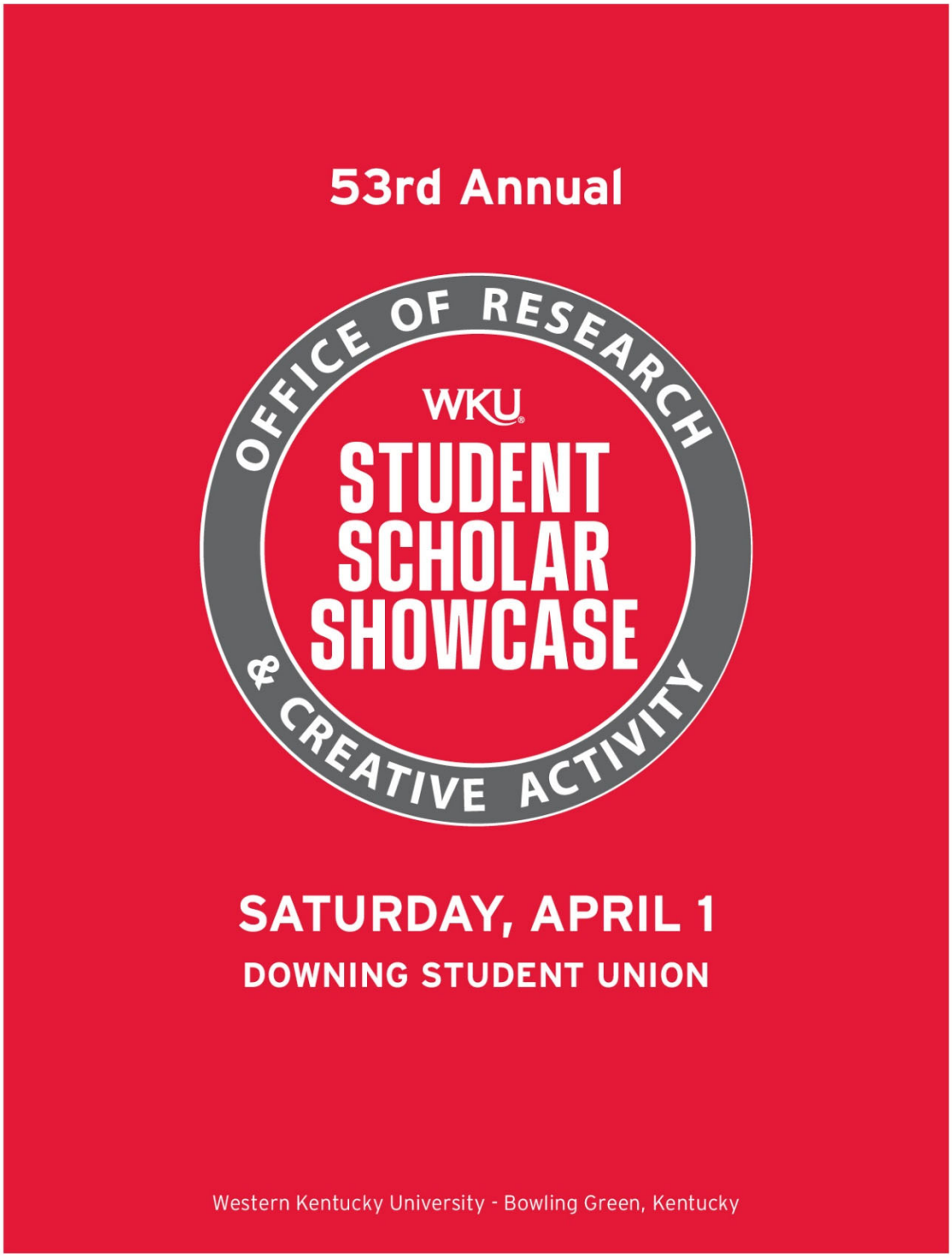
53rd Annual
OFFICE OF RESEARCH & CREATIVE ACTIVITY
WKU
STUDENT SCHOLAR SHOWCASE
SATURDAY, APRIL 1
DOWNING STUDENT UNION
Western Kentucky University - Bowling Green, Kentucky

Adeyemi, Kayode; Neupane, Shreya; "Legionella Pneumophila Effector MavA Functions as a Ras-guanine Exchange Factor" (Simran Banga)

Legionella pneumophila, the causative agent of Legionnaires' disease, interferes with numerous cellular activities in the host during the infection through an armory of its effector proteins. However, the majority of these effector proteins, including the MavA protein (more regions allowing vacuole protein family), are hypothetical in their annotations. In this study, we sought to define the structural and functional characteristics of MavA protein to understand its role in host-bacterial interactions during Legionella infection by applying transcriptomics gene profiling and a series of web-based analytical methods. We utilized Alfa-Fold2, COFACTOR, I-TASSER, SWISS-MODEL, Phyre2, and HDOCK servers for bioinformatics prediction analysis. The transcriptomic analysis of MavA expressing HEK 293T cells showed that MavA significantly induced the expression of Arrestin-containing domain protein (ARRDC3) and affected G-protein coupled receptor signaling pathways while repressing Sortilin protein in comparison to cells expressing GFP tag. Furthermore, bioinformatics analysis predicted that MavA protein possesses coil-coil & Ras-GEF domains and potentially binds to GTP. Based on our data and the literature indicating the involvement of Ras-GEF and arrestin-containing domains in bacterial internalization, we predict that the MavA protein is involved in internalization of L. pneumophila and creating Legionella-containing vacuole in host cells through endosomal remodeling and cytoskeletal reorganization.

Ahmed, S. M. Istiak; "Quantifying Estrone and β-estradiol Conjugates in Dairy Cattle Urine Using Sorptive Stir Bar Extraction and Gas Chromatography-Mass Spectrometry" (Eric Conte)

The environmental presence of compounds with estrogenic properties has become a worldwide concern. Endocrine-disrupting compounds (EDCs) are environmental contaminants that interfere with the function of the endocrine system of wildlife and humans. A significant source of these naturally occurring estrogens, such as estrone and β-estradiol that enter the environment originate from dairy wastes. These lipophilic compounds may accumulate within the fat tissues of livestock and thus may enter the human food chain. Sulfated estrone and β-estradiol, also measured in the environment, contain a greater degree of saturation than their non-conjugated counterparts. The implications are important from an environmental health perspective because these more saturated forms, also having estrogenic activity, persist in the environment longer than their non-conjugated forms. This persistence results in a greater degree of estrogenic activity in the environment and more significant potential for human endocrine disruption than non-conjugated and less saturated estrogens. A chromatographic method for the determination of estrone and β-estradiol and their conjugated forms will be presented. In the gas chromatographic portion, all respective sulfated conjugates are converted to estrone or β-estradiol using acid hydrolysis. This method will be applied to quantify estrogen conjugates, contained in dairy cattle waste and surrounding dairy farm samples.

