density), distinct localized π

electronic states were found in PLE spectra at the carbon atoms around oxygenated and nitrogenated species. The origin of these states is discussed based on experimental findings and density functional theory exemplifying structural evolution.

Evans, JC "Remote Sensing Analysis of Hurricane Harvey" (Joshua Durkee)

Hurricane Harvey was a Category 4 hurricane that made landfall over the Gulf Coast regions of Texas and Louisiana. The hurricane formed on August 17, 2017 and made landfall on August 25. Hurricane Harvey was the first hurricane to hit the mainland of the United States during the 2017 Hurricane Season and was the first major hurricane to hit the United States since Hurricane Wilma in 2005. This paper uses images from GOES 16 that were obtained through the College of DuPage. This paper will analyze satellite imagery of Harvey starting in the evening of August 25 through August 30. Visible, infrared, and mid-level water vapor imageries will be used to analyze how the storm gained the strength it did and its impact on the region. This paper will also use radar data from Corpus Christi, Houston, and Lake Charles provided by NOAA. NOAA also provided the upper air data that will be used in this paper. It remained where it landed due to a large atmospheric ridge that was in place over the western U.S. When that ridge dissipated, Harvey moved northeast where it continued to flood areas it passed over before eventually being downgraded to a Tropical Depression.

Feige, Emma; Colvin, Alexa; ; Smith, Tanner; Smith, Janice; Colvin, Alexa; Greene, Anna; Peavler, Rachel; "The Dixit Method of Language Sampling in Early Adolescents" (Janice Smith)

Our study explores a novel method for collecting and analyzing language samples in the early adolescent population. The purpose of this study is to measure lexical diversity in typically developing early adolescents using both the standard assessment procedure (conversational interview) and a novel assessment technique (The DiXit Method) and compare the effectiveness of the techniques (Nippold, Frantz-Kaspar, Crammond, Hayward-Mayhew, & MacKinnon, 2013; Roubira & Cardouat, 2008). Our goals were to examine best practices for collecting lexically diverse language samples that reflect adolescents' current spoken language skills, expand on previous research revealing the importance of language sampling in adolescence, and raise awareness regarding various language sampling methods available. Preliminary analysis of results indicate the DiXit method for facilitating language yields larger and more lexically diverse samples than the standard interview procedure.

Ferguson, Ava "The Mediating Role Of Resilience In The Relationship Between Sexual Trauma And Disordered Eating Behavior" (Amy Brausch)

It is widely known that sexual assault disproportionately effects women. College-aged women are the highest risk population of all ages, in fact. That said, sexual assault can occur at any age and may have a varying range of emotional consequences for survivors. This includes pathological coping mechanisms, such as disordered eating behaviors. This study examined the mediating effect of resilience on the relationship between sexual assault and disordered eating behavior. A sample of 519 undergraduate women at Western Kentucky University completed a survey assessing sexual experiences, trauma symptoms, disordered eating behavior, and resilience. Results confirm the hypothesis in that resilience fully mediated the relationship between sexual assault and disordered eating behavior ($B = 0.008$, $p = 0.03$). These results highlight the importance of resilience as a mitigatory factor in recovery from sexual trauma. Further research on ways to foster resilience post-assault is in order.

Forgione, Brandi "Impact of Two Types of Multi-Tasking on Self-Selected Exercise Intensity" (Steven Wininger)

The main objective of this research was to determine the effect varying levels of cognitive load on self-selected exercise intensity (i.e., multitasking or engaging in a cognitive task and exercising simultaneously). A secondary objective was to examine the effect of a distance versus time goal on self-selected exercise intensity. Seventy-two undergraduates served as participants: 1 dropped out and 10 did not finish (33 females & 28 males used for analyses). Participants completed two bouts of exercise on a stationary bike, one with a time goal and one with a distance goal. Participants were assigned to one of three different cognitive load conditions: control, memory questions, and math problems (addition/subtraction). Participants in the control condition selected the highest exercise intensity levels. Those in the memory CL condition performed at the next highest intensity, followed by those in the math CL condition at the lowest intensity. Participants selected higher exercise intensities during the distance trial with no CL. Implications with regard to attempting to multi-tasking, specifically engaging in a cognitive task while exercising, are discussed.

Fox, Jason "Networks of Sustainability Within the Iceland Whale Watching Industry: Communication, Environmental Impact, and Economic Growth" (Leslie North)

Whale watching is one of Iceland's most popular activities supporting the country's expanding ecotourism industry. Driven by the economic opportunities of the tourism boom, whale watching operations continue to expand their services, and old and new operations housed within the same harbors compete for customers. Operators generally recognize the importance of sustainable management and environmental stewardship in this industry, but the degree of commitment and action toward sustainability varies between companies. As Iceland's whale watching industry continues to grow amidst regional climatic and societal changes, communication and cooperation between companies may be vital to ensuring that whale tours may continue to be offered with minimal environmental implications. This interview-based study of company owners, managers, and local activists determined trends in company growth management, tourist education, and future goals of some of Iceland's most prominent whale watching operations in three locations: Reykjavik, Húsavík, and Akureyri. Data reveal many companies regularly commit to environmental sustainability to some extent through participation in certification programs, development of sustainability protocols, and collaboration with research bodies that monitor cetacean populations; however, the degree of cooperation with other operations located both within the same harbor and across the country is greatly variable. These variances are sure to challenge the sustainable development of the industry in the years to come.

French, Carrie; Mauch, Jordan; Forgione, Brandi; Wininger, Steven; "The Impact of Exercising at a Self-selected Intensity on Concurrent Academic Task Performance." (Steven Wininger)

The goal of this study is to examine the impact of exercising while completing an academic task on performance on the academic tasks. Participants will be asked to complete reading and math tasks while exercising on a stationary bike. Performance on tasks on the stationary bike will be compared within-subjects to performance on parallel tasks while seated. Overall, individuals are expected to have worse performance on reading and math tasks completed during concurrent exercise, compared to parallel tasks completed while seated. ACT Reading Score, ACT Math

Score, Reading Span, and Operation Span, are expected to serve as significant covariates. Individual multitasking behaviors and exercise habits are expected to serve as additional significant covariates.

Frint, Hunter "Analyzing Biological Anthropology in Journalism: Evolutionary Content in Scientific and Nonscientific Media Outlets" (Darlene Applegate)

This paper examines patterns in the nature and the accuracy of human evolution content in articles printed in publications geared toward a non-scientific audience and those specifically for a science-based audience. As hypothesized, the major type of evolutionary content focuses on paleoanthropology (past human species) generally, and new hominid fossil discoveries specifically. Key evolutionary terms and concepts that appeared frequently, as expected, are species, Latin genus/species names, family tree, missing link, natural selection, survival of the fittest, reproductive fitness, adaptation, evolution, and fossil. The human evolution content did vary in its centrality to the article, as predicted, but the headlines were not reliable indicators about the centrality of the evolution content. The hypothesis that evolutionary concepts would be explained in layperson's terms and that technical terminology would be defined was supported in this analysis. Comparing types of articles, there was more sensationalism, inferences, and jumping to conclusions in the non-scientific publications.

Froedge, Tom; Hahn, Lance; Leibman, Noemi; "Identifying Competitive and Collaborative Text with Machine Learning" (Lance Hahn)

As society grows more dependent on digital communication, our ability to identify subtleties in textual language grows in importance. This project attempts to construct a machine learning algorithm capable of differentiating competitive from collaborative text. We begin with a dataset constructed by Leibman and Hahn (2017) of 112 sentences containing 56 competitive and 56 collaborative sentences. We encode each word of these sentences into a unique string of 1's and 0's. Encoded sentences are then passed through an artificial neural network (ANN), which consists of a three-layer matrix of weight and state values. The sentence encodings combine with the network weights to create the ANN. The numerical output of this ANN indicates whether the sentence provided is collaborative or competitive. The network weights are trained using back propagation. Our ANN is currently capable of classifying 64.8% of dataset sentences correctly when given a vector of target words that appear more frequently in one category than the other. Future work will attempt to optimize network parameters to achieve higher success rates, discover new relevant linguistic features, and work towards a general classifier of competitive and collaborative text.

Gabhart, Austin "A Perturbation Method for Determination of an Approximate Analytical Solution of a Nonlinear System of Ordinary Differential Equations" (Mikhail Khenner)

We considered the steady-state (time-independent) solutions of a system of two nonlinear diffusion-type PDEs that model concentrations of carbon atoms and dimers in the course of a growth of two graphene islands on copper by the chemical vapor deposition. Wolfram Mathematica was used to find the approximate analytical solutions for various parameters sets by implementing a perturbation method; next, the full system was solved numerically and the solutions were compared. We found that the steady-state concentration profiles are approximately parabolic, and the concentration of atoms is typically much larger than the concentration of dimers. This signals that in the steady-state regime graphene grows primarily by

the attachment of atoms, rather than dimers, to the growing edge.

Gadde, Divya; Taylor, Ritchie; Golla, Vijay; Ding, Xiuhua; "Assessment of Ergonomics Among Indian Dental Practitioners" (Vijay Golla)

Dental practice can be more efficiently performed by the application of ergonomics, rather than physically forcing the worker's body to fit the job. However, Posture is highly influenced by various factors at work and it is necessary to control all those factors. The aim of the study was to assess ergonomics and elucidate factors responsible for Indian dental practitioners not applying ergonomics in their practice. An observational study was conducted among 58 Indian dentists both from a private dental hospital and clinics. A questionnaire that consisted of 37 open-ended and closed- ended questions was used as a research tool for the study. Information on background characteristics, work environment, equipment, work administration, and ergonomic awareness were collected using the questionnaire. Sampling consisted of observing 37 male and 21 female dentists. A total of 58 individuals, 62 % (36), worked for a private dental hospital, and 38% (22) for dental clinics. A majority, 84.5 % (49), of the dentists reported that they do not receive any sort of ergonomic training from their work administration. Most dentists, 96 %, (56) reported that there was no system of recordkeeping for workplace accidents. In analysis of the results, greater inclinations of arms and forearms were found to be positively related with lack of ergonomic training ($p < 0.05$). Rounding of back during work was found to positively associated with no proper system of recordkeeping of workplace accidents ($p < 0.05$). Lack of proper ergonomic training and no system of recordkeeping for workplace accidents were found to be the primary factors for not applying ergonomics by Indian dentists. Ergonomic training programs are needed in India to help educate dentists on workplace safety and health, and thus aid in reducing musculoskeletal pain.

Gaiko, Kathrine; Kim, Dr. Moon-Soo; "Developing Tale Proteins as a Sensor for Detecting Pathogens" (Moon-Soo Kim)

Efficient detection of specific double-stranded DNA sequences possesses a wide realm of possibilities for point of care (POC) devices. A new domain known as transcription activator-like effector proteins (TALEs) has recently emerged as an alternative platform DNA-binding. The TALEs are currently thought to be superior methods for DNA specific binding due to their simplistic structure that increases specificity and has more manipulability which would be advantageous for biomedical applications. They are most often 34 amino acids in length with residues 3-11 and 15-33 comprising of 2 helices while the 12th residue stabilizes the RVD loop and the 13th specifically recognizes DNA bases. The TALEs were engineered to consist of a capture and detection probe that bind to the stx2 gene that encodes for Shiga toxin in E. coli O157. The detection probe of TALE was fluorescently labeled using Alexa Fluor labeling which allowed the TALE to give an emission when binding of the target DNA occurred. The capture probe was immobilized in a gel solution that allowed the capture of the target DNA which was confirmed by the fluorescence of the detection probe. This use of TALEs to detect DNA in a wide range of host organisms has exponential possibilities for detection of pathogens in the presence of large amounts of non-target DNA.

Gaiko, Steven "Smart Phone App Development And Implementation" (Huanjing Wang)

The project was designed to advance the programming skills of Gatton students through app development. After weekly lessons on development, each of the students was given the task of

developing an app on their own. When testing ideas, I came up with an idea that could build off the concept of the RFID scanning within our phones. The app would be able to keep track of any cards from WKU IDs to your gym memberships and credit cards. The first implementation of the app will contain a storage system that can hold the information of as many cards as you wish along with a picture of the front of each card and any bar codes needed. The last implementation will not only allow you to access and use cards with bar codes, but also allow the user to pay with a credit card or check into a building using the RFID sensors in their phones. The app will be able to hit a large demographic of people from college students to business man, and allow easy access to gift cards, membership cards, and credit cards through only their phones.

Gaines, Miriam "How Dance and Marketing Brought a Community Together" (Amanda Clark)
In the summer of 2016, I founded The Beautiful Feet Foundation, a nonprofit organization designed to empower, uplift, and provide performing arts education to young aspiring artists, specifically those who may not be able to afford the desired training. The program started with a summer camp providing training and performance experience in voice, music, and dance. After the success of the first camp, I was inspired to further develop my program using both of my majors, dance and marketing. Through research, I devised new strategies to reach more students and increase the summer camp's enrollment number. These strategies included not only advertising and promotions, but also curriculum expansion, the registration process, and organizing and scheduling the activities for each day. With the support of my team and the WKU FUSE grant, I successfully produced a second summer camp that included a 30 percent enrollment increase, and enhanced reach in to the community.

Garcia, Marco; Hill, Lawrence; Ballentine, Michael; Buzzard, Lydia; "Synthesis of Pt/co Alloyed Nanoparticles in Ionic Liquids" (Lawrence Hill)
Carbon Dioxide is one of the main causes of global warming and climate change, which has caused an increase of research on environmentally friendly methods to deal with the CO₂ we produce. One such method is to use electrocatalysts to convert CO₂ into useful chemicals. Pt₃Co octapods, which are several times more effective than other Pt based catalysts, have proven to be a very effective electrocatalysts. There is also substantial evidence that ionic liquids can improve the effectiveness of catalytic nanoparticles. Synthesizing Pt₃Co octapods in ionic liquids could greatly improve their performance, but there are no known methods for do so. We are currently attempting to synthesis Pt/Co alloyed nanoparticles in the ionic liquid BMIM BF₄. Once nanoparticles have been synthesized, we will attempt to control the shape of the synthesized nanoparticles and optimize their synthesis.

Garcia, Ryanne "Importance of Infection Control Risk Assessment for Healthcare Based Construction" (Taha Alyousef)
Construction in the healthcare industry, especially in existing hospitals without proper planning and risk mitigation could be very hazardous to already sick and at-risk patients. Researching the importance of infection control risk assessment for healthcare-based construction would provide more knowledge and proper planning techniques for construction managers and other construction industry employees. In addition to researching the importance of these specific planning techniques and requirements, the research will include the necessity and benefits of educating students in this topic while in the university. Investigation techniques will include studying previous implications of infection control risk assessment and mitigation to further

expand the knowledge of this very real-world issue. Furthering research on this topic could bring a new light and awareness for the necessity of this way of planning.

Garrison, Jessica "Clay Mineral Analysis Using X-ray Diffraction" (Andrew Wulff)

Clay minerals such as kaolinite and montmorillonite have very small grain sizes that cannot be seen under a standard microscope. Instead, their crystal structure can be identified using x-ray diffraction. The process uses two x-ray beams that are angled at different heights to produce a constructive beam off a horizontally placed sample. The angle of the beam produced can then be attributed to a specific mineral as each one has a specific diffraction angle. The sample can be used to analyze the mineral composition and can lead to research on depositional conditions, paleoclimate, paleo flora, etc. Clay minerals may be used as paleoclimate indicators. Clays could be eroded from the same source material and subsequently altered in various climatic conditions to form unique mineral structures. This project aims to develop a Standard Operating Procedure for clay analysis by comparing Western Kentucky University's x-ray diffraction methods against other labs, specifically the Illinois Geological Survey and the Kentucky Geological Survey. Nine samples were analyzed at each lab and the results compared against each other to quantify the differences between each lab's technique. This can ensure that WKU instruments can facilitate future research with this equipment.

Gearner, Olivia; Philips, Keith; "New Discoveries of Relationships in Spider Beetles and Related Families Using Molecular Phylogenetics" (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 these insects that is vastly understudied but highly diverse is the bostrichoids, which include four main groups, the dermestids, bostrichids, anobiids, and the spider beetles. Hypotheses on the evolution of the bostrichoids are currently poorly supported, and except for one limited molecular study, are all based on morphology. This project looks to improve on the previous phylogenetic analyses of the group and with an emphasis on the spider beetles by greatly increasing the sampled taxa from 50 to over 120. The standard genes previously used, including CO1 and 28S, were amplified and then sequenced. Genes were then aligned using Clustal and phylogenies discovered using TNT, RAxML, and MrBayes software for parsimony, maximum likelihood, and Bayesian analyses. Results are being used to hypothesize the evolution of morphological traits and lifestyles as well as providing a solid basis for a revised classification based on monophyly.

Gill, Emilie; Cary, Megan; "Breath and Life: Fundamentals of Puppet Performance" (Liza Kelly)

Puppetry is an ancient form of storytelling that uses objects to act out a drama. These objects are manipulated by a puppeteer, who may be seen, but never noticed by the audience despite their crucial role in the performance. A puppeteer must practice and study a multitude of techniques to not only bring the puppet to life, but also give it a sense of personality and convey emotion. The manipulator must learn to have complete control over the puppet. Complete focus is required for a smooth and believable performance, while not distracting the audience with their own presence if that is not the intent. In our performance, we will explore how a puppeteer controls a puppet via animal demonstration. Puppets representing various animals are constructed in order to demonstrate manipulation concepts such as "breath," "stillness," and "movement". Materials

used in the creation of these puppets include: foam, various dowel rods, felt, wire, simple sewing supplies, and various found objects. The goal of our performance is to convince the audience that the puppets are not objects, but instead living, breathing animals.

Glascoek, Allison; Smith, Tanner; Smith, Janice; "The Jarvis Ecological Approach to Analyzing Adolescent Language Samples" (Janice Smith)

When a speech-language pathologist is tasked with completing an evaluation, they are armed with a battery of various standardized assessments and routine procedures. Among these formalities lie language samples: a more naturalistic approach to capturing the capabilities of a person's communication, in terms of functionality and diversity. Most frequently, language samples are analyzed using type token ratio (TTR). It is possible, however, that TTR is not wholly reflective of the speaker's abilities and diminishes insight into lexical diversity. A possible alternative to TTR, the ecological approach, entails examining language samples based on six terms theorized by Dr. Scott Jarvis: size (type), richness (token), evenness, disparity, importance, and dispersion. The purpose of this research project is to compare the effectiveness of type token ratio and the theorized ecological approach when analyzing language samples from adolescent students. Language samples were collected using both a standard interview protocol and a novel, game-like exercise from 42 students at a local middle school. Once collected, samples were transcribed and analyzed in terms of TTR and the theorized ecological approach. Preliminary results suggest that the presented ecological approach provides a wider variety of information concerning the individual's ability to communicate versus the traditionally used type-token ratio.

Goins, Graham; Weddle, Ryan; "Predicting Median Home Prices" (Leyla Zhuhadar)

Actual home value is often the biggest factor considering by home buyers and there are numerous factors that impact a home's value. Some of these factors include the age of the home, number of rooms, crime rate, and accessibility to main roads and commercial districts. The data set used in this project comes from a study in 1978 about urban environments in the Boston area. The same attributes used in the study are still relevant to home prices today. By developing an accurate model of median home prices and their associating factors individuals will be able to predict their own home's value using the same factors.

Gondal, Anas; Hendrickson, Evan; Ronkainin, Millicent; "Discovery and Genomic Analysis of Mycobacteriophages Chotabhai and Barabhai" (Naomi Rowland)

As the most numerous biological entities on the planet, bacteriophages could hold the secret to solving antibiotic resistance. The objective of our analysis is to gain better insight into the vast diversity of the bacteriophage, of which only a small part is known. Using *Mycobacterium smegmatis* as a host, we characterized newly discovered Mycobacteriophages BaraBhai and ChotaBhai from soil samples collected from different geographical regions in Kentucky. Both phages were characterized using Electron Microscopy and Restriction Enzyme analysis. BaraBhai was isolated from a wet and fertile soil sample in Brodhead, KY and ChotaBhai was isolated from a moist and fertile soil sample in Bowling Green, KY. Despite similarities in soil composition, the Mycobacteriophages were noticeably different in both morphology and DNA restriction patters. BaraBhai had large, 4.0 mm in diameter, turbid and haloed plaques in comparison to ChotaBhai's small, 1.0 mm in diameter, clear plaques. BaraBhai was predicted to be a member of the Singleton cluster while ChotaBhai was predicted to be in the A1 cluster.

These results provide further evidence that the mycobacteriophage population is incredibly diverse, and may also be indicative of these phages possessing properties that are potentially active against a relative of *Mycobacterium smegmatis* which causes Tuberculosis.

Graham, Anthony; Orooji, Fatemeh; "Amphibious House: A Novel Flood Mitigation Strategy" (Fatemeh Orooji)

Floods are one of the most common and destructive natural hazards worldwide. Almost 75% of all federal disaster declarations are related to flood events. Property damage from floods is a major economic concern for federal agencies, local governments, and individual homeowners. Permanent static elevation has been a common strategy to keep homes above the water levels in flood-prone areas around the world. Permanently elevating houses creates new problems such as inconvenient access to living areas, difficult access for elderly and disabled residents, loss of neighborhood character, and increased vulnerability of the structure to wind damage. This research developed a new concept for a flood-resilient house prototype that is capable of floating on the surface of rising floodwater and does not have to compromise its convenience and appearance for its function. This study explored an appropriate design solution for an amphibious house as an alternative flood mitigation strategy that allows the home to float on the rising floodwater without causing an increase in wind damage through identification of the amphibious design and construction key factors. The design solution included the foundation and structural sub-frame of the building.

Graham, James; North, Leslie; "Using Mobile Eye-Tracking to Inform the Development of Mass Tourism in Iceland Towards the Principles of Ecotourism" (Leslie North)

Since the late 20th century, ecotourism—an alternative to mass tourism with a focus on natural environments—has grown in popularity. Ecotourism areas should be considered a platform for informal education and exemplify environmental stewardship and conservation. Iceland, an island nation in the North Atlantic, is one area of the world that has seen dramatic growth in its tourism industry over the last several years. Between 2010 and 2016, the number of annual visitors to Iceland increased from 488,600 to 1,289,140. The pressures of economic development have resulted in the continued promotion of Icelandic tourism, and, subsequently, the rapid development of various tourist destinations. This study used a triangulated mixed methods approach including post-assessments, location aware-mobile eye-tracking (LA-MET), and observational analysis to assess visitor experience and behavior in two popular Icelandic tourist destinations: Sólheimajökull and Þingvellir. Through the use of LA-MET, a greater understanding of visitor behavior has been developed in these areas. Further the ways in which LA-MET may be used for data-driven tourism development are better understood. These findings may be used to guide the future development of tourism destinations to further engage visitors, while promoting education and conservation. In doing this, tourism practices in Iceland may align with the principles of ecotourism.

Greene, Anna; Smith, Janice; "Cross-Cultural Comparison of French Dialectal Variations and Potential Impact on Business Communication" (Janice Smith)

According to the France Diplomatie, French is the official language of 29 countries, second to English, and is the second most learned foreign language, globally ("The Status of French in the World," n.d.). Due to the continual growth of the French language as a universal means of communication, French is increasingly becoming economically significant to global markets.

Because many French speakers have adopted French as their second language, native languages play a crucial role in how spoken French will be perceived to the listener. Thus, an individual's first language can create a distinct French dialect, potentially resulting in miscommunication. The purpose of this investigation is to identify those language barriers and expose potential limitations of language use within the business arena. During this research study, I analyze language samples from a small group of adults utilizing a case comparison format between nonnative French speakers and native French speakers. Preliminary analysis of results indicates observable variances within the phonological and pragmatic aspects of French due to individuals' first languages.

Greer, Casey; Griffin, Melissa; Schargorodski, Megan; O'Connell, Charles; "Case Study and Future Uses of Frozen Soil Observations" (Melissa Griffin)

During winter months, many locations throughout Kentucky experience frozen soils and the communication of 'frost depth' is imperative ahead of significant winter weather events. Frozen soils retain moisture, which disturbs the water cycle by stopping the exchange of moisture between the air and ground. The process of freezing and thawing can alter soil properties, disrupt plant root systems, and cause issues for infrastructure. The authors will examine 5-minute soil moisture and soil temperature data and compare trends with the atmospheric data from two Kentucky Mesonet stations during the winter of 2017-2018. While evaluating these datasets, the authors will compare soil compositions at each site, determining potential threshold criteria for the soil to freeze. This case study will serve as an initial step to explore how identifying frozen soil events can provide beneficial and timely information for water resources management, agricultural development, and transportation concerns.