Akridge, Grasen; "A Critical Review of Mixed Reality in Building Information Modeling for Early Stage Design" (Fatemeh Orooji)

Technology's adopted design has evolved over time, from hand drawings to 2D CAD software. Later, to 3D software, virtual reality (VR) modeling, and Building Information Modeling. BIM is used for creating and managing data during the design, construction, and executive processes. The next step is to implement the benefits of BIM into a mixed reality (MR) space where the user can see details of structures and design features in one physical space. Unlike VR, MR is a view of the physical world, with an overlay of digital elements to interact with user occupied physical environments. It offers a revolution in the virtual representation of objects and space through context awareness beyond 3D, offering more effective design visualization. MR can be useful to construction and design of retrofitting existing structures. This technology can benefit early design coordination for better communication between designer, builder, and client. This can reduce reworks, budgeting, and material usage. This paper investigates the application of an MR based workflow in a BIM enabled project. The goal is to eventually implement this technology into use. To discover a methodology for the application of MR in design coordination and investigate the impact of MR in BIM workflow. The role of MR will be analyzed in education. Architecture and systems will be able to unite.

Allamyradov, Yaran; Hakimov, Somon; ben Yosef, Justice; Kitchens, Chazz; Majidov, Inomjon; Khuzhakulov, Zikrulloh; "Enhanced Antibacterial Activity of Pulsed Laser-synthesized Silver and Gold Nanoparticles Combined with Methylene Blue" (Ali Oguz Er)

The photosensitizing agents are crucial against multidrug-resistant bacteria and treat tumors. In this study, silver nanoparticles (Ag NPs) and gold nanoparticles were synthesized by pulsed laser ablation in different mediums. Later, methylene blue (MB) was attached to nanoparticles to improve their antimicrobial efficiency. Silver and gold nanoparticles with different sizes were obtained and their characterization were performed using transmission electron microscopy (TEM), UV-vis, and photoluminescence (PL) spectra. The cytotoxicity measurement were also performed using different cell lines. The average size distribution of Ag NPs in citrate, PVP, and PVA at 1064 nm was discovered to be 6 nm, 10 nm, and 12 nm, respectively. Escherichia coli (E. coli), and Staphylococcus aureus (S. aureus) were both deactivated using these Ag NPs in combination with MB. In comparison to MB and Ag NPs used alone, it was discovered that MB and Ag NPs together had stronger antibacterial activity and were hence more successful at killing both Gram-positive and Gram-negative bacteria due to higher singlet oxygen generation. The MB/Ag NPs deactivated the entire 10 CFU/mL concentrated S. aureus and E. coli bacteria within 6 minutes of the 660 nm LED irradiation period. The use of MB/Ag NPs in PDT may be useful in treating cancer in vivo, infections of prosthetic joints, open wounds with bacterial pathogens, and tumors.

Alvarez, Isaiah; Reilly, Jonathan; Hunt, Alli; Harper, Doug; "Investigating T1 and T2 Relaxation Times in NMR: A Comparison of De-ionized and Doped Water" (Ivan Novikov)

Nuclear Magnetic Resonance (NMR) detects the magnet moment of nuclei as they precess around

an applied magnetic field. These nuclei's produce a signal at resonance that directly relates to the applied magnetic field. The setup used is a TeachSpin EF-NMR experimental setup which consist of a controller, field/gradient coils, Helmholtz-coils, and a polarizer. The Earth's magnetic field provides an applied magnetic field for the sample; however, since the apparatus is indoors, other electronics distort the field, so the gradient and Helmholtz coils are used to provide a cleaner output of data. By using a dip needle, the polarizer was aligned perpendicular to the local magnetic field to assure an higher output in the signal. The time constants T1 and T2 which relate to magnetization and de-magnetization times respectively, were found experimentally for de-ionized water and doped water and the results were compared.

Alvey, Ryan; "Newtonian vs Non-Newtonian Flow Comparison" (Manohar Chidurala)

In this study, we sought to find how various types of fluid flow interact through ducts and pipes. The data was collected using ANSYS Workbench, which is a tool that allows for accurate and detailed models of engineering principles through simulation trials. The main difference between Newtonian and Non-Newtonian fluids are in the way in which they follow Newton's law of Viscosity, which states a fluid's shear stress is proportional to its velocity gradient and the dynamic viscosity of that fluid. The goal of this study is to see accurate models of the difference between fluid flowing that both follows and does not follow Newton's Law of Viscosity. This data is used to understand applications of heating, ventilation, and air conditioning (HVAC) through ducts and pipes. Equipped with the results of this study, the efficiencies and effectiveness of fluid flow through ventilation ducts can be better understood, assisting with HVAC future innovation.

Anekere, Nishu; Cossel, Elijah; Chhabra, Ansh; "Development of Low-cost Systems for the Drone Delivery of Medical Supplies" (Farhad Ashrafzadeh)

Drone delivery services have gained traction as large retailers, including Amazon and Walmart, have begun adopting these services for last-mile delivery. Unfortunately, these services aren't accessible to customers in under-developed areas due to lack of infrastructure and affordability issues. Drone delivery services can cost millions of dollars to implement. The drones used by these services can cost over five thousand dollars, and more affordable drones sacrifice payload and range. This project is intended to develop systems that could be implemented with existing drone platforms to increase the accessibility of medical supplies in underdeveloped areas while avoiding the additional costs of developing purpose-built delivery drones. These systems consisted of a delivery app for the Android OS platform, a depth camera for the identification of QR codes on drone landing mats, an underbelly package mount system for ensuring package safety during deliveries, and a versatile propeller design that could be adapted to different lift requirements. The app was developed in Java and includes an intuitive user interface to allow customers to easily order deliveries. The depth camera utilized the DepthAI API to accomplish QR code identification. The package mount and propellers were 3D designed in Autodesk Fusion 360 and were 3D printed.

Anglea, Edward; "Faros Library Vault and Learning Center" (Shahnaz Aly)

I have designed a mixed use building that contains a repository of information and a learning center. Facilities that store items in case of catastrophe already exist; the seed vault on Svalbard Island and the Smithsonian warehouse are two such facilities. But there has yet to be a building that is designed purely to house our information, arguably the most valuable thing we have in this Information Age. The goals for this project were to create a monumental entry, a subterranean storage vault, and a publicly accessible learning center to share both the vault's mission, and threats to our world that make such a vault necessary. In this design, I used the form of the building and its ornamentation to create a sense of monumental, futuristic space to convey that we as humans should be looking toward the future.

Arnold, Savanna; "Molecular Evolution of the Cancer-related Gene FGFR2" (Chandrakanth Emani)

The present study deciphers the molecular biological evolution of the CDKN2A protein. CDKN2A was shown to correlate with early onset and tumor progression during cancer. CDKN2A is unregulated in several cancers, such as carcinoma and skin cancer, such as melanoma. The protein's primary functions are to encode proteins that regulate the p53 and RB1 cell cycle pathways, which function as tumor suppressors. In this study we analyze FASTA sequences of CDKN2A from a diverse array of life forms using computational tools. Analysis was performed using bioinformatics software databases NCBI and EXPASY. Conserved domains and evolutionary ancestors were identified through PSI-BLAST and neighbor-joining phylogenetic trees. The initial BLAST analysis has identified a hypothetical evolutionary ancestor, the western European hedgehog.

Arnold, Savanna; "The Discovery of Gwendoluna, a Viral Predator of Mycobacterium Smegmatis" (Rodney King)

The purpose of this project was to isolate and analyze a bacteriophage capable of infecting Mycobacterium smegmatis, a common soil microbe related to important human pathogens. A soil sample was collected from WKU's campus and used to enrich for mycobacteriophages. Spot plates were created to quickly test whether any viable bacteriophages were present within the samples. After the presence of bacteriophage was verified, a homogenous population, as determined by uniform plaque morphology, was generated through several rounds of plaque purification. A high concentration of phage particles was prepared and analyzed using the electron microscope. These results showed that Gwendoluna is a member of the Siphoviridae family of phages. Gwendoluna's genomic DNA was purified and the concentration was measured using a spectrometer. Restriction enzyme digests were performed using the purified DNA and the products were analyzed by agarose gel electrophoresis. The genomic DNA was only cut by a subset of the enzymes that were tested. Our results suggest that Gwendoluna is a novel mycobacteriophage. The information gained from this study has expanded our understanding of bacteriophage distribution and diversity.

Avendano-Martinez, Ana; Buoncristian, Nick; Malone, Grant; Schafer, Mark; "Rock Out Workout: Cardiodrumming's Impact on Function with Down Syndrome" (Whitley Stone)

BACKGROUND: People with Down syndrome (DS) are at risk for obesity and function declines. Cardiodrumming is a cardiovascular-based exercise modality that is relevant to all populations. METHODS: Participants with DS (n = 10) were assessed for function using the modified Berg balance test (mBERG), Established Populations for Epidemiological Studies (EPESE), Timed Up and Go (TUG) at the beginning and end of an eight-week intervention. Cardiodrumming consisted of participants selecting 'drum sticks' (pool noodles) and station (fixed yoga ball), following exercise leaders through moderate intensity exercise (as measured by heart rate). Sessions consisted of a five-minute warm up, two fifteen-minute active periods and ten minutes to cool down. Pre- and post-data were analyzed using ANOVAs for each functional test. RESULTS: There were no improvements in TUG performance ($F(1,9)=4.39$, $p=0.66$, $np2 = .328$), mBERG ($F(1,9)= 0.498$, $p = .498$, $np2 = .052$ or EPESE performance ($F(1,9)=1.210$, $p =0.30$, $np2 = .119$). CONCLUSIONS: There appears to be no measurable benefit from Cardiodrumming in people with DS in regard to function. This finding may have been influenced by participants engaging at a self-selected intensity. Overall, participants with DS enjoyed Cardiodrumming, but more incentive to push themselves would be needed to elicit functional adaptations.

Baggett, Elena; "The Molecular Evolution of Cancer-Related Gene FGFR3" (Chandrakanth Emani)

The Molecular Evolution of Cancer-Related Gene FGFR3 Elena Baggett, Chandrakanth Emani Department of Biology, Western Kentucky University, KY Abstract. This study decrypts the molecular evolution of the fibroblast growth factor receptor 3 protein, encoded in humans by the FGFR3 gene. The main involvements of this protein are in cell division, cell maturation, wound healing, bone growth and development, maintenance, and overall cell survival. Mutations in this gene can prompt craniosynostosis and multiple types of skeletal dysplasia, as well as bladder cancer. In this study, FASTA sequences of FGFR3 were analyzed for a variety of lifeforms, and national bioinformatics software databases such as NCBI were utilized. Conserved domains and related ancestors were established using PSI-BLAST and neighbor-joining phylogenetic trees. Keywords: Cancer, FGFR3

Barker, Ashley; Himes, Danielle; "Using Explicit Instruction to Teach Coding and Robotics to Young Children with Disabilities" (John Wright)

This Single case research study was a milti probe across three skills replicated across multiple students. The aim of the study was to exhibit that using explicit instruction would be effective in teaching young children with disabilities the three essential skills needed to code an OZOBOT. Using the, "I do, we do, you do," model of explicit instruction, we were able to demonstrate that students with disabilities were able to successfully master the three skills (calibrate, tracks, and code) required to code the OZOBOTS. Currently, the research in utilizing STEM instruction to engage young students with and without disabilities is lacking, so the implication of this research

is to promote further research in the areas of robotics & coding as a tool for teaching young children with and without disabilities.