Ha, Dat Thinh "The Fluorescence Quenching Ability of Graphene Oxide as a Platform for Pathogenic Double-stranded DNA Sensing Utilizing Engineered Zinc Finger Protein." (Moon-Soo Kim)

Two-dimensional graphene oxide (GO) possesses unique electronic, thermal, and mechanical properties. The quenching ability of GO creates novel methods for detection of biomolecules. A zinc finger is a DNA-binding domain that can recognize three nucleotides. Multiple fingers can be linked together to form zinc finger proteins (ZFPs) that recognize extended DNA sequences. Fluorescence dye-labeled ZFPs can bind to GO via stacking interactions of aromatic and hydrophobic residues in conjunction with hydrogen bonding interaction between hydroxyl or carboxyl groups of GO and hydroxyl or amine groups of the proteins. They can come in close proximity with GO, which acts as a quencher due to fluorescence resonance energy transfer (FRET). Thus, in the absence of target DNA, fluorescence signal of dye-labeled ZFP is quenched. When target DNA binds to ZFPs, the bound complex is released from GO, which causes the fluorescence signal to be restored. Here, fluorescence quenching of dye-labeled ZFP by GO has enabled an effective system with high sensitivity and specificity for the detection of antibiotic resistance genes.

Habib, Awais "Optimizing Marking of Sheet Metals" (Morteza Nurcheshmeh)

During the fall 2017 semester, Team Etch-A-Sketch was tasked with determining the best all-around measurement grid application method for sheet metal deformation analysis. Students analyzed available information from literature and conducted research on the recommendations about the most effective marking methods, which then is to be compared against the other top

methods during physical testing in the 2018 spring semester. The Western Kentucky University Mechanical Engineering Program currently owns an electro-etching system, and this method has previously been used for testing but has yielded unsatisfactory results. In response, Team Etch-A-Sketch was given the responsibility of determining a method that may provide a better grid quality, and therefore, if the electro-etching system warrants further testing and optimization. Based on the comparison criteria of dark line marking, thin line marking, uniform pattern marking, shallow marking depth, material mark-ability, marking time, and cost-effectiveness, Team Etch-A-Sketch identified the five best marking methods for our application: electroetching, chemical etching, laser etching, CNC engraving, and non-destructive marking. After thorough research and careful comparison, the best all-around method was determined to be the electroetching method.

Harper, Seth; Dobrokhotov, Vladimir; Banga, Simran; Novikov, Ivan; "Comparison of Bacterial Count and Sensor Response Using Metal Oxide Sensors" (Vladimir Dobrokhotov)
This experiment created a link between bacteria counts within a meat sample and sensor signal response using the SGX MiCs-6814 sensor array. The purpose of this is to be able to detect when meat begins to spoil based on signal response. This was done by first taking measurements of the sensor response and simultaneously plating diluted meat samples onto agar plates. After a 48 hour incubation period, the agar cultures showed bacterial growth proportional to the number of bacteria in the sample. By counting the number of colony forming units [CFU], the colony counts were plotted as a function of signal response. The relationship between the two was found to be linear. This linearity has two different slopes depending on the region of the plot. These regions can be split into two separate linear fits. Then by setting the functions equal to each other and solving for the signal response, the threshold for each sensor to detect meat that is starting to spoil was found. For Sensor 1 the threshold is 0.356, for Sensor 2 the threshold is 1.95, and for Sensor 3 the threshold is 1.28. This can be used in home appliances by integrating the sensor array with a system that determines the signal response to warn users of potentially spoiled meat

Hart, Kyler "Telecom Segmentation's: Predicting Customer Gender Based on Network Behavioral Trends" (Leyla Zhuhadar)
Mobile phone network marketers are responsible for segmenting customers based on behavioral patterns associated with mobile phone usage. These segments offer a diverse range of customer profiles, and provide information regarding professional and residential use, contractual data, and various network activity trends. By developing a regression model, marketers can predict with a certain accuracy the gender (Male or Female) of a given customer based on the behavioral data they have collected. This research used logistic regression techniques within the analytical software RapidMiner to estimate a model for telecom segmentation data, retrieved from the book *Effective CRM Using Predictive Analytics*. The research findings indicated that the gender of telecom customers could be predicted with a certain degree of accuracy using logistic regression. With this method, marketing campaigns can more accurately assess the gender of potential clients and utilize this information in the implementation of advertising techniques.

Hatcher, Alexa "Critical Service Learning at WKU Glasgow Regional Campus: A Path for Marginalized Students to Stay in School and Combat Social Inequality?" (Nicole Breazeale)
How do students at commuter campuses—comprised largely of poor and working-class folks—experience critical service learning (SL) that addresses the injustices that many of them face in

their daily lives? SL is a high impact practice, key to college success and retention, but little is known about how it impacts low income students that are most challenged to persist in higher education. The intervention that is investigated in this study, namely critical SL, builds on Stoecker's (2017) "liberating" framework and aims for individual outcomes as well as progressive social change that benefits marginalized communities that students call home. In this paper, I will present the findings of a retrospective, longitudinal study that investigates the impacts of critical SL. The study employs a mixed-methods design and data includes a survey with both closed and open-ended questions pertaining to student experiences as related to persistence theory. The project was implemented over five years and engaged six classes at WKU Glasgow Regional campus. It involved a partnership with community organizers and marginalized residents to change local policy to address housing injustice.

Hatter, Evan "Remote Sensing Analysis of Multi-Vortex Tornado Near Dodge City, Kansas on May 24, 2016" (Joshua Durkee)

On May 24, 2016, a potent mid-latitude cyclone dragged a cold front across the nation's mid-section. This cold front collided with warm, moist air returned from the Gulf of Mexico. This allowed several supercell thunderstorms to grow and develop across Colorado, Kansas, Nebraska, Oklahoma and Texas. One of these powerful thunderstorms was a photogenic low-precipitation supercell that produced several tornadoes in the vicinity of Dodge City, Kansas. One of these tornadoes became a large tornado, with multiple satellite vortices that rotated around its center. While at other times, multiple tornadoes from the same parent supercell were on the ground simultaneously. This storm was captured on video by multiple meteorologists and storm chasers. This study utilizes both satellite and radar data to investigate how this weather system came together to produce such an unusual phenomena and how these remarkable storms were depicted on both GOES satellite data and on NEXRAD Radar.

Henson, Alex; Evans, Brendan; Gupta, Sanju; "Large-Area Graphene Membranes and Mesoporous Deionization Electrodes for Water Desalination" (Dr. Sanju Gupta)

In this work, we developed large-area nanofiltration membranes using 1) shear aligned discotic nematic phase of graphene oxide and 2) holey graphenes with narrow hole size distribution via controlled catalytic oxidation. We also prepared interconnected network of mesoporous graphene-based electrodes to achieve optimal desalination during capacitive deionization (CDI) of brackish water, attributed to higher specific surface area, electrical conductivity, good wettability of water, environmentally safe, efficient pathways for ion and electron transportation, as potential successor of current filtration membranes. The pressure driven transport data on highly ordered, continuous, thin films of multi-layered graphene oxide and holey graphene is expected to demonstrate faster transport for salt water, higher retention for charged and uncharged organic probe molecules with hydrated radii above 5 Å as well as modest retention of mono- and di-valent salts for ~150 nm thick membranes. The highly ordered graphene nanosheets and nanoscaled porous graphene in the plane of the membrane make organized, molecule-hugging cylindrical and spherical channels, respectively, thus enhance the permeability and hydrodynamic conductivity. The results illustrate that both the macro and nanoscale pores are favorable for enhancing CDI performance by buffering ions to reduce the diffusion distance from external electrolyte to the interior surfaces and enlarging surface area.

Hernandez, Fernando "Using Groundwater Hydrogeochemical Evolution and Tracing to

Understand Speleogenesis in Sistema Huautla in Oaxaca, Mexico" (Jason Polk)

Deep cave systems of the world continue to be a focus of exploration, but have not yet received as much scientific study. Sistema Huautla in Oaxaca, Mexico is the deepest explored cave in the western hemisphere and contains significant water resources, having been explored through diving and vertical caving for decades. Despite the attention Huautla has received, connections to the ultimate baselevel springs and nearby passages that likely are part of the system have yet to be made and almost no studies have been conducted on the recharge inputs, geochemistry, or springs in the cave system. This study proposes to conduct a thorough investigation of the hydrogeochemical evolution of Sistema Huautla's water as it flows through the cave to its ultimate resurgence, including dye tracing to make the connection with the main cave, delineation of the recharge to different portions of the system, and geochemical sampling to characterize the evolution of the water as speleogenesis continues to occur and carve deeper passages. Collectively, these data will improve understanding of the groundwater evolution in deep cave systems and how it influences cave formation, including controls on passage level development in relation to elevation, flow variability on dissolution, and how geochemical mixing of under-saturated waters contribute to speleogenesis at depth. The results of this study will contribute greatly to understanding of water resources in the region, further exploration of the cave system and potential connections, and geochemical behaviour of karst water at depth over seasonal variations in Sistema Huautla.

Hernandez, Luis "Research and Development in Sports" (Shahnaz Aly)

Pirma is a Mexican sports brand company with reaches into Central and South America. The need of company expansion into the US and Canada has led to the idea of creating a research and development facility in the US. A prime location for the Pirma USA facility would be Franklin TN. Franklin is only located about 20 minutes from Nashville and is middle point for many other important Southern cities. The facility would be able to house several different activities under the same roof. Some of the major needs for a facility of this type are offices, fields, courts, lounges, and etcetera. The Pirma USA would have a combination of all these facilities that have been determined with research to be vital to a facility of this kind. The proposed building will be a Type-I building with a sprinkler system. The building would have 2 hour rated partitions as well as the use of other materials such as metals and translucent panels for aesthetics. This project would fall under the subject area of Natural Science Department at WKU.

Holden, Anne "The Influence of Mary on Modern Catholic Women's Expression of Sexuality" (Elizabeth Gish)

A main figure of importance in the Catholic faith is Mary, the mother of Jesus. Looking at the time period from the 1970s to the present, Mary influences the faithful's views on the sexual purity movement and their own sexual identities. To research Mary's influence on the women of the Church, the Catechism of the Catholic Church was used to view how the Catholic Church teaches about Mary, and how they relate it to their teachings of the Theology of the Body, as well as the biblical literature used to support these two texts. The purity that Mary exhibits includes sexual purity, but also relates to her faithfulness to God, obedience to God's orders, and her overall spirituality and connection to God. The Catholic Church teaches about Mary and how she should be a model for the faithful, especially in the Catechism of the Catholic Church. The overall focus on Mary in the Church puts many Catholic women in a position of attempting to mimic her seemingly unreachable sexual purity, as well as the other aspects of purity that make

Mary, according to the Church, have a closer relationship with God.

Holliday, Joe "Twisted" (Neal Downing)

Concept statement: This project consists of a stand-alone, high rise, ski resort that provides its guests with a one of a kind alpine experience. The building's site is located on the slope of a mountain in Lake Tahoe, California providing access to the many outdoor sports available. A majority of the resorts located in the region are tailored toward relaxation and only offer minimal recreational sports. The selected site and unique form offer a one of a kind experience. By shaping the structure in the form of a skier sliding down a slope, the resort clearly stands out among the rest. The atrium unifies the rotating levels and allows the building's guests to see inside of each floor while also experiencing the outside as they circulate skyward.

Complimenting this experience is the ground floor gourmet restaurant and a rooftop bar for the guest's enjoyment.

Hooker, Christine "Why the One Child Policy Was Unnecessary" (Timothy Rich)

While I was researching the long-term effects of the One Child Policy I found that all of the literature started out with the same assumption, the One Child Policy was a necessary measure to decrease China's population growth. By looking at the fertility trends in China during the decade before the One Child Policy was implemented and trends in fertility within other East Asian nations including but not limited to Japan, South Korea and Singapore, I have concluded that the assumption made in the previous research was faulty. The One Child Policy was unnecessary as there were other, more effective, policies that China could have copied from its neighbors.

Hornback, Skyler; Stevens, Edwin; "Experimental Electron Distributions of the Antiestrogenic Drug Tamoxifen" (Edwin Stevens)

Two of every three breast cancer diagnoses are hormone receptor positive, and the majority of these are estrogen receptor positive (ER+). The most common form of treatment involves using antiestrogenic drugs that bind to the receptors and inhibit tumor growth. One such drug, Tamoxifen, has been proven to produce survival advantages in both node-positive and node-negative disease, reducing the spread of contralateral breast cancer. The crystal structure and electron density distributions were determined from 123,477 high-resolution x-ray intensity measurements collected from a crystal of Tamoxifen cooled to 120 K using the Bruker® Apex II automated diffractometer at the WKU Advanced Materials Institute. Tamoxifen was found to crystallize as a citrate salt in a monoclinic structure with one independent molecule in the asymmetric unit. When tamoxifen is co-crystallized with citric acid, H⁺ is transferred from the citric acid to the nitrogen on tamoxifen, yielding a positive tamoxifen cation and a negatively charged citrate anion. Using the determination of the electronic properties of Tamoxifen from the data, we hope to establish a firmer foundation in the understanding of how Tamoxifen binds to its target estrogen receptors, which may lead to drug designs with higher levels of safety and efficacy.

Hornsby, William "Metric Invariance of the BIS/BAS Scale" (Andrew Mienaltowski)

The Behavioral Inhibition System and Behavioral Activation System Scales, or BIS/BAS Scales, were originally developed by Carver and White in 1994 using a large sample of college students. The BIS/BAS scales are often included in studies that compare motivated younger and older adult behavior, so it is important to test whether the BIS/BAS scales are examining similar

constructs in younger and older adult samples. Socioemotional Selectivity Theory suggests that advancing age is associated with greater attention to emotions, but it is less clear if the prioritization of emotion processing that takes place in older adulthood leads to changes in the behavioral inhibition and behavioral activation systems as measured by the BIS/BAS scales. This study used a sample of 319 college students and a sample of 304 adults over the age of 60 to examine what differences exist in the BIS/BAS and related measures between younger and older adults. LISREL was used to analyze the data, which suggested that the BIS/BAS has weak metric invariance, meaning that similar constructs are measured by the BIS/BAS in older and younger adults, although those groups have different observed average scores on the measures.

Hounshell, Conner "Assessing the Extent of Biomass Fuel Consumption in Kasigau, Kenya and Its Relation to Household Air Pollution Exposure and Hypertension" (Nancy Rice)

The goal of this project was to provide quantifiable, demographic data about solid fuel use in rural Kenya, and its likely relation to household air pollution (HAP) and hypertension. A preliminary survey of the Kasigau community included stove type, fuel type, household characteristics, and cooking practices. Approximately 25 individuals were surveyed from 5 villages. Results indicate a high prevalence of unclean stove types and fuel, such as wood-burning stoves and charcoal. Clean fuel types were mostly unavailable or expensive. Quantification of fuel used was inconclusive due to variation in units. On average, daily cooking periods were 60 minutes each, three times per day. Poor ventilation practices were also identified (e.g. lack of chimney, enclosed kitchen). Overall, our preliminary results suggest a significant daily exposure to HAP by the primary cook. Further surveys will be conducted to increase sample size for statistical significance. These results will also be used to identify a subset of households in which HAP will be quantified and correlated to the development of hypertension. This study contributes to the global effort of reducing rising chronic disease, specifically cardiovascular, in developing nations and could lead to prevention methods to reduce HAP exposure.

Howlett, Josiah; Rollings, Amelia; "The Short-Term Effects of Alcohol, Coffee, Milk, and Water on Acoustical and Perceptual Measures of the Singing Voice" (Amelia Rollings)

Some voice professionals discourage singers from drinking dairy, coffee, or alcohol before a vocal performance (e.g., Vincent, 2011). However, limited data exist to support or oppose these claims. The purpose of this study was to determine the short-term effects, if any, of alcohol, coffee, milk, and water on acoustical (long-term average spectra [LTAS]) and perceptual (questionnaire) measures of university singers (N = 25) as they performed the same song. Acoustical and statistical results indicated significant differences ($p \leq .001$) between pre- and post-test conditions for all groups including the control group. Mean LTAS data displayed decreased signal energy between pre- and post-test conditions in all groups. Participants in the water group responded that they did not feel more mucus or thicker saliva when singing after drinking the beverage. However, participants not consuming water reported mixed perceptions regarding mucus and saliva production. All participants (N = 25, 100%) commented that they believed what they drank could affect their singing, yet LTAS data indicated more nuanced changes in acoustical measurements of voice production.

Hulse, Madeline "Reinforcement Learning for Optimizing Dots and Boxes Strategy" (Uta Ziegler)

Reinforcement Learning algorithms are machine-learning algorithms that learn the actions an agent should make to optimize a reward. MCTS learning creates a search tree based on simulated playouts, updating the nodes of the tree at the end of each game. Our algorithm blends RL Learning with MCTS learning (based on published research) and apply it to the game Dots and Boxes in an effort to reduce memory usage. Our program aims to optimize playing strategy by assigning values to state-action pairs and running simulations in which those values are updated. The Learn() method runs games and stores information in a permanent memory. Before making a move, the Search() method is called to run games and store information in the transient memory, which is used to pick the next move. A trace keeps track of the last moves made in each simulation. The values of states in the trace are updated backward from the terminal state, allowing the agent to learn which moves led to a particular result. We are currently running tests to determine the efficiency and accuracy of the learning process. If effective, later refining of the program may lead to new insights into the use of reinforcement learning.

Ihrom, Saidjafarzoda; Kholikov, Khomidkhodza; Thomas, Zachary; Roberts, Duvall; Er, Ali; Li, Peizhen; Karaca, Haluk; "Generation of Recoverable Patterns on Niti Alloy by Pulsed Laser Irradiation" (Ali Oguz Er)

Shape memory alloys (SMAs) are a unique class of smart materials and they were employed in various applications in engineering, biomedical, and aerospace technologies. Here, we report an advanced, efficient, and low-cost direct imprinting method with low environmental impact to create thermally controllable surface patterns. Patterned micro-indentations were generated on Ni50Ti50 (at. %) SMAs using an Nd:YAG laser with 1064 nm wavelength at 10 Hz. Laser pulses at selected fluences focused on the NiTi surface and generated pressure pulses of up to a few GPa. Optical microscope images showed that surface patterns with tailorable sizes can be obtained. The depth of the patterns increases with laser power and irradiation time. Upon heating, the depth profile of SMA surfaces changed where the maximum depth recovery ratio of 30 % was observed. Recovery ratio decreased and saturated at about 15 % when the amount of time and thus the well depth was increased. Laser-induced shock wave propagation inside the material was simulated and showed a good agreement with the experimental results. The stress wave closely followed the rise time of the laser pulse to its peak value and initial decay. Rapid attenuation and dispersion of the stress wave were observed.

Irihamye, Elvin; Cecil, Wendy; Chumbler, Jackson; Nofsinger, Leah; "Analyzing the Efficiency of Reforestation Efforts in Regaining Carbon Storage in a Costa Rican Cloud Forest" (Martin Stone)

Forests hold an important place in offsetting carbon emissions, absorbing nearly 40 percent of man-made fossil fuel emissions every year. Over the last 100 years, the effects of deforestation have crippled our forest's ability to store excess carbon, leading to drastic atmospheric change. Efforts to regrow deforested forests have increased rapidly to address issues like climate change. There is thus a need to analyze current efforts at regaining carbon storage, a critical component to maintaining atmospheric homeostasis. Accordingly, we traveled to the Cloudbridge Nature Reserve in San Gerardo, Costa Rica to aggregate data on the carbon storage capabilities across three different forest successions; un-tampered old growth, naturally regenerated deforested growth and reforested growth. Using allometry we were able to estimate the average carbon storage of three different land plots in each type of growth. We concluded that the reforested plots of the forest had surpassed the natural regeneration plots in terms of carbon storage by a

factor of two, and that the planting of larger, rooted, climax species correlates to higher carbon storage. This research can be used to support reforestation (especially of climax species) as a means of reducing carbon emissions, and to advocate against the deforestation of forests.

Iyer, Shyama "An Indian Exploration of Musical Theatre" (Julie Barber)

The rich and magnificent history of the Indian performing arts traditions are extremely informative as well as pertinent to the study of any contemporary performance. For an artist of American Musical Theatre, certain techniques are inalienable to their treasured skills, for example, the ability to dance, sing, and act. The conventions of rhythm, the arrangements and patterns of the melody, and the dramatic scenes and movement in the classical dance form Bharathanatyam (South Indian Classical dance), exemplifies the characteristics that these artists strive to possess. I hope to give a performance in this ancient style that is entirely based on the context of a contemporary musical theatre piece. It is vital for these diverse traditions to be explored and understood because their conventions and cultural context will encourage society to grow and reciprocate a more diverse and international story.

Jackson, Andrew; Morris, Cody; Winchester, Lee; Tomes, Ariel; Neal, Wesley; Wilcoxon, Damon; Arnett, Scott; "Effect of a Simulated Tactical Occupation Stressor on Reaction Time" (Cody Morris)

The purpose of this study was to evaluate RT in response to a simulated firefighting occupation workload. While wearing proper testing attire, ten healthy male participants completed a simulated fire stair climb (SFSC) by completing two consecutive 3-min workloads on a Matrix C7xe ClimbMill (Matrix Fitness USA, Cottage Grove, WI, USA) at a stepping rate of 60 steps/min under four conditions, with some conditions including the wearing of a 75 lb. weighted vest to simulate the typical personal protective equipment (PPE) worn by a firefighter. RT was evaluated by employing a color-word interference test (CWIT) to evaluate how quickly participants could react to distracting and/or incorrect visual stimuli to provide a response. A repeated-measures ANOVA showed that there was a significantly worse RT ($p = 0.016$) than baseline ($p = 0.001$) during the SFSC while wearing the weighted vest. RT time was also slowed during correct responses ($p = 0.025$) while wearing the weighted vest. Based on the results of this study, it appears that wearing a weighted vest to simulate PPE significantly impairs RT. These findings suggest that the decision-making ability of tactical operators could be hampered in response to such a workload-induced physiological stress, exposing themselves and potential victims to further harm.

Jackson, Colleen; Williams, Blairanne; Duke, Brooke; "Cytotoxicity of Novel Platinum Compounds in Models on Mammalian Cancer" (Blairanne Williams)

Cisplatin was the first FDA approved platinum compound used as a chemotherapy agent to activate cellular apoptosis in cancerous and noncancerous cells alike. These compounds include a central platinum atom bound to a leaving and non-leaving ligand. Both leaving and non-leaving ligands regulate the cytotoxicity of the compounds. Different combinations of ligands change the efficacy of the drug based on the cancer tissue of origin. For example, Cisplatin and carboplatin have the same non-leaving ligands, but different leaving ligands, and therefore are used to treat different cancers. Cisplatin is the drug of choice for testicular cancer, while carboplatin is often used on ovarian, lung, head and neck. This study examines the cell type specificity of non-leaving ligands by comparing novel compounds to FDA-approved drugs. We determined their

cytotoxicities by using MTT assays for each compound on a noncancerous control and cancerous human cell lines. Novel compounds which contained ligands structurally similar to current chemotherapies showed comparable cytotoxicities over similar cell lines from the same tissues of origin, such as the oxaliplatin and its enantiomer, (S,S)-(1,2-diaminocyclohexane.)oxalatoplatinum(II).

Jenks, Julianna; Maples, Jill; "Urinary Incontinence Among Postpartum Women" (Rachel Tinius)

Background: Urinary incontinence is a serious public health concern among postpartum women; however, prevention and treatment is rarely discussed among patients and their providers. In rural Kentucky, prevalence and patient-provider communication incontinence is largely unknown, as well as the communication between local providers and their patients on this topic. Purpose: To determine the prevalence of postpartum incontinence, as well as to investigate the patient-provider communication on this topic. Methods: 22 women participated in the study. Surveys regarding incontinence were adapted based on previous studies. Surveys were sent electronically via Qualtrics to women who had experienced childbirth during the past 12-months. Results: 57.1% reported experiencing urinary incontinence; 85.7% were not given information about incontinence from their health care providers; and 90.5% were never asked if they were experiencing incontinence at their routine postpartum visit. It is critically important providers inquire about postpartum incontinence so that physical therapy assistance can be recommended. Further, 76.2% of participants were not aware that physical therapists specializing in women's health could potentially improve/manage their incontinence. Discussion: Over half of the women experienced urinary incontinence postpartum, yet providers did not provide inquire about or provide assistance in correcting this serious, and often debilitating, medical concern.