Beauchamp, Isaiah; "New Analysis of Cold Clouds in Perseus Spiral Arm" (Steven Gibson)

Stars form from the gravitational collapse of cold interstellar clouds within galaxies, but the origins of such clouds remain unclear. We are investigating cold clouds in a section of the Perseus spiral arm where they may be evolving. We compare cold atomic gas appearing as 21cm line HI self-absorption (HISA), molecular gas traced by 3mm line carbon monoxide (CO) emission, and infrared thermal radiation from interstellar dust. We measure the intensity of the dust in each cloud vs. frequency and fit it with a modified blackbody function to find the dust optical depth and temperature. These not only tell us about the dust in the cloud but can be used with HISA and CO measurements to determine properties of the gas, including the total column density and fraction of gas that has become molecular. We compare our results to those of Sato (1990) and Hasegawa et al. (1983) to test and refine our analysis. Our aim is to compare the gas and dust properties implied by different studies to assess how their analytic assumptions affect our knowledge of these clouds' evolutionary states and their prospects for future star formation. This work was generously supported by the NASA-Kentucky Space Grant Consortium.

Beavin, Bridget; "America, The Beautiful: How Cosmetics Companies in the 1950s Created and Challenged Idealized Views of Femininity in the U.S." (Tamara Van Dyken)

This paper explores how cosmetics companies reflected and directed ideas about American women, femininity, beauty, consumerism, and race in the 1950s. Using a variety of primary sources including magazines advertisements, business newspapers, cosmetics packaging, employee manuals, and secondary literature, this paper analyzes the tone and content of messaging published by cosmetics companies and how this messaging affected public perceptions of cosmetics. Analysis shows companies marketed cosmetics as the key to achieving proper femininity, yet the public was critical of women for using cosmetics or participating in sales. While cosmetics offered spaces for both Black and white women to build community and develop economic independence, dominant gender roles restricted women to conduct business primarily in ways that aligned with their feminine nature. Additionally, all women suffered under the weight of American beauty standards portrayed by cosmetics advertisements. This paper provides necessary commentary on the historically neglected complexities of the lives of women in the 1950s, while illustrating the impact that intersections between gender, race, and business have on American society. Furthermore, this paper explains how everyday products were products of American nationalism and are important to study.

Begley, Mary; Simmons, Maci; Johnson, Caleb; Gaskins, Griffin; Forbes, Austin; Almilad, Murtadha; Alenezi, Yousef; Aldousari, Fahad; Rizzo, Ron; "Development of Robot to Participate in IEEE SoutheastCon 2023 Hardware Competition" (Mark Cambron)

Today, robotics curriculum has been incorporated into many institutions to advance the skillset of

students in STEM. For senior design at Western Kentucky University, students are participating at the IEEE SoutheastCon 2023 hardware competition. SoutheastCon provides students the opportunity to further their real-world engineering skills while working in a multidisciplinary team of electrical and mechanical engineers. The team was challenged with designing a fully autonomous robot to perform a series of tasks, while simultaneously traversing a walled course. The device must complete tasks including dispensing chips, collecting items, differentiating objects, placing items in specific areas of the course, and flipping a light switch. In addition to completing these tasks, the robot shall be less than one cubic foot in size and finish its run within three minutes. The team learned the importance of implementing systems engineering principles to obtain goals, especially with such a multifaceted project. In addition, this project allowed students to develop skills needed in professional engineering such as, teamwork, communication, time management, and budgeting.

Bell, Leah; Hartmann, Carelynn; "Analyzing the Impact of Real-time Weather Variables on Crash Severity Along Kentucky's Interstates: Case Studies of I-65, I-75, and I-64" (Kirolos Haleem)

This study investigates the impact of real-time weather-related factors on crash severity along Kentucky's Interstate-64 (I-64), Interstate-65 (I-65), and Interstate-75 (I-75). Recent five years and four months of crashes (January 1st, 2016 through April 30th, 2021) along the three interstates were collected. Crashes were merged with real-time weather variables at the time of crash from the Kentucky Mesonet stations. Five weather-related variables were considered; air temperature (0F), relative humidity (%), precipitation (inches), solar radiation (watts/m2), and wind speed (miles per hour). The three interstates were further categorized into different climate zones based on the geographic location in the state. A severity index (ratio of percent severe crashes to percent exposure "or number of days for a specific weather variable threshold") was proposed and used. The severity index analyses showed that crash severity increased with increase in temperature, relative humidity, and solar radiation along the three interstates. All three interstates experienced a reduction in crash severity as precipitation levels increased. Finally, the impact of wind speed on crash severity differed significantly for each of the interstates (since the topography varies greatly in Kentucky). The study can pinpoint specific weather-related states that could deteriorate highway safety along Kentucky's interstate highways.

ben Yosef, Justice; Khuzhakulov, Zikrulloh; Hakimov, Somon; Banga, Simran; "Photodeactivation of Pathogens Using Methylene Blue with Nanoparticles for Prosthetic Joint Infection" (Ali Oguz Er)

Photosensitizing agents play an essential role in the deactivation process of multidrug resistant pathogens and tumor treatments. In this work, methylene blue (MB) functionalized silver and gold nanoparticles (Ag/Au NPs) are used as a photodynamic therapy (PDT) agent for the treatment of prosthetic joint infections (PJI). Ag and Au NPs were synthesized via a pulsed laser ablation technique in aqueous solutions. At the 1064nm wavelength, the average size of Ag NPs in citrate, polyvinylpyrrolidone (PVP), and polyvinyl alcohol (PVA) were 6, 10, and 12nm in diameter respectively. Au NPs in citrate and PVP were both between 4 and 5 nm in diameter. The Ag and

Au NPs were characterized using transmission electron microscopy, UV–vis, and photoluminescence spectra. NPs in combination with MB were used to deactivate the gram-negative bacteria Escherichia coli and the gram-positive bacteria Staphylococcus aureus. The functionalized NPs were found to possess higher antimicrobial activity and were more effective in killing gram-negative and gram–positive bacteria in comparison to MB or NPs alone. The MB/NP combination used in PDT could be effective in killing bacterial pathogens in PJIs as well as an in vivo treatment method for cancer tumors.

Bennett, Katelyn; "The Spirits We Share: Ghost Story-telling Traditions Amongst Kentucky Women" (Kate Horigan)

The study of ghost and similar supernatural encounter stories has long been a staple of folklore research. Scholars such as Ellis, Goldstein, and Hufford have contributed their analysis and fieldwork to this study of belief expressed through folk narrative. However, what has not been as closely observed is the relationship between ghost story-telling and gender. To fill this gap, my research will focus on the ways in which women express belief in the supernatural through the sharing of ghost stories. This research will focus on Kentucky women in particular, and I will look at how my informants utilize these stories, whether it be for social connection, education, or other reasons. The paper will be based upon interviews I have conducted in which women tell ghost stories. I will ask my informants about the situations in which they share these stories, their belief in the supernatural, and their view on the stories themselves. Relevant folklore scholarship such as those from the previously listed authors will also be used to contextualize the analysis I provide. Therefore, I will frame my interviews with a feminist lens in order to show the unique perspectives women express through the sharing of ghost stories.

Bernal, Ciara; "Girls to the Front: Rituals and Liminal Spaces at Punk Shows" (Ann Ferrell)

In my ethnographic research on the local punk scene in Kentucky, I have found reoccurring themes in interviews with men who refer to mosh pits as therapeutic and transformative events. In participant observation I have seen multiple mosh pits at shows in Bowling Green and Lexington and have witnessed how participants leave the mosh pit seemingly energized and bonded with each other, even with bloody noses and chipped teeth. While this suggests questions about how primarily young white men are using sanctioned violence, I would like to shift my gaze to what women are doing at these shows. Kathleen Hannah of Bikini Kill famously called for “girls to the front” to reclaim space for women at punk shows. It’s common to see a small number of women joining the mosh pit, other times some women will take the space to dance with friends when the mosh pit temporarily subsides. In this project I will be looking at how female presenting people are taking back space and understanding their place at punk and hardcore shows.

Boils, David; **Emslie, Gordon; "Temporal Synchronization of Solar Data to Aid in Solar Flare Prediction." (Paolo Massa)**

Solar flares are massive explosions of mass and energy from the Sun; they present hazards to space

operations, the internet, GPS, and could even lead to power blackouts. Accurate prediction of such events is essential to protecting against them. Using sequences of 4096 x 4096 pixel images taken by the Atmospheric Imaging Assembly (AIA) on the NASA Solar Dynamics Observatory (SDO), our group is creating a solar flare forecasting technique based on machine learning algorithms. However, the images obtained by AIA are in seven different Extreme Ultraviolet (EUV) wavelengths, and each image is taken at a different phase in a 12-second cycle. To avoid temporal distortions that may alias the data used by the machine learning algorithms, the data must be temporally synchronized. To accomplish this, we have used a Lagrange Polynomial Interpolation method to combine short sequences of images to produce synthetic images that correspond to the same times in every observed wavelength. We present the results of such a temporal synchronization technique, and we discuss how synchronized data are more suitable for training machine learning algorithms to accurately identify features that are precursors of flaring activity.

Bonifer, Kaylie; "An Analysis of the Continental-scale Atmospheric Forcing and Upper Air Conditions That Led to the July 19 2018 Southwestern Missouri Derecho Event" (Joshua Durkee)

Derecho events are long-lived high wind events that must have at least 58 mph wind gusts along most of the storm's length, and a swath of wind damage that extends at least 240 miles. Previous research has concluded that derecho events, which are considered a regional-sized meteorological event, are also driven by continental-scale atmospheric conditions. The purpose of this study is to determine influences from continental-scale atmospheric forcing mechanisms that contributed to this derecho event. This was accomplished by analyzing a suite of atmospheric circulation features from the Earth's surface to 12 kilometers. Results from the study show that continental-scale forcings played an influential role during the event. These processes include a narrow band of strong upper-atmospheric winds as well as the mass movement of heat in the atmosphere. Overall, this study shows that local scale severe weather was ultimately driven by continental-scale circulation features.

Boswell, Johnnie; Turner, Joel; Kash, Jeffrey; "Who Believes in 2020 Election Conspiracies? Do They Correlate with Support for Election Reforms?" (Scott Lasley)

Using 2021 survey data collected from voters in Georgia and Kentucky, we analyze the factors that predict levels of support for election conspiracies surrounding the 2020 presidential election. Specifically, we explore how political and demographic variables influence the belief in eight myths related to the election. We also examine how support for conspiracy theories correlate with support for a number of proposed electoral reforms. The use of data from Georgia and Kentucky offers an interesting contrast. While Georgia was a battleground state for the both the presidential race and control of the U.S. Senate, Donald Trump easily carried Kentucky and Mitch McConnell coasted to a re-election victory.

Bowen, John; "The Development Process and Procedures for the WKU Hazard Mitigation Plan" (Joshua Durkee)

Hazard mitigation in an integral part of the emergency management cycle for every community. It is impossible to prevent natural disasters; however, it is possible to mitigate risks using a hazard mitigation plan. Western Kentucky University has not had a proper hazard mitigation plan up until now. The goal of a hazard mitigation plan is to identify the hazards a community is most vulnerable to though the process of performing a risk assessment, and then outline ways to mitigate those risks. When a mitigation plan works it allows for easier response during the incident, and faster recovery once the incident is resolved. This study focuses on the process WKU took to develop a hazard mitigation plan. The plan focuses on natural hazard mitigation, and it follows FEMA guidance for an optimal mitigation strategy while considering the risks that WKU is most vulnerable to. This study will show how the results of the risk assessment shaped the plan to best fit the campus community's needs. A draft has been completed for this plan, and by the end of the semester WKU will have a comprehensive hazard mitigation plan to act on to ensure minimal damage to life and property.

Bowman, Thorin; "Subjective Risk Beliefs about Side-Effects of the COVID-19 Vaccine" (Jacob Byl)

The COVID-19 pandemic accented the importance of understanding how people think about risky situations like potential pathogen exposure, uncertain health outcomes, and particularly the side effects of medical interventions such as vaccines. This research focuses on how people process information about the risk of side effects from COVID-19 vaccines. People underestimate the likelihood of common side effects from the COVID-19 vaccine, but drastically overestimate the likelihood of serious side effects. Those who most drastically overestimate the risk of serious side effects are Republicans, the young, and those with kids while people who have lower risk beliefs are elderly and white individuals, those with bachelor's degrees, and those who are taking prescription drugs. Helping close gaps between subjective risk beliefs and the objective measures of serious side effects from vaccines can help with uptake of important public health tools.