Johnson, David "The Shadows of the Present" (Liza Kelly)

Historically, puppetry theater has been used to not only entertain adults across all social and class boundaries, but it has also been used to provide commentary on socio-political and cultural issues. For instance, in 19th century Europe "Punch and Judy" puppets were used to provide political opinions in public when such opinions were not welcomed. Traditionally, shadow puppetry is used to convey a myth or legendary story. The goal of our project, however, is to push the boundaries of shadow puppetry and move into the realm of political and cultural activism. Many recent events have brought great upheaval in our nation, from the current presidency, to the "Me Too" movement, to rising racial tensions. Shadow puppet scenes will be constructed with cardstock, rods, and shadow screen to highlight current issues. The result of the performance will be to draw attention to shadow puppetry work and its ability to unconventionally highlight current issues. This will be especially significant due to the ability of puppets to present, begin dialog, and ask questions about uncomfortable topics or social issues.

Johnson, Kathleen; Couch, Melanie; Kasumba, John; Couch, Brandon; Loughrin, John; Parekh, Rohan; Conte, Eric; "Extraction and Quantitation of Tetracyclines Antibiotics in Anaerobic Cattle Wastes Using Ddpcr" (Eric Conte)

Tetracycline is an antibiotic that is used in feeds to protect against a variety of infections and to increase growth in livestock. The overuse of Tetracycline in feeds is causing an increase in antibiotics in animal waste and the environment. When bacteria are exposed to this antibiotic, they develop antibiotic resistant genes which can be spread through plasmids and mobile genetic

elements. One way to lower the amounts of antibiotics and antibiotic genes is through the use of anaerobic digestion. In this study, seven tetracycline antibiotic resistance genes (tet(A), tet(B), tet(G), tet(M), tet(O), tet(W), and tet(Q)) will be monitored in swine and poultry manure over a 64-day period. Three separate air-tight PVC tubes are used as benchtop anaerobic digesters, and samples were collected every 8 days. The DNA from the manure was extracted using the FastDNATM SPIN Kit for Soil and the FastPrep® instrument. Tetracycline antibiotic resistance genes will be quantified by quantitative polymerase chain reaction using BLAST sequence matched primers. Primers were tested for concentration and qPCR efficiency.

Jones, Haley "RAPS-Measuring Problem Solving in Children with and without Autism" (Janice Smith)

This study compares the Rapid Assessment of Problem Solving (RAPS) with the Ravens Progressive Matrices (RPM) in assessing the problem solving of children with and without autism. While the effectiveness of the RAPS has been documented for neurotypical children and adults, and adults with traumatic brain injuries, severe mental illness, and Alzheimer's disease, no studies have yet been conducted with children with autism. The RAPS and the RPM were administered to twelve adolescents with autism and fifteen neurotypical, ages 10;0-17;11. To assess their problem solving abilities, questions were analyzed in terms of inefficient constraint questions, frank guesses, pseudo constraint guesses, narrowing questions, novel questions and category focused questions. They were also assessed on their understanding of pattern completion through the RPM. Findings will expand the normative database of the RAPS to include adolescents with autism, thus providing rehabilitation professionals with critical psychometric information needed to use the test in the clinical setting. Results could also provide a foundation for a larger study that will likely lead to production of the RAPS as a product for broader use in the clinical assessment of both typically developing children and children with cognitive disorders such as autism.

Jones, Konnor; Nee, Matthew; "Temperature and Electric Field Dependence of Asymmetric Stretching of Nitrate Ion" (Matthew Nee)

The decomposition of nitrate ion by exposure to sunlight (photolysis) produces toxic gases such as NO, NO₂, and O₃, which is harmful to the atmosphere. Different induced nitrate geometries in solution may contribute differently to the amount of products that form during photolysis. To better understand the mechanisms of nitrate photolysis, the effects of different electrolyte concentrations on nitrate geometry distortion is needed. Infrared spectroscopy was used to measure the different nitrate geometries at a series of specified constant temperatures with varying total ionic concentrations. The different charged particles (arising from water molecules and other ions in solution) in solution distort the geometry of the nitrate ion. Different nitrate molecular vibrations are observable in the infrared spectra. As the total ionic concentration increases, the lower energy geometry becomes more favored. An initial path may be favored in low ionic strengths, producing different ratio of products during photolysis. The ratio of the nitrate geometries in solution can be correlated to the quantity of each product produced during photolysis to help explain the ionic strength dependence of the yields of those products. Nitrate geometries at the water—CCl₄ interface and aqueous carbonate ion bonding motifs are being investigated to identify pure-water effects.

Jones, Ryan "From Bach To Basie. A Singin' Affair." (Wayne Pope)

This project (FUSE Award #: 17-FA224) was designed to broaden the musical horizons of an audience by presenting both classical and jazz music within the same concert. In this project Dr. Wayne Pope, Professor of Voice at Western Kentucky University, and I traveled to Farmington, Missouri to perform on The Mineral Area Council on the Arts Concert Series. On November 17, 2017, we performed a program entitled From Bach to Basie: "A Singin' Affair". In this program Dr. Pope and I collaborated on a wide range of classical vocal music for the first half of the concert and then collaborated with the Mineral Area Kicks Band (full 17-piece jazz ensemble) in performing the music of Count Basie and Frank Sinatra for the second half of the concert. Upon completing the project, with audience feedback provided by the Mineral Area Council on the Arts, we found that the format of the concert was very well received.

Joshi, Gunjan; Farrell, Colin; Hunt, Matthew; "Socioeconomic Disparities and Dental Health in Kentucky" (Colin Farrell)

Socioeconomic Status & Dental Health in Kentucky vs USA Background: Apart from behavioral & medical reasons, there are social determinants that predict oral health (Thompson et al. 2014). While the U.S. total population with missing all permanent teeth are 6%, Kentucky ranks second nationwide with 13% population with missing all permanent teeth (Childress & Smith-Mello, 2007). Along with the scarcity of dentists, Kentucky has unequally distributed dentists (Childress & Smith-Mello, 2007). Methods: Secondary dataset for Kentucky population was obtained from BRFSS 2016 survey. Binary logistic regression was carried out using "risk for losing permanent teeth" as dependent variable, with SPSS 24. Independent variables were selected based on the literature review, which included demographics, use of tobacco and alcohol, prediabetes/borderline diabetes/diabetes status, health coverage status, obesity status (to account for sugar/caloric intake, as the original variable of sugar intake had all data missing). Variable of interest was socioeconomic status, which was accounted for using variables like education, income, area in which person lives. Results: Results revealed that in Kentucky people in rural areas have 29.3% higher risk for having permanent teeth removed, as education increases, risk of having permanent teeth removed decreases by 33.5%, as income increases, risk decreases by 17.1%.

Kaiser, Rachel; Polk, Jason; Shelley, Adam; Powell, Matt; "Assessing Stormwater Impacts And Hydrogeological Influences On Water Quality in an Urban Karst Lake" (Jason Polk)

Urban karst lakes, often created by subsidence and sinkhole activity, are understudied with respect to the role they play in urban karst hydrology and the water quality implications from their existence in the landscape. It is well documented that stormwater runoff influences various parameters (heavy metals, oil and grease, salts, etc.) and that other urban impacts (septic runoff, detergents, and organic waste) all can negatively impact groundwater systems. Here, we present data from Limestone Lake, a large karst lake in the urbanized area of Bowling Green, Kentucky, regarding the extent of impacts to its water quality. Ten-minute resolution data was collected for water depth, pH, conductivity, turbidity, and temperature within a four-month time span. Weekly water samples were collected for oil and grease, biological oxygen demand, alkalinity, chemical Oxygen demand, anions, cations, total organic carbon, total fecal coliform, and E. coli. Changes in the water geochemistry values, water level, and parameters, resulted from storm events. Seasonal and daily data indicate that the lake is not as contaminated as nearby groundwater sample sites and may function more as a surface water body in the karst system. In conclusion, the importance of karst lakes and their role in urban karst hydrology merits further research and

this case study proves that additional site-specific knowledge is still needed.

Kanthawar, Arjun; Krishna, Nikhil "Accurately Modeling the Healing Process of Chronic Wounds" (Richard Schugart)

In order to formulate a mathematical model that accurately represents the physiology of a wound, the model and its parameters must be identifiable when given actual data. The goal of this work is to create a model that can accurately predict the healing process for individual patients. Practical identifiability is a method used to determine whether parameters in a model can be uniquely determined given actual data. This work uses a differential equation model that describes the interactions among matrix metalloproteinases, their inhibitors, the extracellular matrix, and fibroblasts (Krishna et al., 2015). A singular value decomposition technique with a QR factorization combined with a correlation analysis is used to find an identifiable subset of parameters. Subsets are analyzed through model prediction intervals and parameter Markov chains and posterior densities.

Kash, Benjamin "Synthesis and Catalytic Studies of Metalloporphyrin Complexes as Biomimetic Models for Cytochrome P450 Enzymes" (Rui Zhang)

Metabolic oxidations relating to the protein class known as the cytochrome P450 enzymes hold key knowledge about biological chemistry and the efficient processes undergone to maintain life. These enzymes are present in most metabolic reactions and can function out of body in crucial industrial processes; however, there exist gaping unknowns with respect to them due to their immense nature. In this work, synthesis and characterization of iron and manganese complexes supported by a 5, 10,15, 20-tetrakis-(2,6-dichlorophenyl)porphyrin ligand, abbreviated as MIII(TDCPP)Cl (M = Fe, Mn), was conducted. Oxidation reactions catalyzed by these synthetic catalysts were investigated and remarkable efficiency and high selectivity were achieved for a variety of organic substrates including sulfides and alkenes. Recent studies also showed that the selectivity for sulfoxide versus sulfone in the oxidation of organic sulfides can be simply controlled by amounts of the oxygen source. Mechanistic studies were performed to probe for the nature of oxidizing intermediaries relevant to the catalytic reaction. Specifically, the porphyrin-iron(IV)-oxo Compound II models were generated by chemical and photochemical methods.

Kaur, Simrat "Association of Body Mass Index and Insufficient Sleep: An Analysis of BRFSS 2016" (Michelle Reece)

Obesity is a major risk factor for many chronic diseases including type 2 diabetes, cardiovascular diseases, cancer, and obstructive sleep apnea. Over the past 50 years, the prevalence of obesity among U.S. adults has nearly tripled. As the prevalence of obesity increased, the percentage of U.S. adults who reported an average of ≤ 6 hours of sleep per day also increased. Nearly one-third of adults report sleeping < 6 hours on average, leading some people to suggest that we live in a sleep-deprived society. The objective of this study is to determine whether perceived insufficient sleep was associated with body mass index (BMI) in a national sample taken from Behavioural Risk Factor Surveillance Survey 2016 (BRFSS). The outcome measure of the study is obesity while Independent variables included sex, age in years (18-24, 25-34, 35-44, 45-54, 55-64, and ≥ 65), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and non-Hispanic multiracial/other), education level (less than high school graduate, high school graduate

or GED recipient, some college, and college graduate), smoking status (current, former, and never), recent physical activity (yes or no), and frequent mental distress (yes or no).

Kessler, Austin "Suburban Living in an Urban Setting" (Shahnaz Aly)

The project aimed to address all the problems with urban living in Louisville. This building adds a unique feature to the waterfront area, playing off the metal paneled facade of the Yum Center. The building is a mixed-use facility with apartments, a parking structure, a restaurant, and store fronts. The main issue I wanted to address with urban living is space. The idea of living in a metropolitan area is exciting, but people must often compromise space. The family units in this building are slightly bigger than the "average" downtown apartment units. There is also a parking structure attached to the building to ensure plenty of parking for patrons, also adding to the economic feasibility of the project. This location is prime real estate in the Louisville waterfront and is currently being used as a parking lot. I believe that waterfront apartments and storefronts are a great addition to the city.

Kholikov, Khomidkhodzha; Ilhom, Saidjafarzoda; Thomas, Zachary; Smith, Skyler; Cooper, Lauren; Er, Ali; "Photodeactivation of Pathogenic Bacteria Using Graphene Quantum Dots Synthesized by Nanosecond Laser Pulses" (Ali Er)

In this work, a graphene-based biomaterial which is a promising alternative to standard photosensitizers was produced and its efficiency compared to a standard photosensitizer, methylene blue. Graphene quantum dots (GQDs) were synthesized by irradiating benzene and nickel oxide mixture using nanosecond laser pulses. High-resolution transmission electron microscopy (HR-TEM) results show GQDs whose size less than 5 nm with very good water dispersibility were successfully obtained. UV-Vis spectra of GQDs have an absorption peak around 300 nm and photoluminescence spectra shows that GQDs have maximum emission at 430 nm with the excitation wavelength of 310 nm. Also, Fourier transform infrared (FTIR) spectra further confirms the presence of GQDs. Deactivation of a gram-negative bacterium *Escherichia coli* (*E. coli*) with methylene blue and GQDs was studied by irradiating with different wavelengths. The preliminary results show a significant decrease in the number of colony forming units of *E. coli* and that GQDs can potentially be used to develop therapies for the eradication of pathogens in open wounds, burns, or skin cancers.

Khouryieh, Marlain; Khouryieh, Hanna; Daday, Jerry; "Consumers' Awareness, Knowledge, And Perception of Safety of Locally Grown Fresh Produce Sold At KY Farmers' Markets" (Hanna Khouryieh)

The demand for local foods is growing, and farmers' markets are great ways to meet that demand. However, the number of foodborne illnesses linked to fresh produce has increased in the last decade. The purpose of this research was to determine consumer perceptions of safety of locally grown fresh produce sold at Kentucky farmers' markets. Surveys were administered to farmers' market consumers at 8 Kentucky farmers' markets between April and October of 2017. Ninety-seven percent of participants stated that product freshness and product taste were very important or extremely important reasons for shopping at the local farmers' markets. More than 80% of consumers reported refrigerating perishable goods purchased at local farmer's market within one hour. The consumers believe that consumers themselves (43%) and farmers (43%) are equally the most responsible for the safety of farmers' market products. However, 41% don't

know how long it takes for pathogenic bacteria to cause foodborne illness in foods held between 40oF-140oF. A better understanding of consumers' perceptions allows stakeholders, including growers and vendors, to make better informed decisions regarding their food safety practices.

Kilgore, Baylee "Parent-implemented Adapted Dialogic Reading for Preschoolers with Autism" (Janice Smith)

The purpose of this research study is to investigate the effectiveness of adapted dialogic reading in improving social reciprocity in preschoolers with autism. Dialogic reading is a shared reading intervention technique used by educators and parents to increase verbal participation and duration of engagement with printed materials. This study seeks to answer two main questions: "Does parent-driven adapted dialogic reading increase social reciprocity behaviors in preschool children with autism?" and "Do parents' feelings of competence change after being trained to implement adapted dialogic reading with their children with autism?" Five preschool-age children with the diagnosis of autism spectrum disorder and their parents participated in the study. The parent of each child was trained to implement the reading program and then engaged their child in approximately ten minutes of adapted dialogic reading for five days of the week over a ten-week study. Families were provided with a different adapted book and curriculum each week, which included a prompting guide and cueing hierarchy. Parents made video recordings of each reading session in order for data to be analyzed. Preliminary data suggests that adapted dialogic reading increases parent confidence and improves social reciprocity skills, such as eye contact and joint-attention in children participating.

King, Carson "Comparison of Coronal Dimming Behavior Between Xrt And Aia Data" (Gordon Emslie)

A coronal dimming is an event that takes place in the sun's atmosphere, in which a patch of bright plasma seemingly disappears leaving a dark spot. These events are often associated with other solar phenomena such as flares and coronal mass ejections. Over the lifetimes of the SDO/AIA and Hinode/XRT telescopes many of these dimmings have been observed, however very few have been studied using XRT data. For this project one event was selected, and the goal was to measure how the area of the dimming region behaved over time in relation to other events in the area. In doing this, a new objective method for determining a threshold between the dimming region and the surrounding area was developed which can now be used to analyze the area of almost any dimming region. After comparing the region's behavior over multiple wavelengths, our results support the common theory that these dimmings are caused by an evacuation of plasma due to opening magnetic field lines, rather than a sudden temperature change.

King, Shelby; Rinne, Allison; "Age Differences in Peripheral Emotion Detection: Converging Psychophysical and Electrophysiological Evidence" (Andrew Mienaltowski)

Advancing age is associated with declines in emotion detection, a skill utilized in everyday social interactions. The present study manipulated the expressive intensity of happy and angry faces and their peripheral location on a display to measure emotion detection ability. Intensity was generated by morphing open and closed mouth faces and presentation was across six locations (5, 10, and 15 degrees) in the left and right visual fields. Younger (n = 27, ages 18-27) and older (n = 28, ages 60-79) adults completed the task of indicating if facial stimuli were neutral or emotional for 960 trials. Psychophysical performance and neurophysiological

evidence, visually-evoked early posterior negativity (EPN) potentials, were measured. For both measures, younger adults generally outperformed older adults. Psychophysically, older adults struggled more to detect emotion in angry, low intensity, closed mouth stimuli. However, both age groups showed decline in emotion detection for closed mouth stimuli at peripheral locations. EPN results indicated that both age groups showed an enhanced late EPN to happy expressions, and only younger adults displayed an enhanced late EPN to angry expressions. This suggests that age-related deficits are present, but smaller differences for happy expressions, leading towards evidence for a positivity effect in older adults.

Knerr, Reinhard; Georgia Hoffman; Rinehart, Claire; Rowland, Naomi; Staples, Amanda; "A Comparative Analysis Of Two Novel Phages Childish And Klause" (Claire Rinehart)

Bacteriophages are considered the most abundant living entity on the planet, yet very little is known about their genomic characteristics. This research was conducted to broaden the understanding of novel phages in the scientific community. The purpose of this program is to isolate and characterize a novel virus specific for the infection of the bacteria *Mycobacterium smegmatis*. One soil sample was collected from a fertilizer pile from the Office of Sustainability; the other sample was collected from soil by PFT. After collection, the soil samples were enriched by growing them with *M. smegmatis*. High titer lysates were finally generated from purified phages, from which phage DNA was isolated and subsequently analyzed by using restriction enzymes and gel electrophoresis. Electron microscopy was used to obtain a visual representation of the phage. Finally, the genomes and physical characteristics of the phages were compared. Childish had 4mm diameter Bull's Eye plaques and extremely long, thin tails; Klause had 3mm diameter Bull's Eye plaques, and short, thick tails. Furthermore, the gel electrophoresis results varied dramatically from well-to-well, indicating great genetic variety. The results indicate that a close proximity of phage collection has no correlation to genomic characteristics.

Knight, Lucas "Opinions on Free Trade Policies in Taiwan" (Timothy Rich)

The past several years have seen an intense debate over global trade policies, observable in Taiwan regarding the creation of the Economic Cooperation Framework Agreement (ECFA) and interest in entering into the Trans-Pacific Partnership (TPP). This study analyzes what factors influence Taiwanese perceptions of free trade agreements, with an emphasis on how altering the framing of a potential agreement impacts this perception. Utilizing a web-based experimental design approach with 504 respondents, this project analyzed how presenting the free trade agreement in terms of gains and losses, and how focusing on varying levels of impact (local versus national) altered perceptions of the agreement. While the baseline version support for such a deal was rather high, further analysis suggests that, with regard to the former, respondents respond to framing in line with expectations based on prospect theory, and with regard to the latter, the level of impact has no significant impact in respondents' opinions on free trade policies. These findings offer a greater understanding of the general views that the Taiwanese public holds concerning trade policies while also offering into how such deals such be discussed in the public sphere by interested parties.

Kwan, Henry "Searching for New Blazars" (Michael Carini)

Blazars are extremely energetic phenomenon whose emission is dominated by a relativistic jet powered by the accretion of material onto a supermassive blackhole. Despite over 50 years of study, questions remain unanswered concerning fundamental aspects of these jets such as their

creation, the acceleration of particles in the jet, and the matter content of the jet. The construction of long term optical light curves of a sample of candidate blazars using data obtained with WKU's Robotically Controlled Telescope (RCT) and the Panoramic Survey Telescope and Rapid Response System (Pan-STARRS) was to look for brightness changes consistent in amplitude and character with what is typically seen in blazars. The RCT observations were analyzed using the Image Reduction and Analysis Facility (IRAF) program. Images of the objects were taken every night they were observable from 2014 to 2016 and analyzed to construct the light curve to determine the variability of each object over time. The Pan-STARRS was extracted from the Pan-STARRS archive at the Space Telescope Science Institute and calibrated with contemporaneous observations obtained with WKU's RCT. In addition, spectroscopic observations were obtained by international collaborators in order to confirm the classification based on variability and to determine redshifts.

Lamb, Emma; Uhls, Isabella; King, Rodney; Rinehart, Claire "A Comparison of the Newly Discovered Bacteriophages Lilizi and HenryJackson" (Naomi Rowland)

Bacteriophages are viruses, which like all other viruses, have many forms. Their hosts are bacterial cells, in this case *Mycobacterium smegmatis*, that integrate part of their DNA into their host cell's genome in order to replicate and eventually lyse the host. The newly discovered mycobacteriophages HenryJackson and Lilizi were isolated from two soil samples from the same region and transmission electron microscopy allowed for visual comparison of their morphology. Fragments of their DNA cut by restriction enzymes were also compared by means of gel electrophoresis in order to analyze the differences in their genomic sequences. Additionally, a cluster prediction tool was used to predict the possible clusters of each phage. The phages were compared and found to have vastly different genomes based on the gel electrophoresis and the clusters and phenotypes they were both associated with. HenryJackson is believed to be a J cluster phage and Lilizi is believed to be a B1 phage. This means that the cuts made by restriction enzymes varied greatly indicating very distinct genetic code.

Lamb, Ryan "Using Surface Enhanced Raman Spectroscopy to Examine Light-driven Reactions" (Matthew Nee)

Recent studies have shown 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 intermediates of these reactions is needed to assess their safety. Ideally, Raman spectroscopy can be used to monitor reactions in real time, 100 times faster than the slow process of gas chromatography-mass spectrometry. However, Raman spectroscopy has low sensitivity, so some molecules that are not strongly Raman active do not produce high enough Raman intensity at low concentrations (e.g. 10^{-5} -M) to be observed. To counteract this dilemma, gold nanoparticles can be used to greatly enhance the Raman intensity of molecules in water, termed surface enhanced Raman spectroscopy. Gold nanoparticles aggregate forming large clusters of nanoparticles which could precipitate and lower the overall Raman intensity. A capping agent can be used to prevent aggregation by arresting the formation of large clusters. Using the stable ("capped") nanoparticles, photolytic reactions can be monitored by assessing the changes in the Raman spectrum of a molecule. In this experiment, rhodamine 6G, a common dye, and paraquat, a pesticide, were the analytes monitored and sodium dodecyl sulfate was the capping agent for the gold nanoparticles.

Lamkin, Robert "Major League Gaming HQ" (Neal Downing)

The purpose is to create the next MLG Studios within the Green Wood Mall. MLG stands for Major League Gaming which is the brand of gaming and company that runs eSports. Re-Adapting this anchor store with a new anchor function based off advancing technology would prompt more to have an interest in visiting the store and learning more about it. The proposal would solve the issue of anchor stores disappearing around the world in malls. This could possibly bring malls back into a current attraction in society. The current issue at hand is the internet allowing you to order anything from online and it be delivered to your home taking away from the time and effort of going to a mall to get the same item. Creating this space could promote going to the mall for multiple reasons including the new applications. Creating the next MLG studios would basically be re-adapting the abandoned Macy's store of the Green Wood Mall in Bowling Green, KY. Using the abandoned space with the parallel of advancing technology would create a unique space to all that visit it. So I propose to go with the flow of technology today and put in a Gaming HQ for MLG; which would have some suites, arena, MLG HQ, and some gaming stores.

Langford, Ryan "Seas Hall" (Neal Downing)

The Architectural and Manufacturing Science department at Western Kentucky University was recently integrated with the engineering program creating the School of Engineering and Applied Sciences. Due to this merger, I am proposing a design for a new academic building that houses Architectural Science, Construction Management and Interior Design majors. By creating a home for these allied disciplines students will be able to collaborate among each-other while being in an atmosphere designed and built for learning. This new building will have a strong emphasis on studio spaces where students can work independently while also being able to openly discuss ideas while working in a sense of community. Another major aspect of this building is the addition of more construction related labs. By adding these labs students will have a more hands on approach to learning. Creating this notion of a studio culture helps in the growth of not only an architectural science student but an interior design student as well.

Larkin, Grant; Silva, Philip; "Characterizing Temporal Changes and Growth of Agriculturally Produced Pm Particles" (Rezaul Mahmood)

It is widely accepted that particulate matter (PM) particles and their varying sizes are of detriment to human health and the environment as a whole. Despite the widespread literature on this topic, the effect that agricultural practices have on the concentrations of PM particles and its various sizes has not been examined in great depth. This study examines how agricultural practices may play a role in PM presence and displacement. Before determining how agriculturally produced PM can affect human health, an understanding about the natural progressions of the particles must be known. To accomplish this, optical particle counters (OPCs) was placed outside of a chicken house (OPC2), and one on the inside (OPC1) to determine the size of the particles. The data collected revealed a pattern of wild fluctuations among the counts of each size bin, indicating something beyond the regular pattern occurred. These spikes in counts were isolated for each size bin, and adjusted to the overall average count for each size bin to examine with greater depth what may be going on chemically. As a result, our initial findings have revealed that there appears to be fluctuations among particle counts between each size bin.

Laslie, Kathryn; Hamilton, Emily; Huskey, Steve; Smtih, Michael; "Behavioral Contexts For Production of and Responses to Vibration Signals in the Veiled Chameleon (*Chamaeleo calyptratus*)" (Michael Smith)

Substrate-borne vibrations have been reported to be produced by the veiled chameleon (*Chamaeleo calyptratus*). We first examined the behavioral responses of *C. calyptratus*, and the related *C. gracilis*, to vibrations by placing chameleons, one at a time, on a wooden dowel attached to a permanent magnetic shaker. We recorded each chameleon's behavior before, during, and after a three-pulse vibrational stimulus of 25, 50, 150, 300, or 600 Hz. Both species exhibited a stop-behavioral response (i.e. no movement) when exposed to a stimulus of 50 or 150 Hz, while displaying a reduced sensitivity at all other frequencies (i.e., less or no reduction in movement). A second set of experiments recorded chameleon behavior and vibration production in dominance (male-male), courtship (male-female), predator-prey (adult-juvenile), and heterospecific contexts. Behavior (via digital camera) and vibrations (via accelerometer) were recorded both before and after the chameleons established visual contact. In the presence of conspecifics and heterospecifics, chameleons produced sinusoidal vibrations at a mean dominant frequency near 140 Hz. Vibration production was particularly strong when two males were placed together. These findings improve the understanding of communication between chameleons, and can be utilized as a basis for further research into their use of substrate-borne vibrations.

Lever, Katie "Can The Love Of The Game Become Unbearable? Examining Stress and Burnout in College Athletes" (Jieyoung Kong)

Abstract This study sought to qualitatively analyze college athletes' experiences of stress and burnout as well as debunk the negative "privileged athlete" stereotype. Six collegiate track and field athletes from an NCAA Division 1 university in the southeastern United States were interviewed about their athletic experiences as they relate to stress and burnout. After transcription, coding, and analysis, three main themes emerged: athletes experience stress from pressure to perform, time constraints, and physical stressors. These stressors manifest themselves physically, mentally, and in an overall reduced athletic experience. Finally, athletes cope with these symptoms through social support, self-care, athletic sensemaking, and keeping "on track." This study addressed athletic mental health, reinforced workplace definitions of stress, burnout, and social support, applied Weick's theory of sensemaking to an athletic context and also demonstrated how athletes use stress in positive ways, which is a phenomenon absent from academic literature. Keywords: stress, burnout, social support, coping, sensemaking, NCAA Division 1 athletes.

Lindsey, Chloe "Synthesis of An Analog of the Anticancer Drug Carboplatin" (Kevin Williams)

Platinum based anticancer drugs have become increasingly used in treatments of cancer patients, most commonly in that of testicular cancer. Three FDA-approved platinum based anticancer drugs are Carboplatin, Cisplatin and Oxaliplatin. This research was centered on synthesizing a compound which uses the leaving ligand of Carboplatin (CBDCA) and the amine group N, N, N', N'-tetramethylethylenediamine (Me4en) with both ligands attached to the platinum center. NMR spectroscopy was used to characterize the products of synthetic attempts and to observe reactions between the product synthesized and guanosine monophosphate (GMP) and N-acetylmethionine, which serve as models to the reaction with the main biological targets of DNA and proteins, respectively.

Liu, Haiyan; Lee, Ngo Fung; Zhang, Rui; "Synthesis and Kinetic Studies of High-valent Metal-oxo Generated By Photochemical And Chemical Methods" (Rui Zhang)

Highly reactive iron-oxo intermediates play important roles as active oxidants in enzymatic and synthetic catalytic oxidation. Many transition metal catalysts are designed for biomimetic studies of the predominant oxidation catalysts in Nature, namely cytochrome P450 enzymes. In this work, a series of iron(IV)-oxo porphyrins [FeIV(Por)O] and manganese(IV)-oxo porphyrins [MnIV(Por)O] have been successfully produced in two electron-deficient ligands by photochemical and chemical methods, and spectroscopically characterized by UV-vis, and ¹H-NMR. With iodobenzene diacetate [PhI(OAc)₂] as the oxygen source, iron(III) porphyrin and manganese(III) porphyrin complexes converted to the corresponding metal(IV)-oxo species as oxygen atom transfer (OAT) agents. In addition, a new photochemical method was developed to generate the same species by visible light irradiation of highly photo-labile porphyrin-iron(III)/manganese(III) bromate precursors. Furthermore, the kinetics of oxygen transfer atom reactions with alkene, active hydrocarbons and aryl sulfides by photo-generated and chemical generated [FeIV(Por)O] were studied in CH₃CN solutions. Apparent second-order rate constants determined under pseudo-first-order conditions for sulfide oxidation reactions are $(9.8 \pm 0.1) \times 10^2 - (3.7 \pm 0.3) \times 10^1 \text{ M}^{-1}\text{s}^{-1}$, which are 3 to 4 orders of magnitude greater in comparison with those of alkene epoxidations and activated C-H bond oxidations by the same oxo species.

Loomis, Devon; Harper, Seth; Dobrokhotov, Vladimir; Banga, Simran; "Metal Oxide Semiconductors and Their Application for Spoiled Meat Detection" (Vladimir Dobrokhotov)
The spoilage of meat was analyzed with the SGX MiCS-6814 metal oxide sensor array. This array has 3 sensors designed to detect reducing gases, oxidizing gases and ammonia. In the presence of clean air, oxygen molecules populate the surface of these sensors. Free electrons have an affinity towards the oxygen molecules so they move towards the surface and create a high potential barrier at grain boundaries. This process increases the size of the depletion layer of the semiconductor and prevents the flow of electrons, thus giving the material high resistivity. When the sensors are exposed to gases, these molecules replace some of the oxygen on the surface. Some of the free electrons are no longer attracted and drift away from the grain boundaries, thus decreasing the potential barrier and the width of the depletion layer. The material now has a lower resistivity. Thus, measuring the voltage across the semiconductor should indicate the concentration of off-gassed molecules that have adsorbed onto the surface. The sensors are arranged in a voltage divider circuit allowing their resistance to be calculated. We define a signal value by relating the resistance of the sensor in clean to the resistance in sample air.

Luna, Catherine; Luecke, Kyle; Lawrence, Keely; "Aging and The Use Of Context In Predictive Learning" (Sharon Mutter)

Research with young adults has shown that learning becomes context-specific once one attends to context, and ambiguity during learning induces this attention (Callejas-Aguilera & Rosas, 2010). However, older adults have difficulty processing contextual information (Braver et al., 2001). This study investigated age differences in the use of context during predictive learning. Younger and older adults predicted the likelihood that foods would cause gastric distress in one of two restaurant contexts. In the non-ambiguous learning condition, foods consistently led either to the presence of the illness or to its absence. In the ambiguous learning condition, foods led to

the presence of the illness equally as often as its absence. At test, participants made predictive judgments for target foods in either the same restaurant context in which they were learned or in the other restaurant context. A context-specificity effect occurred when predictive judgments were higher for foods presented in the same context as learned than in the different context. Younger adults showed a context-specificity effect in both learning conditions, though this effect was greater in the ambiguous condition. Older adults showed no context-specificity effect in either condition, confirming they did not process or use the contextual information even under ambiguous learning conditions.

Lyle, Adam "Rejuvenating a Community" (Shahnaz Aly)

The goal was to make a facility that will help my hometown become more up to date, provide a local business for the community, and inspire everyone to unleash their inner child. To accomplish this feat, I developed a family entertainment center that focused on indoor activities such as an arcade, table games, a bowling alley, and VR rooms. In addition, I included a large cafeteria style restaurant to accommodate the patrons there. As research for this project, I looked at locations that incorporated one or more of these facilities including Main Event, Splitsville, and All Star Bowling and Entertainment. In my hometown, there are some options for if someone wants to go out and enjoy themselves from the parks that have equipment for essentially every sport to the various farms and ranges that allow for shooting sports. However, entertainment opportunities for teenagers and young adults are only available outside of the county currently. Having grown up in this area, one of the main complaints that my peers voiced was that there was not much to do. Providing this facility is the first step towards solving this problem.

Mager, Leah "Building a Safe Haven" (Shahnaz Aly)

The Family Enrichment Center is a non-profit organization located in Bowling Green, KY that began in 1977 as a crisis nursery. The current building is outdated, rundown, and doesn't meet their needs. The goal of this research project was to design a unique facility that promotes a safer future for the children in Bowling Green. This project provides a gateway to a brighter future for today's children through parental education, daycare, visitation, fostering, and safe zoning. Research of codes, requirements, and similar community centers inspired the creation of this Family Enrichment Center that empowers families and prevents child abuse by serving as a safe haven for children and as an education center for parents. Multiple interviews were conducted with the employees of the FEC to determine the needs and dreams of the new facility, while case studies of similar facilities across the nation were compiled to further the development of the design. The design was intended to encourage togetherness, strength in wholes, and reuniting families safely. All of the research concluded the need for a sustainable, modern, and ADA accessible facility to be able to reach and serve as many families as possible and ultimately prevent child abuse.

Malone, James; Jenkins, Trevor; ; Khan, Muhammad; "Eclipse Innovative Heat Exchanger" (Robert Choate)

As part of the WKU Engineering program, every student must complete a yearlong design project to satisfy curriculum requirements. Our team has been partnered with Eclipse Innovative, located in Richardson, TX, and assigned with the task of improving their heat exchanger systems, which are primarily used to heat and/or cool liquid beverages during production. The

current heat exchangers are built by Alpha Laval and sized by Eclipse Innovative have been performing below expectation for beverages with high solid contents (sports/energy drinks). This subpar performance is largely due in effect to cracked heat exchanger plates. We as a team are to investigate reasoning's behind these failures and through thermal, mechanical and failure analysis techniques, provide documentation and specifications on an improved design. This investigation and subsequent analysis should ultimately reduce failures due to fouling and plate cracking. Additionally, our team is working to prepare guidelines and documentation regarding heat exchanger selection and sizing methods. The information obtained is being utilized in the creation of a database tool that will not only be deemed useful in heat exchanger selection, but also aid in the design and build of new heat exchanging systems.

Manning, Katherine "Brigham Young and The Utah War, 1857" (Alexander Olson)

American religion and politics have always been closely intertwined. As a religious majority, Protestants in the nineteenth-century believed in a specific American identity—one which championed the “virtuous” family and a capitalist market system. Yet, some religious organizations challenged these norms, making them the object of intense persecution. One of the most famous of these examples is the Mormons. From their “peculiar” beliefs to their separatist goals, Mormons presented the American people with a religious group which defied cultural norms and advocated a disparate interpretation of the American identity. Two ideas central to the Mormon identity, Theodemocracy and polygamy, directly challenged Protestant ideas of virtue and capitalism. The Mormons’ direct efforts at obtaining political power and creating a separate state presented a serious threat to the Protestant American identity and sparked a fifty-year battle between the Church of Jesus Christ of Latter-day Saints and the United States Government. From a physical war in 1857 to the legal battle that followed, the Latter-day Saints discovered that the only way to exist and thrive in the United States was to embrace its norms and create an identity that would smoothly propel it into the twentieth century.

Marita, Madeline "Testing the Correlation of Dialect Density and Social Interaction" (Janice Smith)

The purpose of this project is to explore the correlation between dialect density, how strongly a dialect or accent is expressed, and social interaction, particularly of individuals from the international student population on Western Kentucky University’s campus. The density, or significance, of each dialect will be determined by examining a variety of characteristics of speech, including pronunciation and rate. Cultural differences surrounding communication expectations of each individual’s home country will also be noted. Social interaction with English-speaking American students will be determined by a survey and results will be compared with each individual’s level of dialect density. Data will be collected through surveys, interviews, and audio recordings. The International Phonetic Alphabet will be used to transcribe each sample; each student’s average rate of speaking, or words per minute, will also be calculated. Each participant will read a set story aloud, which will be recorded and analyzed using Systematic Analysis of Language Transcriptions (SALT) software. SALT is software used to manage the process of eliciting, transcribing, and analyzing language samples. Preliminary results indicate that many international students feel that their dialects have led to them being stereotyped by other students and that their dialects have limited their interactions with English-speaking American students.

Marquardt, JJ; Rodgers, Jared; Freeman, Callie; "Survey of Dung Beetle Diversity in High Elevation Forests of the Talamanca Range, Costa Rica" (Keith Philips)

The diversity and abundance of dung beetles in a high elevation Costa Rican oak and mixed montane cloud forest were surveyed at Cloudbridge Nature Reserve. Ten pitfall traps were set 50m apart in each habitat, with cow and human dung baits alternated. Traps consisted of bait in a 1oz plastic cup suspended over an 8oz container set in the soil with the rim flush with the ground surface. Each container was filled with soapy water, so beetles attracted to the bait would drown after falling. Traps were collected after 48 hours, and the beetles were sorted to species and counted. Data was analyzed with EstimateS diversity software. The mixed montane cloud forest had higher species diversity than the oak forest, which supported one of our hypotheses.

Contrary to another hypothesis, the mixed montane cloud forest had less abundance compared to the oak forest. The higher beetle diversity in the mixed forest may be due to the higher biodiversity of plants and associated mammals compared to that of the higher elevation oak forests. The higher abundance of beetles in the oak forest may be due to the increased amount of hikers and human dung compared to that in the mixed forest.

Martin, John "National Parks and Anthropogenic Induced Landslide" (Andrew Wulff)

Geology and Civil Engineering are two of the disciplines that may contribute to the prediction and mitigation of hazardous aspects of mass wasting. The focus of this research is to examine anthropogenic effects on shallow landslide developments within several National Parks. One areas of focus is Death Valley National Park, where recent landslides have occurred, impacting park infrastructure in predictable ways. The second and third areas are within Grand Canyon National Park and Mammoth Cave National Park. Each region was contrasted based on soil moisture, yearly rainfall, vegetation and over steepening of slopes. Each parameter was analyzed to determine the causation of these landslide events. However, park infrastructure improvements that would help reduce landslides are hampered due to monetary issues, aesthetics, and land regulations.

Mathews, Rilee "The Effects Of Age, Goal Motivation, and Mind Wandering On Pupil Dilation" (Matthew Shake)

Previous research has suggested that the experience of mind-wandering during reading is reflected in subtle changes in pupil dilation. In the present study, we examined the interaction between aging, goal motivation, and mind-wandering on pupil dilation during reading. We manipulated the reading goal by giving participants either 1) the goal of preparing for a memory test or 2) simply reading casually (no goal condition). Participants included 20 younger adults ($M_{age}=18.65$) and 17 older adults ($M_{age}=71.29$) who wore an eye-tracker and read a text for approximately 30 minutes. While reading, they were probed by the computer every 2 to 4 minutes to ask what they were thinking about at that moment. Participants were asked if they were on task (paying attention to the text) or off task (thinking about something else, i.e. mind-wandering). After reading the entire text, they were given a comprehension test. We found a marginal trend for larger pupil dilation when mind-wandering, $F(1,33)=3.17, p=.08$, and a main effect of age, in that older adult pupils tended to have larger PD than younger adults, $F(1,33)=10.34, p<.01$. However, there was no effect of goal manipulation or any interactions.

Matney, Sarah "A Systematic Review of Current Beas Investigating Math Skill Interventions"

(Ryan Farmer)

The following review analyzes current brief experimental analyses (BEAs) investigating math skill interventions. Empirically supported interventions are discussed, including repeated practice and error correction. When working with a student, a teacher will need to quickly analyze which intervention works for an individual child and implement it. The following review of current BEAs analyzes the best methods to use when investigating different math skill interventions. In addition to discussing what interventions are used, the following research describes what outcome variables are used and common ways in which probes are constructed. The most common interventions used were cover-copy-compare, taped problems, and math to mastery. The most frequently used outcome variable among the studies was digits correct per minute, and most researchers developed their own probes. A discussion on future implications follows.

McCarthy, Hannah; Thompson, Jena; "Women on the Floor: A Study of Feminism in Modern Dance History" (Amanda Clark)

Women on the Floor: A study of feminism in modern dance history is the culmination of my undergraduate research in conjunction with the WKU FUSE Grant. Dance is now and always has been an important catalyst for change in public opinion. My thesis paper and corresponding dance performance are detailed analyses of how the waves of the feminist movement correspond with modern dance pioneer, Martha Graham and her most important choreographic works. The project explores how Martha Graham's use of choreographic storytelling influenced the public opinion in her time and consequently gave women a voice through movement in the 20th century. My research also examines how feminism has affected and inspired my own choreographic process. This process has opened new choreographic avenues for artistic exploration, and I was able to create three choreographic works of my own for a formal concert this spring. The project conveys the ways in which modern dance has opened a platform for female voices since the earliest days of the American feminist movement.

McClearn, Parker "Dax30 Price Risk Clustering" (Leyla Zhuhadar)

The DAX30 is a portfolio of thirty top companies within the German market. Each of these companies are unique in their growth, but can also be key indicators in relation to how other stocks within this market index behave. In this project, we use a cluster analysis to study the relationships made between individual stocks over time. These relationships help provide an insight on which companies within the market move similarly. Each of the three clusters formed, contains stocks that perform similarly through profitability and growth over time. This study can be very beneficial to investors in order to create a diversified portfolio that provides maximal growth.

McElroy, Kate "Civic Nationalism in Scotland And Catalonia" (Tim Frandy)

This poster presents information arranged in a comparative format, originally gathered for a term paper written for FLK 560: Cultural Conservation in Fall 2017. It encourages the viewer to analyze similarities and differences in forms of civic nationalism present in two nations, Scotland (United Kingdom) and Catalonia (Spain). In these nations' ongoing campaigns for political independence, defining what it means to be a nation and a culture is vitally important work. Many self-described civic nationalist groups in both landscapes have attempted to do that work by crafting a vision of what an independent nation would look like culturally, demographically, and politically. In addition to its comparative element, the poster also provides a brief timeline of

relevant events for each country beginning in the early 20th Century, as well as questions that ask the viewer to evaluate how nationalism functions - or fails to function - in these contexts.

McFarland, Kattie; Jackson, Carter; "Adaptive Reuse: Is It Really Necessary?" (Shahnaz Aly)

The reuse of an old building for a purpose other than which it was intended has become popular among designers in recent years. This type of architecture—known as adaptive reuse—has fostered a belief that all things historic must be of significance and that just because something is old, it must be preserved. Our research questions the assumption that old buildings must always be saved, specifically asking: if a building is incapable of providing for the needs of contemporary society, is it worth saving? We examine this issue by analyzing the new construction of a concert hall in Rochester, New York and the adaptive reuse of the historic Terminal Station in Chattanooga, Tennessee. The significance of our research lies in our examination of ways architecture engages with a community as the stage society tells its story and how architecture, both new and old, can best operate within contemporary society. We maintained that the best architecture continually proves its worth through its ability to enrich the lives of all people. Our own projects were constructed by examining the success of real-world adaptive reuse examples in order to ensure that our work could act as a catalyst for further urban renewal.

Meek, Romney; Evans, Brendan; Henson, Alex; Gupta, Sanju; "Graphene-carbon Nanotube Aerogel As Organic Thermoelectrochemical Energy Harvesters: Hydrothermal Synthesis, Structural Characterization And Properties" (Dr. Sanju Gupta)

We prepared three-dimensional scaffolds comprising different ratios of graphene oxide nanosheets and carbon nanotubes (GA-CNT, here on) macro-assemblies. The resulting hydrothermally synthesized hydrogels are freeze-dried and thermally reduced to yield graphene and graphene-carbon nanotube aerogels with ultra low densities and tunable mesoscopic pore sizes. These ‘all carbon’ aerogels prepared as monolithic solids from suspensions of few-layer graphene oxide nanosheets and small diameter multiwalled carbon nanotubes in which organic wet chemistry is used to cross-link the individual sheets with carbon nanotubes. In contrast to methods that utilize physical cross-links between graphene oxide nanosheets, this approach with polymeric linkers and organic functionalization provides covalent carbon bonding among the graphene sheets and molecular attachment with carbon nanotubes, respectively, thus facilitating rapid and facile electron transport. As a result they are expected to exhibit improved electrical conductivities, moderate thermal conductivity, highly interconnected multiplexed topology with large internal surface areas thus promoting enhanced surface ion adsorption which makes these mesoporous materials viable candidates for use in harvesting thermo-electrochemical energy and energy storage technologies. We used complementary analytical characterization techniques including electron microscopy and tomography, x-ray diffraction, electrical property, and Raman spectroscopy to establish microstructure-processing-property-function correlations.

Melcher, Natalie "Best Platform for Indie Artists" (Dawn Hall)

The multiple platforms we have today for streaming music give artists more room than ever to find success. Well-known artists like country duo Dan + Shay have credited radio as the platform that helped them succeed. Dan + Shay had access to promoters after they signed to their record label, which helped advocate them for airplay; resources that many independent artists don't have. Radio tends to be one-sided when it comes to airtime, as mainstream stations usually only

take the music from promoters who guarantee the songs will be a hit with the station's target audience. Radio tends to steer clear of independent artists, as their lack of a driving force and recognition is often seen as a liability. Streaming services make way for indie artists to find success because they're friendlier platforms that allow all genres of music compared to being strictly one format. Success for independent artist on streaming services comes more organically, as they don't need a driving force to get their music out there. This allows them to keep their creative control and makes their music easily accessible and on demand. Ultimately, steaming services are the ideal platform over radio for independent artists to find success.

Menix, Jacob; Schoonover, Paige; "Statistical Tests for Convergence of Some Random Walks to Perturbed Brownian Motion" (Richard Schugart)

A perturbed Brownian motion is a stochastic process that is like a Brownian motion with added effect each time a new extrema is achieved. While Brownian motion is the scaling limit of simple random walks, it is known that perturbed Brownian motion can arise as the scaling limit of some self-interacting random walks called excited random walks. Excited random walks are a type of self-interacting random walk where the transition probabilities, instead of being the same for every step, are dependent on the number of prior visits to the current location. We consider some examples of other self-interacting 11 random walks where it is conjectured, but not yet proved, that the scaling limit is a perturbed Brownian motion. Using computer simulations, we perform statistical tests for properties of perturbed Brownian motion in rescaled Markovian Cookie Random Walks and Have Your Cookie and Eat It Random Walks to look for evidence of convergence to perturbed Brownian motion.

Mertens, Kimberly; Downey, Emily; Michaud, Zachary; "The Effect of Music Tempo on Exercise Performance and Perceived Enjoyment" (Cody Morris)

PURPOSE: The purpose of this study was to help further understand the relationship between music tempo and perceived enjoyment of a specific exercise routine over three different parameters. **METHODS:** Each participant performed three exercise conditions separated by at least 24-hours each. Condition 1 consisted of rigorous exercise training programs typically performed by ROTC members as part of their standard training while listening to music with a high tempo (Tempo > 165 beats/min). Condition 2 consisted of exercise with music at a low tempo (Tempo < 165 beats/min). Condition 3 consisted of the exercise without any musical accompaniment. Heart rate, number of laps completed, and rating of perceived exertion were measured throughout each bout. **RESULTS:** RM-ANOVA showed evidence of a significantly different number of laps completed between conditions in Rounds 1 ($p = 0.001$) and 4 ($p < 0.0005$) with no significant differences exhibited in Round 2 ($p = 0.060$) or Round 3 ($p = 0.253$). RM-ANOVA also showed evidence of a significantly different HR between conditions in Rounds 2 ($p = 0.004$), 3 ($p = 0.001$) and 4 ($p = 0.009$) with no significant differences exhibited in Round 1 ($p = 0.080$). **CONCLUSIONS:** More work was performed while listening to music without an increase in perceived exertion, implying that a more work was performed at a lower effort.