Brock, Sarah; "The Impact of Beliefs about Emotions on Emotion Regulation and Psychological Health" (Qin Zhao)

This project aims to examine the effects of two most commonly held beliefs about emotions (controllability vs. control value) on emotion regulation and psychological health. Controllability refers to whether emotions can be controlled, whereas control values refer to whether emotions should be controlled. Different types of beliefs about emotions can greatly impact the emotion regulation strategies that individuals implement (Ford & Gross, 2019; Veilleux et al., 2021). Moreover, while some people may believe that emotions should be controlled but are uncontrollable, others may believe that emotions are controllable but should not be controlled. Data collection is expected to conclude in mid March. The hypothesised results are: (a) beliefs about the controllability of emotions would correlate with the use of cognitive reappraisal and acceptance strategies, as well as with lower anxiety and depression; (b) emotion control values

would be associated with more suppression (inhibition of emotion) and lower acceptance of emotion, as well as with higher anxiety and depression; and (c) the two types of beliefs may interact to influence the outcomes, such that the hypothesized effects stated in (a) and (b) may only be observed when individuals believe that emotions are controllable; when individuals believe that emotions are uncontrollable, the effects of emotion control value may become insignificant or reduced.

Brown, Joshua; "A Remote Sensing and Vertical Profile Investigation of the February 3-4, 2022 Ice Storm over Southwest Ohio" (Josh Durkee)

Nearly 70% of deaths from ice storms happen in automobile accidents, while 25% happen from other causes. Studies have established that large-scale atmospheric circulation features must happen before localized sensible weather events can occur. The purpose of the study is to examine wind fields from the surface up to nearly 40,000 feet that contributed to ice accumulations that occurred on February 3-4, 2022. In this study warm air near 5,400 feet above the surface moved into the Wilmington, OH area as well as wave formations conducive for vertical ascent at around 16,000 to 20,000 feet. Results also show cooler profiles from the surface to 16,000 to 20,000 feet and positive differential vorticity from about 9,000 feet created an environment that had little to no air moving vertically around 9,000 feet. Together, this study shows that the diagnostic wind fields were not present during the event, however, the prognostic atmospheric variable played a key role.

Brunot, Kara; "Climate Change Vulnerability Assessment of a Regional Karst Landscape for Hazard Mitigation Planning" (Jason Polk)

Climate change is global phenomena affecting all sectors of society by creating conditions more conducive for the occurrence of extreme events, which are projected to increase in intensity and frequency. Flooding, in particular, is projected to be exacerbated. Karst landscapes are especially vulnerable to climate change impacts, because of their unique hydrology and geology that can create intense flooding from prolonged or intense rain events, which climate change will likely make more feasible. Areas are often disproportionately affected by climate change due to population demographics and environmental conditions. This study uses a modified climate vulnerability assessment and GIS (Geographic Information Systems) to quantify and identify vulnerable areas in the BRADD (Barren River Area Development District) of Kentucky. Each county will be scored using indicators evaluating social, economic, and environmental factors. The scores will be analyzed using GIS by producing spatial distribution maps and compared with demographic and physical landscape attributes to identify patterns of intersection. The resulting maps and scores will help inform the BRADD of the most vulnerable areas, including those that lack data for future planning, and indicators that can inform future mitigation.

Cabrera, Anthony; "Do Teachers Think Math is More Difficult for ELL Students?" (Nicholas Fortune)

Research has shown that students are successfully able to learn mathematics in a bilingual,

multilingual, or second language setting and in the right conditions are able to outperform learners more oriented to a single language (Barwell, 2005). According to Gutiérrez (2002), it is important for teachers to understand students' mathematical needs and linguistic backgrounds. In this study, we conducted a qualitative case study (Creswell, 2013) with three middle grades mathematics teachers about the ways they justify their perception of the difficulty of mathematics tasks specifically for ESL and ELL middle grades students. To analyze the data, we did open and thematic coding (Miles et al., 2014) to categorize the themes of responses from our participants. Results indicate that teachers believe that language acquisition and exposure affect their students' ability to correctly complete more difficult math tasks. Further, results indicate that there are many important factors that influence students' ability to learn outside of their mastery of the language such as teachers' and schools' lack of resources for ELL students as well as the availability of paraprofessionals.

Cambron, Morgan; Mansour, Omar; "Assessing The distribution of Internal Tensile and Compression Forces in Different Truss Bridge Designs Using Engineering Statics Program" (Kirolos Haleem)

In the early 19th century, the world of engineering introduced the truss bridge. It then became very popular as it can be made of non-metallic and easily-accessible materials (such as wood), compared to other bridge types. By the end of the 19th century, most bridges in the United States were truss bridges. With recent advances in the science of engineering, building truss bridges have become less popular, but their engineering aspects are still present in modern bridge design. In the 19th century, two different truss bridges (mainly used for railroad traffic) were introduced worldwide, the Howe and Warren truss bridges. The Howe and Warren truss bridges look similar, but each one deals with external loads differently. The Howe bridge functions by pushing pressure outward and distributing the load to the internal truss members, starting from the center of the truss. On the other hand, the Warren bridge distributes the loads equally to the internal truss members using a series of equilateral triangles. This study uses an Engineering Statics program, named "Actus Potentia", to assess and compare the distribution of internal tensile and compression forces in each of the Howe and Warren steel truss bridges under the same external loading scenarios.

Campbell, Cassandra; "Analysis on Atmospheric Contributions to the 2022 May 14th, Laverne Oklahoma Severe Weather Outbreak" (Joshua Durkee)

Research has shown severe weather events can develop with contributions from continental or regional scale atmospheric circulation features. The purpose of this study is to identify which atmospheric circulation, either synoptic scale (continental) or mesoscale (regional-to-local), dominated during the sequence of this severe weather outbreak. This study uses data collected from the National Centers for Environmental Information and the Storm Prediction Center Mesoscale Analysis Archive. Results from this study show that the synoptic scale circulation was not a driving factor during this event. While this event happened on a regional scale, the greater majority of the processes driving the severe weather were confined to a localized part of the

atmosphere. Overall, this study shows the balance of instability and changing winds with height were key factors in the outcomes on this day.