Meyers, Jon "Oh Brother Where Art Thou Indefinite Articles?: Teaching ESL Through Screenwriting And Other Creative Writing Methods" (Alexander Poole)

What is it about writing -- specifically creative, non-composition writing -- that compels the English as a Second Language (ESL) student to succeed? TESOL Instructor at Penn State-

Abington Carla Chamberlin Quinlisk points out that for "...language teaching, multiliteracies has many implications, one being that the students learn to read and understand the dynamic interplay among their own identities and the texts, images, and cultural stories of mass media" (35). Not only do creative writing techniques, such as screenwriting and playwriting instruction, help the TESL student learn linguistic skills, these methods help the student assimilate into the surrounding culture where they can better use their newly-acquired language skills. By piecing together evidence from previous scholarly journals, I will prove this thesis; and, I will set the stage for further academic discussion.

Miller, Eleanor "The Bears Ears National Monument Controversy: Native Claims, Land Use, and the Potential Role of Folklorists in Shaping the Debate" (Tim Frandy)

Until recently, Bears Ears National Monument was one of the largest of its kind in the United States. Despite its recent reduction in size, Bears Ears represents cultural and environmental conservation efforts, and builds upon what Wallace Stegner referred to as "America's best idea." At the same time, however, Bears Ears illustrates a growing partisan debate over public lands, native land claims, and land use. This debate is dynamic, with growing tensions on both sides. The controversy over Bears Ears draws attention to what I consider to be a major issue in our country: the prioritizing of modern land use concerns over respect for indigenous sacred spaces. In this paper, I provide a historical overview of Bears Ears National Monument, delve into the controversy over its size and existence, and suggest how folklorists can work to shed light on native and local voices in a political era when voices are in vital need of being heard. Citing the ideas of folklorist Debora Kodish, I argue that folklorists have an important opportunity to be activists, and that taking an active role in the debate over public lands would be of great value to our field, as well as to our country.

Mitchell, Logan "An Analysis of Urban Heat Islands in Kentucky" (Rezaul Mahmood)

The purpose of this research is to increase understanding of the Urban Heat Island (UHI) effect in Kentucky by studying its three largest cities: Louisville, Lexington, and Bowling Green. By examining the UHIs of these three cities, two attributes can be determined: if there is a relationship between the size of the city by population and the UHI magnitude and if UHI magnitude follows any daily and/or seasonal cycles. Data was collected from weather stations within the three major cities, as well as from weather stations located in the rural areas surrounding them. The length of the time series being considered is from 12/01/2009 through 11/30/2014. Urban stations are from the Automated Surface Observing System (ASOS), which is a quality-controlled weather data collection network operated by the National Weather Service (NWS). Rural stations are from the Kentucky Mesonet (KYMN), which is a mesoscale weather and climate observing network operated by the Kentucky Climate Center at WKU. Daily/monthly maximum and minimum temperature data was obtained for each of the weather stations. The difference between urban and rural observations was calculated, resulting in the UHI magnitude for each city. The analysis and visualization were conducted using MATLAB, a sophisticated computing software.

Moore, Emma; French, Carrie; Wininger, Steven; "Impact Of Performing Academic Tasks On Self-selected Exercise Intensity" (Steven Wininger)

The goal of this study is to determine if different types of academic tasks impact self-selected exercise intensity differently and if participants' beliefs about multitasking impact their results.

Participants were 71 college students enrolled in introductory psychology courses. Participants completed academic tasks while cycling and parallel tasks while seated. Performance on different academic tasks while cycling will be compared through a repeated measures ANOVA. Individuals are expected to have maintained a lower self-selected exercise intensity during the mathematical task than during the reading task. The results of the study will be useful to anyone trying to improve their physical fitness. Multi-tasking behaviors, exercise habits, cognitive load, and rate of perceived exertion are expected to serve as covariates.

Moore, Lindsey "Understanding Social Workers' Ethical Responsibilities As Advocates For Immigrants" (Dana Sullivan)

Within the past decade, immigration policy has become the subject of a fiery nationwide debate, with policymakers and lobbyists going head-to-head as policy reform is discussed. As a worrisome trend has emerged in which national security concerns are being prioritized over human rights concerns, it has become necessary that social workers get involved, as well. Due to the professional values and ethical standards laid out in the National Association of Social Workers' Code of Ethics, social workers are ethically obligated to engage in this discussion and advocate for fair and just policies on behalf of immigrants. Based off an understanding of these ethical obligations, this thesis seeks to evaluate social workers' performance in this discussion by examining current literature and the responses of practitioners and professional organizations. It is concluded that social workers have been startlingly absent from this discussion and that social work education has left workers ill-equipped to engage in this reform, due to a lack of understanding of immigrant/immigration policies and a lack of advocacy training. It is argued that social work education must expand beyond teaching cultural competence to teaching workers how to understand harmful immigration policies and fight against them at the macro level.

Moscoe, Carrie "The Girl's Song: Brahms And Female Characters In His Leider" (Liza Kelly)

The purpose of this project is to explore feminist commentary within 19th century German romantic art songs of Johannes Brahms. Brahms had a few close interpersonal relationships with women in his life and saw how society had limited their choices. This project, therefore, explores how he imbeds personal commentary on the treatment of women through his setting of text and compositional choices. I will begin exploring commentary by presenting three art songs by Brahms: Klage, Madchenleid, and Auf Morgen Valentines Tag. By analyzing the text and comparing the compositional choices of Brahms, I will reveal the deconstruction of female roles and the extreme effects of male dominance. The final product will consist of a brief lecture recital format: discussion of the song analysis followed by a live performance. This lecture recital process has significance in the performance practice of vocalists by providing historical context and means of interpretation for their repertoire. This project also shows how music can be a tool to reflect socio-cultural issues through the genre of art song.

Nahari, Essa "Sport And Fitness Center" (Neal Downing)

The sport and fitness center will be located in the Farasan Islands which is one of the most picturesque marine areas in all of Saudi Arabia. It's the largest island of the Red Sea and is located some 50 km offshore from Jizan, the far southwestern part of Saudi Arabia. My research focuses on the design and development of a public facility that will serve which the community of Farasan Island. The driving goal of the project is to design and create a healthy place that

include organized activities, group instructional programs such as spinning classes, and martial arts, organized and impromptu team sports, and individual fitness opportunities such as cardiovascular weight training. Individual activities may be self-guided or conducted under the supervision of a trainer. The Fitness Center will also accommodate outdoor activities with features such as a running track, swimming pool and sport playing fields. This will establish a recreational and social facility geared towards exercise, sports, and other physical activities to be healthy and strong. It will be a for-profit commercial facility and a community supported center that will accommodate both the serious athlete and the casual recreational user.

Neal, Wesley; Morris, Cody; Winchester, Lee; Jackson, Justin; Tomes, Ariel; Wilcoxon, Damon; Arnett, Scott; "Effect Of A Simulated Tactical Occupation Stressor On Perceived Exertion And Blood Lactate" (Cody Morris)

Purpose: The purpose of this study was to evaluate rating of perceived exertion (RPE) and markers of physiological stress in response to a simulated firefighting occupation workload. **Methods:** Ten healthy male participants completed a simulated fire stair climb under four conditions, with some conditions including the wearing of a 34.04 kg (75 lbs) weighted vest to simulate the wearing of personal protective equipment (PPE) typically worn by a firefighter. Some conditions involved the inclusion of a color-word interference test (CWIT). RPE was measured each minute during exercise using Borg's 15-point (6 – 20) scale. **Results:** A repeated-measures ANOVA showed that there was a significantly different RPE when comparing conditions ($p < 0.0005$). A significantly elevated RPE per min was exhibited during all six minutes of exercise for both the weighted vest and weighted vest + CWIT conditions compared to exercise conditions without the vest. A repeated-measures ANOVA showed that there was a significantly different blood lactate when comparing conditions ($p < 0.0005$). **Conclusion:** Based on results of the current study, it appears that the wearing of a weighted vest to simulate PPE significantly elevates RPE above what would be expected by the exercise alone. These findings suggest that firefighters are potentially at a substantial degree of perceived stress from the exercise and weight of gear alone.

Berlanga, Jesus; Van Rooy, Paul; Cocker, David; Silva, Philip; Purvis, Kathleen; Nee, Matthew "Kinetic Modeling Of Relevant Atmospheric Sulfur And Nitrogen Containing Compounds To Understand Particle Formation" (Matthew Nee)

Secondary organic aerosols (SOA) form from the atmospheric oxidation of organic compounds that are released into the atmosphere. Reduced sulfur and nitrogen containing organic compounds are of special interest due to their abundant release into the atmosphere through agriculture and the burning of fossil fuels and due to their correlation with the formation of SOA. In this study, kinetic modeling of the atmospheric oxidation mechanisms of dimethyl disulfide (DMDS), dimethyl sulfide (DMS) and trimethylamine (TMA) is used to simulate aerosol chamber experiments and to give insight into the formation of aerosol particles. Then, gas phase data from chamber experiments of the compounds in the presence of H₂O₂ and N₂O₅ as the oxidant sources was simulated to benchmark our models. Experimental data shows a large difference in the production of sulfate ion between DMS and DMDS, as well as a rapid decrease on sulfate ion formation when different amines are present, which may indicate rapid aerosol formation or aqueous-phase reactions. Modeling the gas-phase data allowed to determine reaction rates and suitable atmospheric oxidation mechanisms to estimate the amount of gas-phase compounds that proceed to the formation of aerosols particles.

Ng, Chunlam "Flow" (Shahnaz Aly)

This project involves the design for Lane Motor Museum in Nashville. The aesthetics of a car has always fascinated me. The lines on a supercar are so simple yet beautiful, they are some of the most beautiful things created by human. The sound of a car is the most exciting part, it is better than any music. For my love of cars and by being an architecture student. After many research about museums, materials, and sustainability, I believe I can give the cars in the Lane Motor Museum a better place to stay. Moreover, I believe a museum can be more than just a museum. Therefore, it has a well design coffee shop and restaurant, also a green space surround it. You can look at cars while enjoying a cup of coffee, waiting for a table or having a nice meal. If you are not interested in all that, the structure itself and the landscaping will be worth the trip, because this museum is my heart and soul.

Osborne, Cesalea "Hydrogeology Of The Hidden River Groundwater Basin, Horse Cave, Hart County, Kentucky" (David Keeling)

The Mammoth Cave karst aquifer of south-central Kentucky contains 28 major groundwater basins, of which the Hidden River groundwater basin has been severely impacted by anthropogenic contaminants. Hidden River Cave, part of the overall Hidden River groundwater basin, formed in Mississippian-aged carbonates and consists of a dendritic network of canyons and collapsed domes. A major trunk stream flows through the cave that contributes recharge to the Mammoth Cave aquifer. Poor land-use practices, including changing residential, commercial, and industrial boundaries, have lead to the contamination of the cave stream. As a result, the hydrogeology of the Hidden River groundwater basin has been studied extensively using fluorescent dyes. Recent developments in groundwater resource management have improved cave conditions; however, land-use boundaries in Horse Cave that intersect with areas of recharge may still introduce contaminants into the groundwater system. This research characterizes recharge to Hidden River Cave using geographic information systems analysis and fluorescent dye tracing. Additionally, land-use in Horse Cave is evaluated, as groundwater resource management varies between municipalities and counties. This research provides a more detailed description of the Hidden River groundwater basin and provides scientific data to the American Cave Conservation Association for more informed management of Hidden River Cave.

Padgett, Christopher; Griffin, Melissa; Mahmood, Rezaul; "A Synoptic Analysis Of The June 27 – July 9, 2012, Ohio Valley Heat Wave And An Investigation Of The Effect On Public Health In Kentucky" (Melissa Griffin)

The purpose of this study is to set the basis for a ‘worst case’ scenario that has happened in the recent past and to create a summary highlight. Data from the Kentucky Mesonet, National Centers for Environmental Information, technical reports and media news sources will be utilized and presented using Geographic Information Systems (GIS) and Python-scripting programs. Relating experiences to a recent event can help increase the response to public health information and planning. The keystone event, the June 27-July 9, 2012 Ohio Valley Heat Wave, will be examined from the meteorological perspective and provide information on daily minimum/maximum temperatures, and daily maximum dewpoint temperatures. In addition to these directly measured values, data will be compiled on the number of hours with temperatures

above specific thresholds, diurnal temperatures, synoptic patterns, and temperature records broken/tied. The keystone event will also be investigated using Emergency Room visit data provided by the Kentucky Department of Health. Initial findings have shown that maximum temperature records were broken every day across Kentucky, with maximum temperatures reaching over 100°F for ten out of the thirteen days. There was a noticeable increase in the instance of hospitalizations due to heat-related illnesses.

Pallante, Megan "“this Seems Like The Set Up For Something”": The Use Of Quoted Speech And Metacommunication In The Storytelling Of Zeda K." (Ann Ferrell)

When I first met Zeda, I was instantly drawn to her; she laughed loud and often, and her words captivated me. There's no denying that she is a natural born story teller. I decided to examine Zeda's storytelling to find out what tactics she used to make her storytelling so energetic and lively. In an interview, she provided me with two stories that occurred during her childhood, which I transcribed and analyzed for narrative techniques. My study produced two results. First, Zeda makes extensive use of quoted speech in order to personify other people and to convey internal emotions and thoughts, primarily through the manipulation of accent and tone. Second, Zeda uses metanarration, that is techniques which comment on the story itself or its performative context, to add her current self's thoughts to those of her younger self in the narrative. Her child-self makes great use of adult language despite the unlikelihood of her having actually used those terms at the time. She also directly reflects on the characteristics of her child-self. This analysis is a case study of how one person makes use of the narrative techniques of quoted speech and metanarration as a means to enliven her storytelling.

Parker, Allyson "An Educational Opportunity" (Shahnaz Aly)

I have designed a high school that will hold approximately 2,200 students. This high school is the combination of two existing high schools in Hopkinsville, KY. Combining the two creates new jobs, better education, better athletics, and potentially saves money. I have designed a structure that profoundly influences learning. In order to achieve a significant relationship between the quality of a physical structure and student achievement I have researched lighting, acoustics, temperature, air quality, and accessibility, along with the symbolic environment of a classroom. This structure will give student the tools and environment they need in order to succeed.

Parrish, Deborah; Houle, Jean-Luc; Bayarsaikhan, Jamsranjav; Fuka, Matthew; "Health and Chronology of the Xiongnu on the Periphery of the First Steppe Empire of Inner Asia." (Jean-Luc Houle)

The archaeology of the Xiongnu period has grown considerably over the last decade, yet debate still surrounds Xiongnu subsistence practices, their nomadic lifestyle, and the timing for the rise, expansion, and collapse of the Xiongnu polity - the first steppe empire of Inner Asia. The problem, in part, has to do with some received ideas from Chinese historical records, discrepancies in some radiocarbon dates that may be due to the fresh-water reservoir effect, and to an over-focus on the so-called core region of this polity. To investigate this, we conducted a bioarchaeological study and dated both human and animal remains from three Xiongnu period burials in northwestern Mongolia – the so-called periphery of the Xiongnu Empire.

Patel, Ankitkumar; Watkins, Cecilia; Macy Gretchen; Hwang, Jooyeon; Golla, Vijay; Gilbert,

Weylin; "Assessment Of Fire Smoke And Occupational Air Contaminant Exposure Among Career And Volunteer Firefighters: A Mixed-methods Approach" (RITCHIE TAYLOR)
 Objectives: Identifying contaminant exposure variables for firefighters and evaluating the existing turnout gear practices of Career and Volunteer firefighters in rural Fire departments of Dixie Firefighters Association. Methods: Based on qualitative interviews with a focus group, a 46-question quantitative survey was developed addressing PPE practices and exposures at the fire department and fire scene. Results: 19 career and 102 volunteer firefighters participated in the survey. Career firefighters are more experienced with petroleum fires (47%), than volunteers (29%). Career firefighters were 1.4 times more likely to have experience with RTIs, and remain at a fire department 6 times longer. Career firefighters spend double the time running fire apparatus. Departments support the purchase of new turnout gear, but the frequency of gear replacement often exceeds the 10 years recommended by the National Fire Protection Association. 17% of firefighters have more than one set of turnout gear, but the gear of volunteers is 1.6 times older than that of career firefighters. 85% Career and 59% Volunteers store gear at the department. 21% Career and 53% Volunteers store gear in a private vehicle. Conclusions: Exposure assessment strategies should be conducted for career and volunteer firefighters for smoke exposure at a fire scene, occupational contaminants in a fire department, and PPE.

Patel, Dharmesh; Lee, Ngo Fung; Kwong, Ka Wai; "Investigation Of Ligand Effects On Photo-generated Compound II Models, And Their Kinetic Studies On Reactivity Towards Organic Substrates" (Rui Zhang)

High-valent iron-oxo porphyrins are central oxidizing species in heme-containing enzymes and synthetic oxidation catalysts. In this study, iron(IV)-oxo porphyrins [FeIV(Por)O], commonly referred to as compound II models were produced in two electron-deficient ligand systems via visible light irradiation of highly photo-labile porphyrin-iron(III) bromates. The iron(IV)-oxo porphyrins under study include 5,10,15,20-tetra(2,6-difluorophenyl)porphyrin-iron(IV)-oxo (4a), and 5,10,15,20-tetra(pentafluorophenyl)porphyrin-iron(IV)-oxo (4b). The kinetics of oxygen atom transfer (OAT) reactions with numerous organic substrates by these photo-generated [FeIV(Por)O] were studied in CH₃CN solutions. Apparent second-order rate constants determined under pseudo-first-order conditions for sulfide oxidation reactions are $(2.0 \pm 0.2) \times [10]^{-2} - (2.6 \pm 0.5) \times [10]^{-1} M^{-1} s^{-1}$, which are 3 to 4 orders of magnitude greater in comparison to those of alkene epoxidations and activated C-H bond oxidations by the same oxo species. A disproportionation mechanism was proposed to interpret the inverted reactivity order observed for compound II species.

Patel, Krishna "Comparative Study Of Dental Caries, Malocclusion, And Treatment Needs Among Children With And Without Physical Disabilities In India" (Grace Lartey)

Background and objective: Oral health issues is a major concern for individuals with disabilities. The goals of this study were to identify oral health problems in children with and without physical disability, identify the barriers related to the access to oral health treatment and resources in India. Materials and Methods: Using World Health Organization (WHO) oral health survey criteria, 103 physically challenged children and 214 controls were examined. Comparison of dental caries, malocclusion, and treatment needs were done using chi-square test and Student t-test ($p < 0.05$). Results: Both the groups had high dental caries prevalence with less decayed, missing, and filled teeth (DMFT) score. Physically challenged children had more severe

malocclusion than controls. Conclusion: Increased oral health promotion for parents and caregivers both at the preschool and elementary stages for effective preventive regimes for these children. Any health promotion strategy for these children must include improving access to dental care and encouraging uptake of dental services. Keywords: Dental caries, Malocclusion, Physically disabled children, India.

Pendleton, Kennedy "Uncovering the nature of the rapid optical variability observed in Blazars" (Micheal Carini)

Blazars are extreme examples of the Active Galactic Nuclei (AGN) phenomena. The blazar class includes BL Lacertae (BL Lac) objects and flat spectrum radio quasars (FSRQ). Blazars are defined by continuum variability at all wavelengths on timescales of minutes to decades. My project was to characterize the rapid optical variability of a sample of blazars observed with NASA's K2 mission. The K2 mission, through its superb photometric precision and ability to continuously sample light curves on timescales of minutes to months, provides unrivaled information on blazar variability. In its previous incarnation as the Kepler mission, it uncovered rich and complicated variability in blazars down to the most rapid timescales sampled. My K2 sample of blazars represents a unique set of blazars with light curves sampled on timescales not possible with ground-based observatories. Via Fourier analysis, I am determining the shape of the power spectral density (PSD), which yields information on any characteristic variability timescales present in the light curve. If a variability timescale is present, it can be used to constrain characteristic emitting region sizes.

Penner, Matthew; Wichman, Aaron; "Threat Perception From Outgroups" (Aaron Wichman)
Two studies looked at the effects of insecurity on attitudes towards other groups. In Study 1, participants were asked to write about a secure or insecure relationship that they had and then asked the degree to which both Muslims and U.S. Northerners immigrating to Kentucky was threatening to them. In Study 2, participants were tasked with writing about U.S. border security or not. Afterwards, they again answered questions about how threatened they felt by other groups. Results showed that insecurity was associated with a higher level of perceived cultural, or symbolic, threat from other groups. No effect was found for perceptions of economic, or realistic, threat. Thinking about an insecure relationship had a stronger effect on perceptions of threat than did writing about U.S. border security. These findings suggest that psychological stressors may increase perceived threat from other groups.

Pennington, Susan` "How Policy Affects Workplace Health: A Comparison Of Workplace Health Policies Between Kentucky & Colorado" (Cecilia Watkins)

Background: With people spending a significant portion of their lives in the workforce, workplace health promotion is a growing asset in workplaces across the United States. In the U.S., policies have long been used to encourage behavioral change. While a significant amount of workplace health research has addressed the fact that written policies are beneficial to a workplace, there is little extensive research that has been conducted on written policies at the state level. Methods: Using the results of the Kentucky Worksite Assessment as a basis, with components such as tobacco usage, nutrition, physical activity, and lactation support, state legislation was analyzed within respective topics between Kentucky and Colorado. With the inference that health policies could be indicative of overall state health, other indirect factors such as unemployment rate and the quality/quantity of health and wellness organizations were

also taken into consideration, as they could also be a reflection of the health status of each state. Results/Conclusion: Through policy analysis of an exceptionally healthy state, Colorado, to a state that has been consistently unhealthy, Kentucky, suggestions were made on how to improve workplaces in Kentucky. While policies were found to be extremely important, the health and wellness organizations also played a huge role in policy initiative and health promotion across each state.

Phillips, Brandon "Conventional Surveying Transformed By Drones" (Taha Alyousef)

A job-site starts and ends with some type of surveying, in most cases projects are initially surveyed to construct a topographic map to create contour lines and to generate the site plans. Secondly, projects end with a surveying crew to come back out and form as-builds for future project records. The most common problems with conventional surveying is that it takes a lot of time; hypothetically delays the projects start date and end date. With the invention of drones and the development of drone technology, projects can potentially cost less, take less time to complete and create a more cost efficient project. I will be constructing quantitative and qualitative information to determine the initial cost versus long-term cost, whether or not drones could improve the conventional surveying techniques, and if drones could improve the construction process to create a more efficient and constructible design. With the money spent in the industry, we could potentially find a more cost efficient solution for completing construction projects.

Pitts, Bailey; Maples, Jill; Blankenship, Maire; Hoover, Donald; Olenick, Alyssa; Tinius, Rachel; "The Influence Of Sodium Intake On Blood Pressure During Late Pregnancy" (Rachel Tinius)

Purpose: Hypertension during pregnancy may have serious maternal and neonatal consequences. In non-pregnant adults, excessive sodium intake leads to elevated blood pressure, but little is known about the role of sodium on blood pressure during pregnancy. The purpose of this study was to determine whether salt intake is associated with blood pressure during pregnancy.

Methods: Pregnant women between 32 and 39 weeks completed the National Institutes of Health Diet History Questionnaire II. Resting blood pressures were obtained by a nurse practitioner.

Results: 55 women participated in the study (age: 29.8 ± 4.0 y, pre-pregnancy BMI: 26.2 ± 6.6 kg/m², late gestation body fat percentage: $23.8 \pm 5.7\%$, resting systolic blood pressure (SBP): 122.1 ± 14.0 mmHg, resting diastolic blood pressure (DBP): 74.3 ± 10.8 mmHg). 67.3% of women exceeded recommended guidelines for sodium intake (i.e.

Potluri, Aishwarya; MKanta, William; Alamri, Abeer; Michelle, Reece; "Mental Health And The Impact On Health And Health Services Among Refugees In The USA" (Reece Michelle)

Background: Humanitarian crises and disasters around the world effected the migration of millions of refugees across international borders and into the USA in recent years. Government agencies and local organizations in US cities administer the provisions of the US Refugee Resettlement Program to facilitate refugee resettlement and the integration of new residents into US society. Purpose: The aims of this study are to (i) examine the perception of mental illness among refugees in the USA and its impact on their lived experience (ii) describe the perceptions and challenges experienced by health service providers who have a history of working with refugees with mental illness. Preliminary Results: Refugees are likely to have high prevalence of mental disorders including depression, anxiety, post-traumatic stress disorder (PTSD), and other

conditions. Many challenges can interfere with the provider's ability to obtain accurate health history, provide complete care, as well as patient adherence to medical treatment. Conclusion: Refugees are among the most vulnerable groups in the USA. Untreated mental health issues impact overall care, short and long term health outcomes, individuals' quality of life, their ability to thrive, achieve social integration, and to age well in time.

Powers, Nathan; Kapadia, Mayank; Srivastava, Ajay; "Preliminary Characterization Of A Basement Membrane-associated Protein In Drosophila" (Ajay Srivastava)

Specialized extracellular matrices known as basement membranes (BMs) are critical for myriad activities throughout development in multicellular eukaryotes, including morphogenesis and cell-cell signaling. BM remodeling is crucial for the intravasation and extravasation stages of tumor metastasis because BMs provide structural support to both the tissue from which the tumor originates and the tissue it invades. In addition to minor tissue-specific components, BMs are composed of four major proteins: laminin, nidogen, perlecan, and collagen IV. Since collagen IV comprises 50% of the BM, understanding its relationships with other proteins may be most helpful in explaining overall BM development and function during tumor invasion. In the Srivastava Lab, a protein was recently found to be associated with viking (vkg), a Drosophila homolog of collagen IV, using immunoprecipitation and mass spectrometry. This BM-associated protein is thought to be involved in vesicular transport, so we hypothesize that it may play a role in the establishment and/or maintenance of BMs. This research intends to elucidate where this protein localizes within the secretory pathway, explore how it may be involved in vesicle transport of proteins like collagen IV, and detail its role in the invasive mechanisms required for air sac primordium development.

Pullum, Keelee; Ashley, Noah; "Effect Of Acute Sleep Fragmentation Upon Morphology And Density Of Astrocytes In Hippocampal And Hypothalamic Tissue" (Noah Ashley)

Many people are suffering from sleep fragmentation (SF) as a secondary symptom of sleep apnea, Alzheimer's disease, Parkinson's disease, and more. Previous research has indicated that one type of glial cell, microglia, are activated in the mouse brain following sleep fragmentation (SF). Another type of glial cell, astrocytes, develop a unique morphology in response to central nervous system (CNS) trauma and increase in numbers in the affected area. To test the effects of acute SF on astrocytes, five male adult C57BL/6j mice were exposed to a SF chamber for 24 hours (60 forced arousals per hour), whereas controls (N = 4) were taken from home cages. Brain tissue was collected from mice following perfusion with ice-cold PBS and then 4% paraformaldehyde. Brain sections were stained for glial fibrillary acidic protein (GFAP) using immunocytochemistry. Astrocytes in the ventromedial hypothalamus and CA3 region of the hippocampus were counted, and processes from five astrocytes in each sample were measured. Acute sleep fragmentation led to astrocyte process elongation in both regions and an increased density of astrocytes in the hypothalamus. These results suggest that acute SF leads to astrogliosis in both the hippocampus and hypothalamus, with greater severity in the hypothalamus.

Quiambao, Kailey; Young, Sonia; Wallmann, Harvery; "Study Protocol: The Effects Of Whole Body Vibration On The Limits Of Stability In 18-29 Year Old Individuals With A Sub-acute Ankle Injury" (Sonia Young)

Introduction: Injuries to the ankle joint ligaments cause balance deficits that result in a decreased

limit of stability (LOS) which is the maximum range in which an individual's center of gravity can be displaced without altering the base of support. The aim of our study is to examine the effects of high and low frequency whole body vibration (WBV) on the LOS in individuals with a subacute ankle sprain. Methods: 25 individuals, aged 18-29 years, presenting with a Grade I or II subacute ankle sprain will be included in this 2x3 repeated measures ANOVA study. All individuals will receive interventions under 3 conditions (high frequency WBV, low frequency WBV, and control) in a randomized order and each individual's LOS will be assessed before and after they receive the intervention. Results: Multiple one-way repeated measures ANOVAs and paired t-tests will be performed using SPSS. Discussion: This is one of the few studies investigating the effects of WBV on Grades I and II subacute ankle sprains. WBV has been shown to be an effective treatment for those with chronic ankle instability, therefore, it could be potentially be a successful intervention for individuals with a subacute ankle sprain.

Quiroga, Allison; Polk, Jason; Kaiser, Rachel; "Characterization Of Carbon Flux In Icelandic Glacier-fed Rivers" (Jason Polk)

Temperate glaciers of Iceland are dynamic systems vulnerable to changes in climate. The release of carbon dioxide (CO₂), a greenhouse gas, is part of the normal lifecycle of a glacier, but is exacerbated by various influences, including increases in air temperature. Various sources of CO₂ transported within glacier-fed rivers are stored, transformed, and transported during glacial melting events. The glaciers release trapped CO₂ as they melt, but the system consumes CO₂ from riverine and surface stream weathering processes. A longitudinal study was conducted on glacier-fed rivers to quantify and characterize the carbon flux from four glaciers in Iceland: Gígjökull, Steinhóltsjökull, Sólheimajökull, and Falljökull. Hydrogeochemical parameters including pH, specific conductivity, temperature, alkalinity, anions, cations, and stable carbon isotopes were collected and used in post-sampling analyses. Discharge was determined for three of the sites using an acoustic Doppler current profiler for the glacier outlet rivers. The dissolved inorganic carbon concentration of each sample was calculated and used to determine the carbon flux from each site where discharge was measured. Preliminary calculations indicate the geochemistry of the rivers vary longitudinally and each site was a source of carbon. Advanced calculations showed measurable change in the geochemistry and DIC flux downstream.

Rajendran, Nikitha; Furgal, Karen; Esslinger, Keri; Tinius, Rachel; "The Relationship Between Maternal Physical Activity And Infant Motor Development" (Rachel Tinius)

Physical activity during pregnancy has benefits for pregnant women and their offspring. Studies suggest that exercise during pregnancy may also elicit improvements in the brain of the newborn. To our knowledge, influence of physical activity on infant motor development has not been studied. The goal of this project is to determine the relationship between maternal physical activity during late pregnancy and infant motor development. Physical activity during late pregnancy (32-39 weeks) was assessed and Infant motor development assessed using the Alberta Infant Motor Scale (AIMS) in four month old infants. The AIMS is a validated test to assess motor control in infants from birth to 18 months of age, and all testing performed by a physical therapist who is board certified in pediatrics. Maternal physical activity and infant AIMS scores are correlated using SPSS to determine the relationship between exercise during pregnancy and newborn motor control/development. In addition, potential confounders (e.g. amount of time infant spends in different positions), will be assessed via survey. We believe the maternal physical activity levels during pregnancy and the AIMS scores in infants will be positively

correlated. These findings may suggest maternal exercise as an effective, resourceful approach to improving maternal and infant health, as motor performance early in life is linked to improvements in cognitive function in childhood.

Ramsey, Haley; Wichman, Aaron; "Right-Wing Authoritarianism: Ambivalent Attitudes toward Counterterrorism Policies" (Aaron Wichman)

Sometimes people hold ambivalent attitudes that manifest in discrepancies in expressed beliefs or attitudes. Experiments using right-wing authoritarianism as a personality variable and disconfirming feedback can be used to capture this ambivalence in a research setting. Previous research has shown that people who score highly on right-wing authoritarianism are less displeased when they are informed that policies that reflect their beliefs will not be implemented (Engle & Wichman, 2017). The aim of this study is to replicate that effect by measuring personality, assessing attitudes, then providing disconfirming feedback regarding those attitudes, and examining the effect of right-wing authoritarianism on displeasure with disconfirming feedback. This study uses attitudes toward civil liberties in counterterrorism policies to examine the effect of personality on displeasure with disconfirming feedback. The findings of this study replicate the earlier study (Engle & Wichman, 2017), showing that right-wing authoritarians who express a willingness to sacrifice civil liberties in order to fight terrorism are less displeased with disconfirming feedback compared to those who score lower on right-wing authoritarianism and express a desire to uphold civil liberties when they are provided with disconfirming feedback. This project demonstrates how ambivalent attitudes can manifest in real-world policy issues.

Ranburger, Davis; Lee, Ngo Fung; "Photochemical And Catalytic Study Of Manganese Corrole Complexes As Biomimetic Catalysts" (Rui Zhang)

Due to the structural similarities between metallocorroles and metalloporphyrins, a significant interest of the two systems has grown in the field of biomimetic catalysis. Examining and characterizing the less known corroles compared to the well-studied porphyrins is a result of this work. In this presentation, 5,10,15-trisphenylcorrole (H3TPC) and 5,10,15-tris(pentafluorophenyl)corrole (H3TPFC) were synthesized and characterized followed by a manganese metal insertion, which produced MnIII (Corrole)•(Et₂O)₂. The high-valent manganese(V)-oxo species as the active oxygen atom transfer agent have been generated by photochemical and chemical methods. Kinetic studies of the generated manganese(V)-oxo corroles in the presence of substituted thioanisole substrates were conducted. In addition, our catalytic study shows manganese corrole complexes catalyze highly efficient and selective oxidation of sulfide compounds to sulfoxides with iodobenzene diacetate (PhI(OAc)₂) as the mild oxygen source.

Reece, Christopher "A Case Study Of The Historic March 4-5, 2015 Winter Storm In Kentucky" (Joshua Durkee)

On March 4th and 5th of 2015, unseasonably cold air moved into the eastern U.S. as a strengthening region of surface low pressure emerged from the desert southwest, and propagated across the south. While heavy rain overspread much of the Ohio Valley, arctic air intruded the region from the north, turning heavy rain to a dangerous snow event. In wake of the storm, widespread accumulations of 4 to 12 inches were observed, with a band of historic accumulations upward of two feet observed along the Bluegrass and Western Kentucky parkways in Kentucky. Highways were shut down and motorists stranded as temperatures fell

below zero. The purpose of this study is to diagnose the large-scale atmospheric circulations that contributed to such a historic winter storm, along with the local scale atmospheric features that lead to significant banding of snow. Analysis will be conducted through the subjective analysis of surface weather observations, upper air reanalysis data, as well as satellite and radar observations provided by the National Weather Service, National Climate and Data Center, and Unisys. Results indicate that middle-atmospheric features were strongly connected to changes in surface conditions that led to considerable warm, moist air overrunning a cooling environment, while a strong temperature gradient over the region produced strong frontogenesis, resulting in heavy banded snowfall.

Reed, Natalie "A Computerized Solution To The Fold-and-cut Problem" (Uta Ziegler)

The fold-and-cut problem was first discovered in 18th century Japan. This problem consists of the idea that, for any shape, a fold pattern can be created that will allow for the shape to be cut out by making one straight line cut across the folded paper. The theorem to develop these fold patterns was proved by Eric Demaine in 1999. Translating this solution into a computer program poses many obstacles because the process of creating these fold patterns relies heavily on a human ability to identify patterns in line graphs. This project works to translate these seemingly random observations made by the human eye into mathematical algorithms that can be utilized by a computer. The process of solving the Fold – and – Cut problem can be broken down into three main parts: creating a straight skeleton, adding other necessary lines, and determining how to fold these lines. The current focus of the project is on the first step of creating the straight skeleton for the given shape. David Eppstein & Jeff Erickson developed a new way of computing these straight skeletons in 1998 which is used in the current program.

Rose, Chaney "Increasing Breast Milk Supply" (Deanna Hanson)

Describing recent evidence about how to increase breast milk supply in lactating mothers using pharmacological and non-pharmacological methods. While breast milk is the best evidence based method of feeding infants, many mothers are fearful that their breast milk supply is inadequate. Breast milk supply can be increased through the use of herbal galactagogues, early skin-to-skin contact, and traditional foods. This poster synthesizes several recent research studies from peer-reviewed journals into one evidence based practice poster.

Ruggles, Joshua; Alghamdi, Osama; Bradley, Michael; Carter, Trason; "Design Of A Portable Faraday Disc Experiment" (Walter Collett)

In 1831, Michael Faraday created what is commonly called the Faraday Disc. The device operates using an electrically conducting disc rotating perpendicularly to a magnetic field, thus inducing a DC voltage across its radius. A portable experiment, based on this concept, is being designed to demonstrate the principle of electromagnetic induction. This system will consist of a motor-controlled disc and a variable strength electromagnet. The design will offer user control over the magnetic field strength and the rotational speed of the disc and display the generated voltage to demonstrate the relationship between each. The system housing will include all displays and controls, as well as safety features such that it is appropriate for students to operate in the classroom. The disc and electromagnet assembly have been modeled using ANSYS Maxwell simulation software. Design of the electromagnet and housing is underway, with the goal of assembling the device by the end of the semester.

Sahlman, Jon; Brown, Laura; "Things White People Say: Mechanisms Of Moral Disengagement Within Interracial Communication" (Laura Brown)

The issue of racial discrimination has been an ongoing problem since the inception of the United States. With the official abolition of slavery, to the Civil Rights Movement, the country has seen an ever-changing state of rights extended to non-white individuals. However, despite progress made by non-white activists, the issue of racial discrimination has only changed shape. While most focus has been placed on the inadequacies of the criminal justice system, less focus has been placed on the racial divides in one of the most influential settings; the college campus. Building from Bandura's theory of moral disengagement, this study uses Bandura's work as a theoretical framework to explore how racist micro-interactions (face-to-face communication) between non-white and white students are justified. 10 interviews were conducted with non-white students about their interactions with their white peers. Questions ranged from their emotional response to racially charged language, to how white students seemed to justify their ignorance both in and out of the classroom. The findings showed that not only are mechanisms of moral disengagement prevalent during interracial interactions but, they have lasting implications on the academic and personal well-being of non-white students.

Sairajeev, Sasha; Al Khayyat, Sarah; Rinehart, Claire; King, Rodney; "The Discovery And Genomic Comparison Of Two Novel Bacteriophages Cardisan And Kahve" (Naomi Rowland) Bacteriophages are the most abundant viruses in Earth's biosphere with an estimated population of 10^{31} . Understanding these species is key to addressing pressing medical issues such as antibiotic resistance as humanity has an ever-growing need for alternatives to pharmacological mechanisms to target pathogens. The purpose of this research project was to progress bacteriophage research, adding to the scientific community's work to solve these medical crises. Two separate environmental samples (both soil samples) from two separate geographic regions in Kentucky were collected. Two bacteriophages, Cardisan and Kahve, were isolated from the soil samples and purified using *Mycobacterium smegmatis* as a host. Further testing was performed to characterize the bacteriophages by determining the genomic DNA concentrations and potential phage clusters through DNA restriction digests as well as running a gel electrophoresis. Cardisan had a predicted phage cluster of A1 which was determined through the provided phage cluster tool. Kahve, which was sent for sequencing at the Howard Hughes Medical Institute, was determined to be B1. In summation, bacteriophages Kahve and Cardisan exemplify differences in terms of their genome but exemplify similarities in terms of particular physical characteristics.

Salim, Hasan; Fan, Joy; Srivastava, Ajay; "Assessing The Role Of The Gene, *pebbled*, In *D. Melanogaster* Asp Invasive Behavior" (Ajay Srivastava)

The *Drosophila* Air Sac Primordia (ASP) can be used to study invasive behavior as it mimics tumor behavior when it invades into the Wing Imaginal Disc (WID) during larval development. A protein expressed in the ASP was found to be coded by the gene *pebbled* (*peb*). This study was conducted to see whether *pebbled* influences the invasive behavior of the ASP. Using *Drosophila* genetics and RNA interference, the *pebbled* gene was knocked down and less-developed and less-invaded ASP's were seen as the result. The data presented provides information on the possible role of *pebbled* in tumor invasion. The downregulation of *pebbled* also lead to a decrease in filopodia (actin projections protruding from the ASP) supporting the claim that there is a direct positive correlation between quantity of filopodia and the invasive capabilities of the

ASP.

Sandefur, Sydney "Berea Community Center For All" (Shahnaz Aly)

Growing up in Berea, Kentucky, I realized that certain aspects of the town were lacking. With this project, I hope to provide facilities that will offer entertainment as well as bringing the community together as a whole. I would like to design a community center with a library, fitness center, daycare, auditorium, indoor/outdoor recreation, and cafe that will provide a place for everyone to feel welcome while incorporating the artistic atmosphere of Berea both on the inside and outside of the building design. With a building that has all of these amenities, Berea will thrive economically and socially. The need for this building is significant because not only will this appeal to the people of this town, but it will also bring in friends, family, and other people from surrounding towns to have a chance to be a part of this community.

Sanford, Dylan; Thomas, Zachary; Saidjafarzoda, Ilhom; Khomidkhodza, Kholikov; Li, Peizhen; San, Omar; Karaka, Haluk; "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 (SMA) and aluminum 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/cm² is used.

Scanlon, Kyla "Effects Of Terrorism On The U.s. Stock Market: Evidence From High Frequency Data" (Alex Lebedinsky)

This paper investigates the effects that 24 different terrorist attacks had on the US stock market, using high frequency intraday data and the GARCH model to identify stock price and variability reactions in the hour after the attack. The market reaction to attacks that occurred domestically versus attacks that occurred internationally was examined to measure contagion across financial markets. The next variable analyzed was the impact of attacks by casualty level, breaking down the data into three parts based on number of casualties. The results concluded that attacks that occur inside the USA cause a larger, adverse impact on variability and price level in the hour after the incident compared to foreign attacks, providing a small possibility of market contagion. There is also graphical evidence from each of the attacks that the market dynamics recover from the attacks within the day. An analysis of the attacks by casualty reveals no clear relationship between a larger casualty level and a larger market reaction. All of these contribute to the possibility of desensitization, suggesting that the market response to terrorist attacks have diminished.

Schnittker, Anna "Spatial Analysis Of Karst Geology On Isla De Mona" (Patricia Kambesis)
 Isla de Mona is a small carbonate island located 66 km west of Puerto Rico. The island is known for its extensive series of flank margin caves which are karstic features formed within and adjacent to the edge of a fresh-water lens. Though these features have been documented on Isla de Mona, they have not been spatially compiled or analyzed. The purpose of this study was to georeference the caves within the context of the island's geology, determine distribution and volume of the karstic voids, and estimate the karstic denudation vs littoral (wave-influenced) denudation vs. cliff-line retreat. This was accomplished by using a Geographic Information System to perform spatial data analysis and geologic interpretation. Analyses show that most of the caves are located on the perimeter of the island and extend inland a maximum of 270 meters distance. Extensive speleothem development indicate the caves formed without natural entrances. The caves formed at the contact of the Miocene-age Lirio Limestone and Mona Dolomite and appear to have been dissolved at the edge of a paleo freshwater lens. Tectonic uplift has raised the caves 20-80 meters above current sea level and cliff-line retreat has exposed the caves to the surface.

Schulz, Michael "The Influence Of Topography And Land-use/land Cover On The Development Of A Tornadoic Thunderstorm Along The Mississippi River" (Joshua Durkee)
 Numerous studies have been conducted in recent years with respect to how the land surface interacts with rotating thunderstorms in the southeastern United States, where considerable variations in topography and elevation exist. The purpose of this study is to apply the observations and theories concluded from these previous studies to part of the life cycle of a single rotating thunderstorm as it tracked from southeast Missouri to western Kentucky, and to show how certain land features likely led to the tornadoes it produced. The data used for this study includes various National Weather Service Doppler Radar observations, official airport weather observations, and previous published research for support. Initial findings show that two distinct land features, a topographical ridge and the Ohio River, led to an enhancement in the storm's strength and rotation, and ultimately led to two cases of tornado formation. These initial findings are supported by scholarly research from eastern Tennessee and northern Alabama, that illustrate how influential large bodies of water and topographical ridges are when it comes to tornado production in rotating thunderstorms.

Scott, Rhiannon "A Study Of Disturbed Geomorphic Features On The Northeast Coast Of The Yucatan Peninsula, Mexico" (Patricia Kambesis)
 Beach ridges on the northeast coast of Quintana Roo on Mexico's Yucatan Peninsula typically form on linear trends that parallel the coastline. LIDAR data revealed a series paleo beach ridges, located 2 kilometers inland where the linear morphology of the beach ridges had been extensively broken. It has been suggested that either tsunami or extreme hurricane activity may have caused the extreme change in beach ridge morphology. However, the northeast coast of the Yucatan is not subject to the extremes of tectonic activity though hurricane activity is common. The purpose of this research was to determine the cause of the geomorphic disturbance of the beach ridges. Field activities included collection of rock samples, geologic mapping, and georeferencing of beach ridge morphologies. Rock samples were analyzed and geologic data georeferenced within a Geographic Information System. Spatial analysis of the LIDAR data and the geologic and geomorphic features revealed that the break in the linearity of the ridges was caused by neither tsunami nor hurricane activity but rather by littoral processes associated with

changes in sea level.

Sedlak, Caleb "Using Engineered Zinc Finger Proteins To Detect Pathogen-specific Dna"
(Moon-Soo Kim)

Zinc Finger Proteins (ZFPs) are one of the most common DNA-binding domains. ZFPs can be engineered to bind to specific genes on a double stranded DNA. Developing a rapid and reliable method for detecting specific pathogens would be greatly beneficial to modern biomedicine as well as more resource-limiting areas. A pair of ZFPs was used in a two-step process to first capture the target DNA and then apply the second detection probe ZFP labeled with a fluorescent molecule. A *stx2* gene was chosen as a target DNA, which encodes for Shiga toxin a food born pathogen *E.coli* O157. The ZFP array takes the capture ZFP probe and immobilizes it on an acrylamide gel surface. After target DNA was added, the detection probe a ZFP labeled with a fluoresces molecule was applied to the bound complex of the capture probe and target DNA. At the final step, fluorescence intensity was measured to compare the signals between target DNA and non-target DNA. Part of this research was carried out through the collaboration between WKU and Hongik University in South Korea through the National Science Foundation IRES Program. This collaboration helps to gain advanced research experience, and as allowed an opportunity to learn and experience Korean culture.

Sego, Christina "Maternal Health Challenges In Eastern Tanzania: Antenatal, Delivery And Postnatal Care" (Alexander Olson)

The purpose of this study is to evaluate maternal health conditions in eastern Tanzania and identify areas for improvements in healthcare services. Tanzania is ranked 27th in the world among countries leading in maternal mortality rates. Similar to most sub-Saharan Africa countries, maternal health is one of the major challenges facing Tanzania. This study was designed to identity aspects of maternal health services that could benefit from advanced quality of care interventions. The experience of Sinza Palestina Hospital, in Dar es Salaam, Tanzania, was used for the purpose of the study. Data was collected in the form of observation, interviews and questionnaires with healthcare professionals such as nurses, midwives and doctors. Information was obtained for the 3 areas of maternal care in the hospital: antenatal, delivery and postnatal care. Challenges for maternal care were determined from provider perspectives. My findings showed that limited supply of trained healthcare providers, poor equipment, limited facility space, and cultural influence on care are major factors affecting quality of care. I propose improvement interventions that should include health education, infrastructure modifications, additions to hospital staff, and community awareness. Progress in these areas would enhance the quality of care and improve maternal mortality rates in Tanzania.

Seng, Amanda; Warren, Jon; Upright, Paula; "Motivations To Spectate As Drivers Of Social Media Engagement" (Joanna Melancon)

This study explores how a fan's motivation to be a sport spectator influences the value they seek from sport social media sites. Uses and Gratification theory, motivations to spectate, and motivation to follow sports online provide theoretical justification for the relationships explored in this study. A survey of 598 sports fans showed that differences in motivations to consume a sport did contribute to variations in the types of content/value sought on social media. Implications for how sports franchises can customize content for different fans are discussed.

Sewalls, Harper "Computer Simulation Of Conformations Of Large Dynamic Proteins" (Sarah Edwards)

The research that I am conducting consists of using the the molecular dynamics program AMBER to simulate the motion and different structural confirmations of large proteins. These computer simulations are important because X-ray diffraction, which is used to determine the structure of such proteins, is limited in its ability to represent the range of possible protein confirmations. Many of the proteins have a large number of "moving parts". This dynamic nature is necessary for function. The protein's free movement allows it to withstand the heat of its environment and remain functional. We will use a part of AMBER known as RMSD analysis. This will take different frames of protein motion and find the most unique ones as the sampling of possible protein shapes. Finding all of the shapes one protein can take will eventually lead into simulating the docking between two proteins. Once we have developed a reliable formula for finding different protein conformations, other researchers can use this protocol to study any protein and design future experiments. It is difficult now to obtain structural data about molecules and especially for conformational pairs of proteins. With this computational formula anyone will be able to predict the likelihood of various docking configurations for large proteins. This is the end goal of this phase of the investigation.