Cannon, Parker; "Mommy & Me: Paid Parental Leave and Mother-child Quality Time" (Lauren McClain)

The U.S. is the only industrialized country without federally mandated paid maternity leave, leaving only 16% of women with access to paid leave through their workplace. This lack of paid leave can hinder healthy parent-child relationships by reducing bonding time between mothers and newborns, often resulting from a premature return to work. Our study will investigate whether women who have access to and use paid parental leave spend more time with their babies than those who take other types of leave or no leave. We will also explore whether paid leave reduces maternal stress in parenting. Our research aims to support the argument for a national 12-week paid maternity leave policy for all women in the U.S. workforce. Such a policy can improve the parent-child relationship and alleviate the negative impact of inadequate parental leave policies. It can also provide economic security for families and promote gender equality in the workforce. We will use data from the Parental Leave Survey to investigate whether women who have access to and use paid parental leave spend more time with their babies than those who take other types of leave or no leave. Overall, our study's findings could help inform policies that better support the well-being of mothers and their children.

Chessor, A.; "Far-left and Far-right Political Parties in The United Kingdom: A Comparative Analysis" (Kevin Modlin)

Today in the United Kingdom, political parties are mostly center-left and center-right. However, it was not always like this, and the remnants of radicalism of the 20th century still lives on today in some parties, although most do not hold any seats in parliament. To really understand how these parties are still active, we must delve into the history of both the far-left and the far-right in Britain, from the British Union of Fascists to the British National Party, and from the Communist Party of Great Britain to the modern and similarly named Communist Party of Britain. Between the times of these parties, many parties were founded and dissolved with similar ideologies. However, even before the days of political parties, the foundations for the rhetoric for these parties was present in Britain's history, and after fair knowledge of this history, we can compare how far-right, and far-left rhetoric has changed from the 20th century to present day. We will also be able to see how the popular parties of today such as the Conservative Party, the Labour Party came to take most of the seats in Parliament.

Choudhury, M. Tazwar Hossain; "Gendered Eating: Bengali Folk Foodways in Atlanta, Georgia." (Ann K. Ferrell)

Foodways are one of the most integral parts of any culture. It is one of the most tangible and expressive elements of culture that can reflect people's attitudes and give knowledge about how people make their life around food. Bangladeshi Foodways is an example of how people can

concurrently express their traditions and construct gender identities around food. ‘Achar’ and ‘kacchi Biriyani’ are Bangladeshi traditional and historical foods that contain a gendered discourse with them to the Bengali culture. In this paper, I’ll explore some narratives on how some food can create masculine or feminine ideas or identities among Bengali Communities based on the interviews I have taken for my research project in Atlanta, Georgia. This research will be able to illustrate how some foods have the capability to complicate gender roles, behaviors and create categorical boundaries for people to react accordingly. It will be an important data source for social researchers of comparative studies, folklorists, anthropologists, and sociologists currently working with foodways, gender, or both.

Clifton, Tyler; King, Rodney; "Discovery and Analysis of Mycobacteriophage Tclif" (Rodney King)

Bacteriophages are viruses that infect bacterial cells and are the most abundant biological entities on earth. Programs such as SEA-PHAGES (Science Education Alliance-Phage Hunters Advancing Genomics and Evolutionary Science) are working to learn more about their therapeutic potential by isolating and characterizing novel bacteriophages. The newly discovered phage, Tclif, infects the host Mycobacteriumsmegmatis, a common soil microbe. Tclif was isolated from a soil sample at the base of a tree on Western Kentucky University’s campus. Tclif was purified and it’s plaque morphology was compared to an online database. The phage particles were examined under an electron microscope to determine their physical properties. This analysis revealed that Tclif is a member of the Siphoviridae family of phages. Tclif genomic DNA was isolated and analyzed by a restriction enzyme digest and gel electrophoresis. The DNA was only cut by a subset of enzymes that were tested. Based on our analysis, we suggest that Tclif is a novel bacteriophage. To determine how Tclif is related to other similarly characterized phages, it will be necessary to determine the sequence of its genome. Our results have added new information to the growing database of characterized bacteriophages.

Cloherty, Grace; Taylor, Elizabeth; "Literacy-focused Cognitive Activities Predict Health-related Quality of Life in Older Adulthood" (Matthew Shake)

Purpose: Factors that may limit negative health outcomes hold great value in geriatric cognitive research. We investigated the relationship between cognitively stimulating activity engagement over the lifespan (Lifetime Cognitive Activities Questionnaire; Wilson et al., 2003) and health-related quality of life (HRQOL; CDC’s Healthy Days Core Module) in older age. Procedure: Measures were administered to participants (219 total, mean age 73, 88% female) through an NIH-funded clinical trial of Bingocize, a health promotion program geared toward older adults. Results: People who engaged in fewer literacy focused activities were less likely to be health independent in older age. Specifically, people who needed help with personal care needs had significantly less lifespan engagement in reading books, $t(7.53) = 2.03$, $p = 0.04$, magazines, $t(8.48) = 2.07$, $p = 0.03$, and newspapers, $t(8.57) = 2.52$, $p = 0.02$. Yet, non-literacy focused cognitive activities (playing games or doing puzzles) did not differ as a function of needing help with personal care, $t(7.31) = -0.48$, $p = 0.68$. Conclusion: Results indicate literary activity engagement throughout life is related

to increased personal care independence in older age. However, our findings challenge the popular belief that playing games or doing puzzles improves health in older adults.

Coburn, Mason; "Fluid Structure Interaction Analysis of a Cantilever Beam" (Manohar Chidurala)

In the relevant study, research was conducted to discover the fluid-structure interactions that occur with a cantilever beam. This study was conducted using ANSYS Workbench, a program that allows us to simulate the interactions between fluids and structures in specific models. A cantilever beam is a rigid structure that is fixed at one end and free at the other end. The free end of the cantilever beam is subject to deflection due to the flow and pressures applied by surrounding fluids, which is what can be analyzed in this study. The goal of this study is to discover how the cantilever beam is effected by the fluid in different scenarios by analyzing stress and deformation through ANSYS Workbench. Cantilever beams are often used in or near water and/or fluid systems and this study will allow us to analyze how they are effected in order to improve future designs for certain use cases.