Seymour, William "Hydrogen-powered Scooter" (Anne Heintzman)

This project tests the practicality of converting an electric scooter to a hybrid of hydrogen and electric power, using hydrogen to supplement battery power and to recharge independent of a wall outlet. The scooter will run primarily on battery power, with additional electricity generated from an onboard hydrogen fuel cell. When not in use, the scooter can be set to a "recharge" mode, where the hydrogen fuel cell will draw power from pressurized hydrogen gas reserves to recharge the batteries for later use. Thus, the scooter can be "refueled" by simply replacing the hydrogen tank. The design will integrate a Horizon Fuel Cell Technologies1 30W hydrogen fuel cell into a Schwinn S180, substituted with parts from a broken Schwinn S500. All of the drive system from the S500 will be used in the S180's chassis, with the 30W fuel cell bypassing the charging cord connector through a voltage boost regulator (switching type for efficiency to not waste the low output of the fuel cell.) The results of this project may help determine how augmentation of a standard battery system with hydrogen affects the efficiency of lightweight hydrogen-based vehicles.

Shaikh, Waleed "Racing Facility" (Aly Shahnaz)

Street racing is a topic that has become a public issue. The dangers are clear to see, yet people seem to miss discussing ways to prevent it. The objective of this program was to attempt to create a way to move racing from an extremely dangerous setting to a safe and controlled facility, this is what led to the race facility. The main components of the facility include; A public garage, an enclosed tracks for racing and a designated emergency care area. Although this facility was built around creating a safer way to street race, there are also components with in the facility that cater to other aspects of street racing. One of those being a simulation room to prepare racers and possibly teach them how to prevent accidents. The last major part of the facility was a family friendly gaming room. This was added in efforts to improve the negative connotation that surrounds street racing. In conclusion, the facility was created to change street racing in it's entirety while maintaining the trend setting stigma yet creating a safe and acceptable setting.

Simpson, Hannah "Ethics of Dissent: Russell Moore and the Evangelical Population's Support of Donald Trump" (Anthony Harkins)

In the 2016 presidential election, it was no secret that a large majority of Trump supporters were evangelicals. Donald Trump was the Republican nominee, so it was expected for Christian conservatives to back Trump wholeheartedly, as Republican conservative stances often align with evangelical stances. However, when Russell Moore, president of the Southern Baptist Convention's (SBC) Ethics and Religious Liberty Commission (ERLC), criticized presidential nominee Donald Trump's moral character, his dissent received great backlash from the Southern Baptist population and revealed a larger problem among Christians: the desire for political power and influence can drive Christians to make irrational decisions that contradict what they claim to believe. Moore's criticism was a testament to the often high price of dissent, for he nearly lost his job, and quite ironically, sacrificed his ethical authority within his own congregation—a stance that was supposed to represent the Southern Baptist congregation as a whole. My analysis of this case reveals how dissent can disrupt foundations that are supposed to be fixed and understood, breaking the boundaries of moral and ethical conservatism.

Simpson, Olivia "Crystal Growth of Novel Metal-Organic Framework from polyoxoniobate clusters and ruthenium complexes" (Bangbo Yan)

Metal-Organic frameworks (MOFs) are compounds made up of a metal ion attached to various ligands that form multidimensional structures. Due to their high porosity and large surface area, MOFs have applications in clean energy, ion exchange, as catalysts, and almost all applications where sorption of gases or liquids is necessary. Our project is to synthesize novel MOFs from polyoxoniobate clusters ($\text{Nb}_6\text{O}_{19}^{8-}$) and ruthenium complexes ($[\text{Ru}(\text{bpy})_2]^{2+}$). We have investigated how the ratio of the reactants, reaction time, reaction temperature and pH affect the growth of the crystals of the materials. The crystal structures are studied by single crystal X-ray analysis.

Sims, Hunter; Warlick, Corinne; Jaconette, Conrad; Hill, Lawrence; "Synthesis And Characterization Of A Benzylic Ether Boronic Ester Difunctional Initiator And Its Use In Oxidatively Degradable Polymers" (Lawrence Hill)

The objective of our research is to produce a class of methacrylate derived polymers that can be fine-tuned to degrade at desired rates under oxidative conditions. This will be achieved by inclusion of an oxidatively-sensitive initiator with boronic ester linkages. The rate at which the polymer degrades, and the molecular weight of degradation products, will be controlled by varying the ratio of monomer to aryl boronic ester linkages. The polymer's construction consists of two major steps: synthesis of a benzylic ether boronic ester functionalized initiator, and then atom transfer radical polymerization to form an oxidatively degradable polymer. Herein, we describe the first major step of the synthesis and characterization of the benzylic ether boronic ester derivative that will act as a difunctional initiator for polymerization.

Smith, Nick; Dalton, Destin; Fallata, Mohammed; "Construction Labor Shortage" (Taha Alyousef)

Skilled labor supply in the construction trades is quickly falling, presenting a big problem for the future of the construction industry. This problem is significant because with the fall in labor supply there will be an increase in construction labor costs and overall project costs. This is bad

for the industry because it will encourage people to buy existing structures rather than build new construction. In America, there is a negative stigma surrounding the construction trades. This paper will examine why this ideology exists in American society through literature review and local surveying of schools, contractors, and young people. A better understanding of this will help provide solutions to this issue. In addition, seek out technological alternatives to construction labor that can fix this labor shortage problem in the future. The expected results are that young Americans are ignorant of the demand for labor in the construction industry and the potential for successful careers in the construction trades. Young people view it as a dirty, low paying, blue-collar job, rather than a secure job with opportunity for entrepreneurship. The expected solution is high school programs that inform young people on career choices before deciding to go to college.

Sneed, Jubilee "The Computer Aided Design of a Bullpup" (Shane Palmquist)

While most associate Mechanical Engineers with science and mathematics, the design aspect of the field may go unnoticed. This process is essential when creating and prototyping. In the last two decades, computer aided design (CAD) programs have developed to become one of the most powerful design tools for an engineer. A plethora of 3D drafting programs exist-- Western Kentucky University engineering students are taught to use SolidWorks. Knowledge of this program has been extremely effective toward my position at the Engineering-Manufacturing-Commercialization Center (EMCC). Through my internship at EMCC, I have completed many different contracted design projects for a variety of clients. One particularly fascinating project was to design a casing for the internals of a gun, or what is known as a Bullpup. The Bullpup that I designed and prototyped is for a 10-22 Ruger rifle. Bullpups give benefits that are comparable to a phone case; protecting the product, providing aesthetic appeal, and adding more user-friendly features. Through the application of my knowledge and the power of computers, I have designed a full functional Bullpup which makes a regular rifle look similar to guns one would see on a video game. Gun lover or not, this is a project that is visually grabbing and a strong demonstration of the power behind Computer Aided Design.

Snyder, Cierra; Vazquez, Abigail; "Click, Buy, Lie or Die?" (Leyla Zhuhadar)

Our project was about finding out if a company's website was beneficial to the company. We had many attributes to help find out if the website was producing revenue for the company or if it needed to be updated or worked on. Our attributes of data were types of Browsers customers used, website pages that were viewed most often, what time the website was visited the most and how many viewers of the website actually bought something. The goal of the project was to relay our findings back to the company to tell them what needed to be done to help boost revenue. We found that the website needed a lot of updating. We found a lot of viewers ended up not completing a purchase from the website. We gave the company tips on how to improve the website. Abby and I also decided at the end of the project how we could make our findings even better as well. We agreed that we would have liked some of our data attributes to be more useable because we did a lot of cleaning of our data before importing it into our data system.

Spalding, Sarah "Holding The Rock: The Native American Occupation Of Alcatraz Island, 1969-1971" (Patricia Minter)

After the American Indian Chicago Conference of 1961 inaugurated the term "Red Power," the movement made the biggest statement it had yet: the occupation of federal land that had fallen

into disuse. That land was Alcatraz Island, the infamous island prison that held criminals on the forefront of world news in the early twentieth century. What followed November 20, 1969 were almost two years of continued Native American occupation of the island and a whirlwind of both media and federal attention. By the end of 1971, remaining occupiers of Alcatraz were forcibly removed by federal marshals. However, the movement was successful in bringing Native American activism to the attention of the American people and President Nixon. Though rife with privation and hardship, the occupation succeeded in garnering a change in the federal passage of acts that protected Native American interests and heritage. Through the use of both secondary historical accounts and press reports from the time, this paper argues that though the protestors were eventually removed from the island and the occupation technically considered a failure, the spirit of modern Native American social empowerment has its roots in the Alcatraz occupation and its impact is still being felt today.

Spencer, Colton "A Community Made Stronger" (Shahnaz Aly)

Currently we are experiencing a fitness craze throughout the world. Studies show that people are being made more aware of the importance of exercising and as such are developing numerous locations to exercise. Having all of these specific locations unintentionally divides the fitness community. The city of Bowling Green has several gyms and unique fitness centers but does not offer a space where these can be housed underneath one roof. For that reason it was appropriate to design a multi purpose fitness facility. The goal of designing a facility like this was to create a space that can accommodate all athletes and their various preferences of fitness. By doing so, this facility will bring together the fitness community so that they may interact and work out with one another as a whole. My research shows that crafting an environment that exposes people to new activities will encourage them to experiment and open up new opportunities for the facility's patrons.

Stamps, Emily "Post Oak Baptist Church" (Neal Downing)

Church is so much more than a building to me. It is a combination of all people, regardless of race or ethnicity, coming together to fellowship and worship God. I am proposing a new building for Post Oak Baptist Church in Russellville, Kentucky to provide more space for our rapidly growing congregation. This incorporates a larger space for worship in order to maintain a single service, which will complement our specific fellowship. In addition, there is a need for recreational space for indoor and outdoor ministries. This will consist of classrooms to be utilized for bible studies before worship on Sundays and throughout the week. Our children's ministry has experienced the most growth so they are in need of a separate wing. A multipurpose building and exterior elements to accommodate the flag football programs and other outdoor ministries will provide for our members as well as our community. This combination of a sanctuary, fellowship hall, educational building, and areas for numerous outdoor ministries, will enhance our fellowship and the welcoming of all people.

Starkey, Luke "Lombardi Inn & Titledown Tavern" (Neal Downing)

The purpose of this project is to design a unique hotel/bar that will not only add to the football experience, but become an icon to the city of Green Bay, Wisconsin. Downtown Green Bay only has a total of 7 hotels and very few bars; none of which provide an environment that makes you eager to watch the Packers play. These bars are not utilizing the location and space of their occupancies optimally. They are not as open or accessible as they could be to provide a better

game day experience. Out of the 7 hotels in Green Bay, there is 1 high-end lodge. People traveling from all over the country should be given the opportunity to stay in a place that stands out as a major part of their time in Green Bay. In order to optimize the best possible experience, the geometry of the building and living spaces plays the largest role, providing a cascading effect resembling the stadium across the street. This also creates more open areas to avoid feeling constricted. With the combination of these aspects, this building will provide a new look and feel, while adding to the history of Green Bay.

Stekardis, Julia; Ringo, Wyatt; Rowland, Naomi; Rinehart, Claire; King, Rodney; "A Comparison Of Bacteriophages Fresapreciosa And Rainyjennifer With Similar Phenotypes" (Naomi Rowland)

Bacteriophages present a new opportunity in the fields of medicine and epidemiology as novel treatments for bacterial diseases. Phage therapy reduces antibiotic resistance growth through easily accessible means. Widespread collection and isolation of these bacteriophages conducted to be an effective search for phage therapy. Two novel bacteriophages, FresaPreciosa and RainyJennifer, were isolated from enriched soil samples outside of Downing Student Union and Garrett Conference Center, respectively. These were grown on *M. smegmatis* plates to purify and were imaged via electron microscopy. DNA from each underwent Restriction enzyme digests/gel electrophoresis to approximate their clusters, with ongoing research to sequence/annotate the genomes. These phages were very similar though geographically disparate, and analysis of their similarities (small tail size, mutations in purification) will prove valuable to broader bacteriophage research. RainyJennifer has a distinct physical appearance with a small tail and a large capsid, and its cluster predictions were inconclusive. FresaPreciosa has a similar small relative size and short tail with a cluster prediction of Singleton which could lead to a new cluster being developed. The general inconclusiveness of cluster predictions and similar abnormal size indicates both phages may contribute greatly to genomic knowledge of bacteriophages and overall diversity with further study.

Stevens, Lauren; Neils-Strunjas, Jean; Falls, Dustin; "Bingocize®: An Evidence-based Program To Improve The Quality Of Life Of Kentucky Certified Nursing Facility Residents" (Jason Crandall)

Over 50% of older adults residing in nursing homes or certified nursing facilities (CNF) in Kentucky have cognitive and physical disability. The lack of opportunity for social and physical activity in nursing homes results in a downward spiral of cognitive and physical health. In the spring of 2017, our team received a 3-year grant from the U.S. Center for Medicare & Medicaid services (CMS) to implement Bingocize®, a combination exercise and bingo game designed to improve CNF residents' quality of life and physical health, as well as decrease social isolation. The overall project objectives are 1) to train 300 CNF staff from 23 Kentucky CNF to lead Bingocize® for CNF residents, 2) train 17 faculty and 100 students from eight Kentucky universities to lead Bingocize® and partner with the CNFs to implement Bingocize®, and 3) recruit 1000 CNF residents to participate in Bingocize® with the goal of improving functional status and social engagement. The purpose of this presentation is to describe the steps for implementing this state-wide project and highlight progress towards our objectives.

Steward, Kayla; Nee, Matthew; "Buoyant Photocatalyst To Degrade Organic Compounds" (Matthew Nee)

Unlike biohazards and inorganic compounds, organic pollutants can be difficult to remove. Photocatalyst can break down organic compounds when in the presence of the sun into less harmful ones, but photocatalyst without a support material cause a slurry in the water and are difficult to remove. Through microbubble fabrication, a photocatalyst can be incorporated into a polydimethylsiloxane (PDMS) bead. The high surface-to-volume ratio gives the photocatalyst a maximum amount of access to the sun and the pollutant. The PDMS beads have a hydrophobic nature and low-density, which makes them float on the surface of the water, allowing for easy removal. The first photocatalyst used in the beads was titanium dioxide (TiO₂), and TiO₂ beads can remove an organic pollutant from water within a few hours, but it is not very effective in visible light. Zinc oxide (ZnO) was then incorporated into the beads, but the ZnO disfigures the beads. While the plain PDMS and the TiO₂ beads are very porous, ZnO creates jagged and flat structures within the beads. Even though some of the structure is lost, ZnO could still potentially outperform the TiO₂ beads due to better photocatalytic properties.

Stewart, Alexander; Shaprio, Hannah; Rinehart, Claire; King, Rodney; "Discovery And Comparison Of Bacteriophages Kalnoky And Hankaysha" (Naomi Rowland)

In recent years, the number of bacteriophages discovered has risen drastically. Because of this influx data, comparative analysis of phages is a useful tool in classification. Using the host *Mycobacterium smegmatis*, the phages Kalnoky and HanKaySha were isolated and characterized to gain an insight into the diversity of mycobacteriophages. Kalnoky was isolated from a soil sample taken from Bowling Green, KY. HanKaySha was isolated from a water sample taken from Greensburg, KY. Their viral morphology was observed under a TEM. Their genomic DNA was isolated and restricted. Visualization of the restrictions through agarose gel electrophoresis revealed genetic differences between the phages when restricted by ClaI, AhdI, and BstXI. Analysis of the gels suggests that the phages may belong to separate clusters. It was predicted that Kalnoky belongs to the A1 cluster, while HanKaySha could belong to the A1, F1, or J clusters. Genomic sequencing is needed to confirm these predictions. Although our phages were isolated under similar conditions, they were taken from different mediums and are noticeably different in both morphology and genetic makeup. Due to these differences, our evidence supports that phages isolated from different mediums can vary in morphology and genetic makeup, and that our phages are unrelated.

Stovenour, Reagan "A Cabaret featuring Reagan Stovenour" (Amelia Rollings)

A special magic happens when audience members feel the intimacy that exists between themselves and the performer. A performer writes his or her cabaret based on their own individual talents, passions, and to respond to the world around them. A cabaret can take a highly political stance or a neutral stance. Cabaret is a type of theatre that doesn't adhere to a fourth wall. The performer communicates with the audience and brings them into the show through singing, acting, dancing/movement, and comedy. Most importantly, the performer displays raw and soul-bearing honesty to an audience simply because that is what she feels she needs to do. This original cabaret performance, written and performed by Reagan Stovenour, includes music, short scenes, and monologuing. The performance balances humor with poignancy and is both provocative and timely. All repertoire performed aims to answer the question, "What am I trying to present to the audience and why does it matter that they hear it now?"

Stratton, Tabatha; Gill, Jennifer; "Effect Of Different Riding Terrains On Hoof Wall

Performance In The Barefoot And Booted Horse" (Jennifer Gill)

Hoof care is crucial in caring for horses. If the hooves have damages, such as chips and cracks, it can cause issues such as abscesses, unbalance, and laminitis. The purpose of this study was to determine the number of chips and cracks the hoof receives during exercise on different terrains while being barefoot versus wearing hoof boots. Cavallo's TREK Regular Sole Hoof Boots were chosen for the study. A total of 5 horses were used. Measurements (in millimeters) were taken pre and post exercise of notable cracks and chips. Photographic evidence documented the damages. The horses were lunged on 3 different terrains that they commonly encounter. Using SAS software, the results show that the number of chips and cracks was lower when the horse was booted versus being barefoot. It was also shown that there was no significant difference in number or size of chips and cracks after exercise each day. However, results show that the number of chips and cracks increased throughout the 6-week study period, though most of the damages occurred out at pasture. Overall, the study shows that hoof boots are favorable in hoof protection. The invention of a long-term hoof boot could potentially help horses who cannot wear metal shoes or whose owners have low income.

Strunjas, Anna; Patterson, Connor "Discovering And Comparing Bacteriophages Struki And Doctordiddles" (Claire Rinehart)

Bacteriophages are small, ubiquitous, infectious agents that target bacteria to reproduce. They are the most abundant organisms on the planet with an estimated 10^{31} individual species, and due to this they show a wide variety of features. In the Genome Discovery and Exploration Program we discovered and characterized a new phage by purifying it from a soil sample. Each student discovered their own phage and this poster compares two phages, DoctorDiddles and Struki, in order to show the vast diversity in viral morphologies. Our phages were purified through a plaque purification technique that involved diluting the phages, incubating them in Bacteria, and plating them on TopAgar nutrient plates. These steps were repeated until each phage produced a lysate, and each eventually produced a high titer lysate. These were ultimately used to isolate the DNA of our phages and use restriction enzymes to characterize our phages. An electron microscope was then used to view the phages and their specific characteristics having to do with tail length and capsid size. The results of comparing the two phages, DoctorDiddles and Struki, show the incredible diversity of viruses, by demonstrating how different these two bacteriophages are even though they come from very similar environments.

Tadakaluru, Apoorva; Tinius, Rachel; Yoho, Kristin; Pitts, Bailey; Blankenship, Maire; Furgal, Karen; Maples, Jill; "The Metabolic Responses To A High-fat Meal And Exercise Among Postpartum Women." (Jill Maples)

There has been very little research regarding the metabolic health of women during the postpartum period. Metabolic responsiveness to metabolic demands is a good indicator of overall metabolic health and may be influenced by weight status (i.e. lean vs. obese). Purpose: To describe the metabolic responsiveness to two different types of metabolic challenges: 1) a high-fat meal and 2) an acute bout of exercise among six-months postpartum women. Methods: Fifteen Caucasian women (Age 32.0 ± 4.4 years; Body Mass Index (BMI) 24.6 ± 4.2) participated in metabolic testing. Lipid and carbohydrate oxidation rates were measured during baseline, at two-hour post consumption of a high-fat meal and during moderate intensity exercise for 30-minutes. Results: In response to the high-fat meal challenge, women increased lipid metabolism by $39.8\% \pm 8.3\%$ (SEM) and carbohydrate metabolism increased $26.0 \pm 4.7\%$

(SEM). In response to the acute bout of exercise, lipid metabolism increased 2.3 ± 0.2 -fold while carbohydrate metabolism increased 3.1 ± 0.4 -fold. There was a positive correlation (Pearson correlation $r=0.6$; $p=0.01$) between BMI and carbohydrate oxidation in response to the meal challenge. Conclusion: The postpartum weight status may be linked to metabolic responsiveness to a high-fat meal challenge.

Taylor, James "Predicting Which Telecom Customers Churn" (Leyla Zhuhadar)

Customers churning is a big problem that many companies face today. The lower the percentage of customers churning you have the better that is for your business. Many people don't realize but when a customer churns and goes to another company it is very expensive to replace that customer. That is why businesses would much rather give a current customer a discount than try and market and get new customers. The model that we developed for this project is a model that can be used to predict customers who are likely to churn. By using this model, a company could predict which customers are likely to churn and then maybe specifically offer them a deal to maybe get them to stay.

Taylor, Logan "Slurs and In-Group Uses" (Benjamin Lennertz)

When slurs are used, the speaker communicates some perspective of their own that is launched toward the target of the slur. Slurs are generally used to derogate some target, and slurs are intriguing because of their power and prevalence in relation to this derogation. All slurs possess similar features that explain the ways in which slurs operate differently than other parts of our language. There are generally two kinds of theories of slurs, pragmatic and semantic, that attempt to explain this offensiveness. Semantic theories of slurs work to explain that the offensiveness of slurs arises because of something concerning the slurs meaning. Renee Bolinger offers a pragmatic theory of slurs, one that is concerned with the usage of slurs, that works to explain the justification behind this offense. I will explore whether her theory can account for the phenomenon of in-group uses associated with slurs. In-group uses are instances in which slurs have been appropriated and are now used by people who are targeted by these slurs. These in-group uses often take on other meanings that differ from the pejorative use of the slur.

Taylor, Morgan; Andrew, Keith; Womble, Phillip; Andrew, Karla; "A Cyber Social Model For Analyzing Information Transmissions Of Twitter Data Sets To Perform Threat Level Assessments" (Keith Andrew)

Social media is an active and efficient database of information. We have previously tracked the spread of social events such as the spread of Chikungunya, the activity of a school related shooting or an active crowd surge similar to the Hong-Kong political unrest via data mining of active Twitter accounts. We are now able to use selected word memes to search the Twitter database for indicators of possible life altering events such as the spread of a virus or a potential mass shooting. Memes of interest relate activity to geospatial growth. The meme spreads through the vast number of social users similar to nonlinear wave propagation. The spread is modeled as a system of ODEs isomorphic to a modified Tweet-Erase-Retweet (TER) system of three coupled nonlinear differential equations using Twitter variables. From this data, we derive the linear time dependence of the exponent of the degree distribution function. The rate of change is then compared to the rate of change for the corresponding centrality eigenvalues within the giant subgraph and to the external edges, which connect to nearby clusters.

Thomas, Zachary; Seyitliyev, Dovletgeldi; Kholikov, Khomidkhodzha; Grant, Byron; "Laser-induced Hydrogen Generation From Coal" (Ali Er)

This study presents a simple way of obtaining hydrogen gas from various ranks of coal, coke, and graphite using nanosecond laser pulses under different conditions such as water, air and argon atmosphere. Coal samples were initially characterized by scanning electron microscope (SEM), Fourier transform infrared (FTIR) spectroscopy, and calorimeter. It was observed that 532 nm laser pulses were more effective than 1064 nm pulses in gas generation and both were nonlinearly correlated with respect to the laser energy density. Gas chromatography measurements indicate that mainly hydrogen and carbon monoxide were generated. The hydrogen to carbon monoxide ratio shows that the highest efficiency rank was anthracite coal, with an average ratio of 1.4 due to its high fixed-carbon content and relatively high hydrocarbon amount. Graphite was used as a pure carbon source to study the possible reactions of gas yielded during the irradiation process. In addition, theoretical simulations using a standard finite difference method supported experimental observations. The possible mechanisms of gas generation were explained with chemical reactions. The amount of hydrogen production using laser pulses might be enough to power devices where relatively small amounts of hydrogen are needed.

Tisdale, McKenzie "Naples Florida Science Museum" (Neal Downing)

With the current emphasis on STEM research and careers, there is a need for more science resources for the public to inspire people to pursue and learn more about science. Local science museums have been shown to increase the science literacy of the community it is located in and foster more interest in science. The purpose of my research is to design an interesting science museum in Naples, Florida to draw the visitors in to explore the interactive science exhibits. My goal is make the building itself a part of the experience and to show it as an example of the applicability of science in the field of sustainability and green technology. It will also display how renewable resources can be used, and how the weather patterns and geography of the area can influence the design of a structure. Floor plans, rendered 3D modeling, and an overview of the main design elements will be used to display the final design of the building.

Tomes, Ariel; Morris, Cody; Winchester, Lee; Jackson, Justin; Neal, Wesley; Wilcoxon, Damon; Arnett, Scott; "Effect Of A Simulated Tactical Occupation Stressor On Immune System Markers Of Physiological Stress And Inflammation" (Cody Morris)

Purpose: The purpose of this study was to evaluate specific immune system markers in response to a simulated firefighting occupation workload. Methods: Ten healthy male participants completed a simulated fire stair climb (SFSC) under four conditions, with some conditions including the wearing of a 34.04 kg (75 lbs) vest to simulate the wearing of personal protective equipment (PPE) typically worn by a firefighter. Some conditions involved the inclusion of a color-word interference test (CWIT) as a distracting mechanism. Salivary cortisol (CORT) was measured at baseline, following initial 3 min workload, and following completion of total workload. CRP was evaluated at baseline and one hour following the completion of each workload. Results: A repeated-measures ANOVA showed that there was a significantly different blood lactate when comparing conditions ($p < 0.0005$). Both Conditions 2 and 4 exhibited a significantly higher BL ($p < 0.05$) than Conditions 1 and 3. Neither CORT ($p = 0.116$) or CRP ($p = 0.700$) was shown to be significantly different across conditions or from baseline. Conclusion: Based on the results of the current study, it appears that the wearing of a weighted vest to

simulate PPE significantly elevates BL above what would be expected by the exercise alone.

Trader, Elizabeth; Paquin, Anthony; Zhao, Qin; "Decreasing Stigma Against Depression In Chinese International Students" (Anthony Paquin)

Higher levels of stress and a shift in support systems during the transition to another culture can put international students at risk for mood disorders like depression. Previous research supports there is also a higher level of depression stigma within Eastern cultures in comparison to Western cultures (Cheon & Chiao, 2012). This may account for the strikingly low numbers from the Chinese population that seek and maintain professional counseling services while studying in the U.S. (Yakushko, Davidson, & Sandford-Martens, 2008). Psychoeducational programs about the symptoms and treatments of depression have been successful in reducing stigma and increasing help-seeking behaviors in Latina populations (Hernandez & Organista, 2013), so the present study seeks to determine whether a similar program would significantly affect Chinese international students in the U.S. Each participant's pre-existing attitudes toward depression will be measured prior to watching two self-produced Chinese videos regarding information about stigma, symptoms, and treatment of depression. We predict that there will be a significant decrease in stigma against depression and increase in likelihood to seek professional help for depression after participants view these videos.

Trejo, Kazandra; Williams, Gracen; "Dream On: Predictors of attitudes toward Deferred Action for Childhood Arrivals" (Gayle Mallinger)

The Deferred Action Plan for Childhood Arrivals (DACA), established in 2012 by the Obama administration, allowed the nearly 800,000 minors who had entered the US without documentation to obtain deferred action from deportation, to work legally, and to attend college (Pope, 2016). However, DACA was recently rescinded by the Trump administration (Department of Homeland Security, 2017). The reversal of DACA means undocumented individuals will be at risk for deportation and poverty. These adult children will lack the ability to work legally and will no longer be allowed to access post-secondary education. Social workers are obligated to advocate for policies ensuring equitable access to opportunities and resources (CSWE, 2015). Advocacy involves knowledge of a particular issue and an examination of one's own personal beliefs. This research explored the relationships among race, gender, generational status, religious fundamentalism, and racial prejudice, on undergraduate social work students' attitudes towards children of undocumented immigrants in the United States. The effect of race, gender, generational status, religious fundamentalism, personal contact, and racial prejudice on attitudes towards Dreamers are discussed.

Tuggle, Samuel "The Diversity Of Puppetry Across Cultures" (Liza Kelly)

In our current culture, puppets are largely viewed as being aimed towards children, usually in the medium of public broadcasting television and other educational programs. However, puppetry is an ancient, international form of storytelling that has been primarily targeted towards adults, ranging from casual entertainment to the highest of performance. Because of this common misconception, the goal of our project is to educate people in the history of the puppetry culture in regions such as Japan, India, and Western Europe. In addition to the core information presented, our own self-constructed puppets will accompany the presentation in order to provide examples of the puppets used throughout these regions. This will include shadow puppets, hand puppets, and Japanese bunraku puppets made from materials such as paper, fabric, foam, and

yarn. To further explain how the art of puppetry is traditionally targeted toward adults, we will describe the traditional themes of common puppet shows, be it mythological, dramatic, or politically oriented. The result, or significance, of our presentation will be the realization that puppetry, although ancient, is very much a living art form for people of all cultures and ages.

Twidwell, Robert; Teeters, Jenni; Hahn, Lance; "Linguistic Attributes Of A Text Message-based Intervention" (Lance Hahn)

Despite the demonstrated efficacy of technology-based treatment interventions, little research has examined the relationship between linguistic variables used by interventionists and participants throughout interventions. The current study utilized data from a pilot trial of a text-messaging based alcohol-impaired driving intervention (Teeters et al., under review) to explore computer-mediated communications (CMC) between researcher and participants. Participants were 25 college students who completed all phases of the pilot trial. Prior to data analyses, all conversations were made anonymous and separated into participant messages and researcher messages. Messages were analyzed using the Linguistic Inquiry and Word Count program (LIWC; Pennebaker et al., 2015). LIWC evaluated messages in multiple categories, including clout, negative emotions, pronouns, punctuation, risk, tone, and word count. A series of Pearson correlations were used to analyze LIWC associations between researcher and participant communications. Significant relationships were found in the LIWC categories mentioned above. Specifically, participant tone and word count ($r=.563$, $p=.003$), participant negative emotion and risk ($r=.738$, $p<.001$), participant 'we' usage and researcher clout ($r=-.762$, $p<.001$), and participant anxiety and researcher period use ($r=-.450$, $p=.024$). These results are discussed within the context of using specific communication styles to improve impact of the intervention.

Vaughan, Jessica; Banga, Simran; "Antibiotic Resistance of Bacteria Isolated from Soils" (Simran Banga)

After the discovery of antibiotics, antibiotics have been increasingly implemented in human and veterinary medicine. In addition, antibiotics are inserted into animal feed for non-therapeutic purposes, which potentially leads to the development of antibiotic-resistant pathogens. When organic compost is made from these animals' wastes as fertilization for soil, the antibiotic-resistant bacteria are introduced to the environment. With soil collected from different farms throughout the Bowling Green area, the microbial communities will be analyzed to determine bacterial compositions and their resistance to common antibiotics through a modified agar dilution technique and other identification methods. Through this method, the opportunistic pathogens will be identified and could suggest a possible public health concern.

Von Hagen, Lynn; Schulte, Bruce; "New Methods Utilized To Deter Elephant From Crop Raiding In The Kasigau Wildlife Corridor, Kenya" (Bruce Schulte)

Human elephant conflict (HEC) continues to rise as human settlements and agricultural developments further expand into African elephant (*Loxodonta africana*) habitat. Elephants often cross from areas of refuge into farming communities and consume or trample crops, exacerbating the threat to the livelihood of farmers and the conservation of elephants. Scientists and local people have worked to develop methods to deter crop raiding with limited success. This study evaluated the efficacy of several deterrent methods as well as a newly developed metal strip fence technique in a large-scale paired control study utilizing farm plots present in the Sasenyi farming community of Southern Kenya in the Kasigau Wildlife Corridor near Tsavo East National Park. Four blocks of farmland comprised of 4 different deterrent methods and their

matching controls were ranked for efficacy. The study found that the metal strip fence was effective at deterring elephants, and even more so when used in combination with a second deterrent method. Surprisingly, the control method for this deterrent measure, a single strand wire, was also effective at deterring elephants from crop raiding. These new methods show promise towards alleviating the conflict between rural farmers and the elephants that live among them.

Ward, Zoe "Validating K2 Blazar Variability With Contemporaneous Ground-based Observations" (Michael Carini)

Blazars are extreme examples of the Active Galactic Nuclei (AGN) phenomena. The blazar class includes BL Lacertae (BL Lac) objects and flat spectrum radio quasars (FSRQ). Blazars are defined by continuum variability at all wavelengths on timescales of minutes to decades. 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. The K2 mission, through its superb photometric precision and ability to continuously sample light curves on timescales of minutes to months, provides unrivaled information on blazar variability. However, no absolute calibration of the K2 data is possible and several different data processing schemes exist; thus it is vital that independent confirmation of any variability observed in K2 data via a particular processing scheme be obtained.

Warlick, Corinne; Hinkley, Branden; Sims, Hunter; Jaconette, Conrad; Hill, Lawrence; "Synthesis And Polymerization Of Ascorbic Acid Monomer" (Lawrence Hill)

The purpose of this research project is to create a polymer using ascorbic acid, an antioxidant commonly found in foods, for use in the drug delivery industry. This research has focused on synthesizing a benzyl-protected ascorbyl acrylate monomer over two steps followed by polymerization of the monomer using atom-transfer radical polymerization. In the first step of the ascorbyl acrylate monomer synthesis, a benzylation reaction was carried out with a 2.433-gram yield (35%); the second step involved adding acryloyl chloride to complete the monomer with a 0.449-gram yield (43%). The monomer was purified and characterized using NMR and TLC. It was then polymerized using atom transfer radical polymerization and deprotected to form an ascorbic acid-functionalized antioxidant polymer. The polymer was then characterized using SEC.

Wasilewski, Brandon "February 28, 2017 Ottawa/Naplate Tornado: A Satellite And Radar-Based Case Study" (Joshua Durkee)

Remote sensing is a process that involves collecting information about objects without physical contact, which is very useful for meteorological forecasts. Real-time observation of the atmosphere is one of the many important advantages of utilizing this process. When observed with surface and upper-air conditions, meteorologists obtain a well-rounded understanding of what is actually occurring prior to and during a severe weather event. An example of such event is the 2017 Ottawa/Naplate, IL Tornado. This unusually early-season tornado caught Illinois residents by surprise and tracked through an area in which many of my relatives live. A better understanding of both satellite and radar imagery can help meteorologists, like myself, warn family members of immediate danger and potential threats. The National Weather Service in Chicago put out a basic radar-based statement of the event. However, there still remains no published in-depth analysis of both satellite and radar imagery for this event. In addition to

upper-air maps, this case study presents real-time analysis of the storm and upper-air conditions with satellite and radar imagery. The examination has helped me understand characteristics of this storm and enhanced my ability to warn family members of an actual threat based on images of both imagery types.

Wei, Summer "Morphological Systematics Of *Leuctra Duplicata* (claassen) Species Group" (Scott Grubbs)

The Northern Hemisphere stonefly genus *Leuctra* (Plecoptera: Leuctridae) is represented in North America by ca. 30 species. Harper & Harper (1997) assigned most of the North American species into five groups based on external morphology of the adult male, emphasizing characteristics of the paraprocts instead of the 7th and 8th abdominal terga. They speculated that *L. duplicata* and *L. maria* are related as one species group, but they did not study adult males carefully at that time. The purpose of this research was to study these two species across their ranges and evaluate their placement into one species group. Adult specimens were obtained from four U.S. institutions. Adults were studied using scanning electron and standard light microscopy. Adult males and females of *L. duplicata* and *L. maria* share several similar features that easily support the morphological concept of these two taxa as one species group. *Leuctra duplicata* and *L. maria* can be easily differentiated in both male and female stages. *Leuctra duplicata* is a broadly distributed Appalachian species whereas *L. maria* is known mainly from northeastern North America. Overall, these two species form a species group unique from all other North American *Leuctra*.

Weyman, Kaitlyn "An Analysis Of Age And Language Interaction: Bilingualism Does Not Effect Normal Age-related Cognitive Decline" (Matthew Shake)

The question of whether bilingualism can improve cognitive function is a controversial topic, with evidence on both sides. One hypothesis is that bilingualism provides a limited buffer against some age-related cognitive decline. This study aimed to test that hypothesis by analyzing the combinatorial effects of age and language upon fluid cognitive performance. Executive function in the form of inhibition, updating, and switching were measured using stop-signal, letter-memory, and color-shape tasks, respectively. Amazon Mechanical Turk was used to reach monolingual and bilingual younger (YA, N=81) and older adults (OA, N=84) from 24 countries. An ANOVA was used to analyze each dataset. The stop-signal task found that YA had shorter reaction times than OA, $F(1,151)=14.51, p<.001$. The letter-memory task showed a main effect of age in which YA recalled more letters than OA, $F(1,158)=7.65, p<.01$. Finally, the color-shape task revealed that a shorter cued stimulus interval led to a greater switch cost, $F(1,151)=83.87, p<.01$. No effects of language were significant. YA and OA performed as expected regarding normal cognitive aging; however, there was no interaction based on language proficiency. Therefore, this study provides support to the claim that bilingualism does not improve executive function, nor does it affect the cognitive decline that comes with age.

Whitaker, James; Hahn, Lance; "Selecting Synonyms Computationally" (Lance Hahn)

Computer-generated synonyms can be useful in a number of ways. For instance an author may want to consider synonyms when writing a message. We developed an algorithm to generate synonyms using an n-dimensional vector space representing 400,000 words. Pennington, Socher and Manning (2014) created such vector spaces with 50, 100, 200 and 300 dimensions. Each word is associated with an n-dimensional vector with similar words being near one another. Our

algorithm selects a synonym for a word targeted within a sentence given an n-dimensional vector space. Synonyms are selected by minimizing the Euclidian distance between the target word and potential synonyms. The algorithm generates a list of 5 synonyms for each target word. While synonym selection with this algorithm can produce appropriate synonyms, the algorithm naturally suffers from the absence of any context. Without context, many of the synonyms make no logical or grammatical sense. The synonyms selected are compared with those produced by Carrico and Hahn's (2017) algorithm that selected replacement words based on the words adjacent to the target word, and word co-occurrence frequencies. Future plans to use non-Euclidean metrics, to integrate context into the existing algorithm, and to apply these approaches to obfuscate messages will be discussed.

White, Nicole "Spaces For Healthy Living" (Shahnaz Aly)

The goal for this architectural capstone project was to create an upscale fitness club that meets the needs of living a convenient and healthy lifestyle for Nashville residents. Through research, I found that the opportunities and atmosphere given in a fitness facility are crucial for customer satisfaction and encouragement for a healthy lifestyle. The design of the project caters to its surrounding area by being as convenient as possible in many aspects. Located downtown, right off the interstate, the facility is in close proximity to many new, high-end business' and high rise condos. The facility includes a restaurant located on the main level and open to the public, a state of the art work-out facility, wellness spa, and a rooftop pool. Being in the city, a key component of the design was to bring the outdoors in. This facility provides a unique and positive environment for residents in the Nashville area to have the opportunity to live a healthy life.

Wilkerson, Phillip; Champey, Patrick; Winebarger, Amy; Kobayashi, Ken; Savage, Sabrina; "Marshall Grazing Incidence X-ray Spectrometer (magixs) Slit-jaw Imaging System" (Gordon Emslie)

The Marshall Grazing Incidence X-ray Spectrometer is a NASA sounding rocket payload providing a 0.6 – 2.5 nm spectrum with unprecedented spatial and spectral resolution. The instrument features a Wolter-1 grazing incidence telescope, an identical pair of stigmatic optics, a planar diffraction grating and a low-noise detector. When MaGIXS flies in 2019, a slit-jaw camera system will reimage the focal plane of the telescope providing a reference for pointing the telescope and aligning the data to supporting observations from other missions. The telescope focuses the X-ray and EUV image of the sun onto a phosphor-coated plate, which then fluoresces in visible light. This REU project optimized an off-axis mounted camera with 600-line resolution NTSC video for extremely low light imaging of the slit plate. Calculations indicate an intensity of less than 1 lux, which set the requirement for camera sensitivity; we selected a camera with 0.0001 lux sensitivity at F1.2. A high magnification and low distortion lens images the slit jaw plane at 10 cm. With the selected CCD camera, tests show that at extreme low-light levels, we achieve a higher resolution than expected, with only a moderate drop in frame rate. The launch vehicle attitude control system stabilizes the instrument such that jitter does not degrade video quality for context imaging.

Willenbrink, Elizabeth; North, Leslie; Vu Thi Minh, Nguyet; Graham, James; "Policy Communication and the Impact of Agriculture on Karst Landscapes: An Example from Phong Nha-Ke Bang National Park, Vietnam" (Leslie North)

Karst landscapes are vulnerable to degradation caused by agricultural development. Soil erosion

and water contamination on karst landscapes increases when agricultural intensification, irrigation, or fertilizer application occurs. To mitigate these negative consequences, policy to regulate human activities is needed. This study occurred in Phong Nha-Kẻ Bàng National Park, Vietnam, a UNESCO World Heritage site dominated by karst landscapes, agriculture, and minimal karst policy. Interviews, observation, and GPS analysis were used to analyze the effectiveness of policy communication and karst protection. It was found that karst protection policy in the region is minimally communicated and often delivered in the wrong way to the wrong individuals. Despite the known harm agriculture causes, degrading behaviors occur frequently and are supported by government officials. The concentration of information on policy and karst landscapes exists among park officials, but is rarely presented in an informal setting to farmers, who are in most frequently in contact with the karst landscape. Broad conclusions on karst protection policy in agricultural regions can be drawn. Communication of karst science and implementation of protection policies must be presented both formally to governing officials and passed down through informal networks to general citizens. Through these means, karst protection can be successfully implemented.

Williams, Abigail; Kambesis, Patricia; Wulff, Andrew; "Investigation of Cave Valley Cave, NV" (Andrew Wulff)

The purpose of this study is to investigate the relationship between Cave Valley Cave (CVC) in Nevada and a nearby spring through the analysis and interpretation of water, rock, and sediment samples. Geological and structural features within a cave provide opportunities to learn more about the formation of the cave. Testing rock, sediment, and water samples from within the cave will uncover information about geologic relationships between the cave and surrounding features. Rock and sediment samples were gathered from various points within CVC. Thin sections and smear mounts were analyzed using polarized and reflected light microscopy, x-ray diffraction, and scanning electron microscopy to obtain the composition and provenance for the sediments. Additional data, including temperature, specific conductance, and pH will be collected to calculate the saturation index of the active cave spring. Further research will include collecting water samples, which will be tested for anions and cations by ion chromatography and mass spectrometry. By combining the results of these analyses, not only will the hydrogeology of the eastern Great Basin of Nevada be better understood, but insights regarding water resource management will become clear.

Wine, Matthew "Hurricane Matthew" (Joshua Durkee)

The quick intensification of Hurricane Matthew, the unfavorable conditions under which it developed, and the destruction it caused throughout the Caribbean as well as along the Eastern seaboard of the United States came together to make Hurricane Matthew a historic storm. While the movement and development of most storm systems are monitored by weather balloons and NWS stations across the country, forecasters monitoring the movement of a hurricane and the conditions in which it is developing rely heavily on satellite and radar imagery. Satellite imagery must be used to show the majority of Hurricane Matthew's development, while radar imagery from the Florida Keys up to the Carolinas can combine with satellite imagery to show the final stages of the storm's destructive path and its eventual demise. One notable aspect of Hurricane Matthew discussed in this paper is its rapid intensification from Tropical Storm force winds to Category 5 strength in 36 hours while under unfavorable conditions for hurricane development. Analysis of radar and satellite imagery combine to show the strength of Hurricane Matthew, how

it was ushered in a northerly fashion through the Carribean by other large-scale weather patterns, and how it overcame the precarious environment in which it intensified.

Woodrow, Kaitlin "The Classroom Connection Of Sight Words And American Sign Language" (Susan Keeseey)

In the educational field, approaches concerning differentiation and universal design for learning (UDL) for students with disabilities have often been found to benefit children who are learning English as a second language. American Sign Language (ASL), the precious language of deaf individuals across the United States for over two hundred years, has quickly become a method of communication for the population of students with disabilities. Since ASL has been found as a strategy to spur students with disabilities on towards academic success, it makes one question whether or not it would be just as valuable for students in an English as a Second Language (ESL) program. This project has explored if incorporating ASL into a curriculum can promote the learning of English for students trying to acquire it as a second language. Research findings from using the language to assist students in ESL programs are shared along with a methods explanation for classroom implementation.

Yoho, Kristin; Tinius, Rachel; Pitts, Bailey; Blankenship, Maire; Furgal, Karen; Tadakaluru, Apoorva; Maples, Jill; "Changes in resting metabolic rate and respiratory quotient from pregnancy to postpartum" (Rachel Tinius)

Background: During pregnancy, a woman's metabolic profile changes drastically; however, the metabolic changes from pregnancy to postpartum are poorly understood. Many women struggle with postpartum weight retention and weight gain. The physiological mechanisms that could be contributing to this warrant investigation. Purpose: To determine if resting metabolic rate (RMR) and respiratory quotient (RQ) are different from pregnancy to postpartum. Methods: 14 women (pre-pregnancy BMI: 23.6 ± 3.1 kg/m², age: 31.8 ± 4.7 years) participated in this study. Their RMR was measured during the third trimester of their pregnancy and again at 6 months postpartum. Results: RMR was significantly higher during pregnancy when compared to postpartum (1770.4 ± 258.8 kcal vs. 1500.1 ± 258.8 kcal, $p=0.002$). However, when RMR was expressed as kcalories per kilogram body weight, there was no difference between the groups (22.5 ± 2.9 vs. 22.5 ± 3.3 kcal/kg, $p=0.96$). RQ was similar during pregnancy and postpartum (0.83 ± 0.02 vs. 0.82 ± 0.01 , $p=0.80$). Discussion: Absolute RMR was higher among pregnant women, and this appears to be due to the higher total body weight during pregnancy and not physiological differences. However, these findings suggest that if a woman delivers a baby and does not reduce total caloric intake by ~200kcal, it may be difficult to lose weight postpartum.

Zhu, Brian "Parallelization of a Monte Carlo Tree Search algorithm for the game "Dots and Boxes"" (Uta Ziegler)

Monte-Carlo Tree Search (MCTS) is a well-established approach to solve difficult learning problems. Parallelizing Monte Carlo Tree Search means dividing the required computation across multiple compute nodes to decrease the overall time required for the system to learn. The system must share information between compute nodes in order to effectively form gameplay. Previous research has shown that slow-tree-parallelization of MCTS is a promising approach to synchronize the information MCTS learns when running in parallel. This project intends to apply a parallelized MCTS to the game Dots and Boxes. An existing MCTS program was modified using openMPI with synchronization at the root level only. Preliminary data collection for the

timing of the parallelized MCTS was compared to that of the unmodified MCTS. The collected data showed that overall time was reduced, but the times of the different nodes varied more than expected. One of the reasons: too little data is synchronized between nodes. As the next step, an algorithm was developed to synchronize levels further than the root level with directed acyclic graphs. This presentation reports preliminary results with respect to the time overhead of the parallelization and explains a method of parallelization that increases the amount of information synchronized.

Zieba, Daniela "Analysis of Single Core vs. Parallel Software Algorithms on Multi-core RISC Processors" (Michael Galloway)

The early development of RISC architectures paved the way for a variety of architectural and software advancements with the basic but important goal of increasing software and hardware efficiencies. This project aims to identify differences in the efficiency of workloads distributed across multi-core RISC processors in comparison to workloads executed on single RISC cores. As intuition may dictate, multiple cores lead towards greater workload executions; however, this paper aims to quantify by exploring the various distribution and parallelization algorithms developed for such purposes. Other goals are to benchmark algorithms within the same language as well as the implementation of parallel and concurrent algorithms across different programming languages. Measures of efficiency are the time needed for workload execution and CPU usage. This work is conducted on a reduced instruction set computer (RISC) processor environment, and briefly explores the RISC processor environment effect, if any, on algorithmic approaches to optimizing computing resources. The RISC architecture environment is a Raspberry Pi 3, a commonly-used computer for its low cost and high functionality. RISC architectures are especially relevant because of the recently discovered security drawbacks of CISC processors, and may see more use as CISC architecture advantages are nullified in favor of security.

Ziege, Nicole "Upton Sinclair's *The Jungle* And The Channeling Of Dissent From Workers To Consumers" (Anthony Harkins)

Upton Sinclair's novel *The Jungle* has been recognized as one of the most influential novels on immigrant life in American history as well as one of the most popular novels of the early 1900s. This paper explores public reactions to the novel at the time it was published and the ways Upton Sinclair's intention in writing the novel to expose and dissent against the corrupt state of capitalism in America during the late 1800s was transformed. As a socialist himself, Sinclair intended to appeal to workers and create a radical shift toward socialism in the United States. This paper argues that the anticipated shift did not take place, however, because the nation focused instead on the consumer implications of Sinclair's novel, particularly Sinclair's exposure of unsanitary practices and conditions in "Packingtown" in Chicago and the meat packing industry. The focus on consumer implications in Sinclair's novel demonstrates how dissent is often channeled through more comfortable spaces, such as pushing for meat and food reform that benefit middle class consumers, in order to avoid considering more radical spaces, such as socialist reform to benefit workers.