Cole, Lynnsey; Tran, My; Grimmett, Tashaunda; Mienaltowski, Andrew; "Pain Perception: A Distinct Emotional Category" (Andrew Mienaltowski)

When observing dynamic facial expressions, people track the motion of facial features to apply a category label to accurately identify what emotion is being expressed. Previously, researchers have examined the perception of basic emotions (i.e., anger, happiness, fear, sadness, disgust, and surprise). The purpose of our study is to investigate how individuals assess dynamic facial expressions, specifically pained expressions. Upon viewing a set of dynamic emotional expressions, participants were asked to provide an intensity rating (i.e., 1 not at all to 6 extremely intense) for each emotion category. Next, participants observed the same stimuli and selected one of the seven emotion categories that best described the expression portrayed. Overall, participants gave pain expressions the highest average intensity rating compared to other emotions and there was a similar effect for disgust. Our ability to perceive pain is reliant on facial movements and cues that can be found in other emotions we regularly observe. This study extends previous research on emotion perception to include pain. It may further provide insight into what emotions pain is commonly mistaken for as well as what facial expressions exclusively portray pain.

Cox, Cori; "Attitudes and Beliefs Towards Death Amongst Gravers" (Kate Horigan)

Most people avoid thinking about death as much as they can. Others fixate on the thought of their own end. However, some choose to spend their free time with the dead through volunteering to help maintain cemeteries. In this paper, I will explore death anxieties and beliefs of individuals who regularly volunteer in cemeteries in Kentucky and Southern Indiana. While research with cemetery volunteers has been conducted in the past, typically it does not incorporate folkloristic views on belief or interview practices. My research methods will include a series of interviews, a brief questionnaire, and participant observation with fellow gravers. I will consider research

questions such as: Do gravers experience anxiety about death? Do they connect graving to a belief system? How do gravers communicate with others about death? What drives them to continue their work? The public has shown a readiness to discuss this extremely personal and difficult subject in the open through growing death positivity and green burial movements. Now is an important time to conduct field research on those who volunteer to maintain the space of the deceased.

Cundiff, Keegan; Revell, Kaitlyn; "Head Start Family Engagement in Informal Science: Link to School Readiness and Science Process Skills" (Erin Jant)

Informal learning settings, such as museums, can play a critical role in supporting early STEM for underrepresented families with young children (Haden, 2010; Pattison & Dierking 2019). Successful community partnerships between informal learning settings and programs like Head Start are one way to encourage inclusivity and accessibility for families from diverse backgrounds and socio-economic status. For many preschool aged children STEM learning most often happens in informal settings (Eberbach & Crowley, 2017; Jant et al., 2014). In this study, Head Start families visited a science center for monthly Family Engagement Nights. Events were held after regular hours and provided families with a meal and the opportunity to engage in any exhibit as well as the four specially designed hands-on activities related to current classroom curriculum. Pilot work with 149 children has demonstrated there was a significant increase from pre- (before family night programing began) to post-test (after program implementation) in school readiness and STEM skills that were explicitly targeted by activities during Head Start Family Engagement Nights, $Fs > 94.90$, $ps < .001$, η^2 s $> .39$. The data analyses to be presented will evaluate the correlation between Family Night activities, follow-up classroom tasks, and children's school readiness scores.

Daniels, Brycen; "Combining Ground-based Observations with Observations from the Transiting Exoplanet Survey Satellite to Understanding the Blazar Phenomena: The Case of 1ES 1959+650" (Michael Carini)

The blazar class of radio-loud Active Galactic Nuclei are those oriented such that we are looking nearly down the throat of the relativistic jet, resulting in the observed emission being dominated by processes at work in the jet and being both amplified and time-compressed in our frame. Blazars represent the most extreme examples of the AGN phenomenon. The defining characteristics of blazars are a featureless or nearly featureless optical continuum, large amplitude and highly variable polarization, and large amplitude continuum variability at all wavelengths and on timescales ranging from minutes to decades. The lack of discrete features in their spectra leaves us with only continuum variability and/or polarization variability as a diagnostic of the emission mechanisms at work in many of these objects. In this presentation, I will discuss the results of the analysis of ground-based and Transiting Exoplanet Survey Satellite (TESS) observations of the blazar: 1ES 1959+650. I will compare the ground-based observations of the objects obtained by WKU's Robotically Controlled Telescope (RCT) with light curves extracted from TESS observations of the sources. I will discuss how the ground-based observations are key to properly extracting light curves from the TESS observations.

Daugherty, Shane; "Health Within Architecture" (Shahnaz Aly)

The Fitness Center and Sports Complex I am going to be designing is going to be a place for people of all ages to be able to visit and spend countless hours. It is going to be a 24/7 facility to give people with all schedules the ability to access it when feasible for them. Within the fitness area of the building, weights, machines, a pool, and much more is included. Within the Sports Complex area there is going to be Basketball Courts, Tennis Courts, Batting Cages, and even a Track and Field. I feel that creating a safe space for people who want to venture into these activities but don't know how, will now be able to. Physical activity in general has been shown to lead to improvements of various health aspects and promoting this would be good for the community. Studies have shown that around 40% of people in the U.S. never exercise, of the ones who do, around 80% don't get enough! This is a massive percentage of the population not meeting their fitness needs and creating an inviting complex for people of that stature to come to will help lower this percentage.

Davidson, Samuel; "A Large- and Local-scale Analysis of Atmospheric Contributions Towards the August 2022 Flooding in Dallas, Texas" (Joshua Durkee)

Flooding impacts people all around the world and can easily affect the daily lives of those that experience flooding. The effects of flooding are magnified when a large city like Dallas experiences flooding. The purpose of this paper is to analyze the large- and local-scale atmospheric contributions towards the flooding event on August 21st and 22nd of 2022 in Dallas, Texas. Data used in this paper include North American Mesoscale Model data from the National Centers for Environmental Information and utilized Integrated Data Viewer in order to visualize the data. From the analysis, the flooding event had few large-scale driven atmospheric characteristics and was more influenced from local-scale driven characteristics. This study shows why both a large- and local-scale analysis is needed when reviewing a past storm since sometimes one type of analysis is more applicable than the other.

Davis, Emily; Campbell, Warren; "Analysis of the Fairness of Stormwater Fee Systems" (Warren Campbell)

Different stormwater fee systems have been established by municipalities across the United States to fund stormwater management utilities. Stormwater fee systems that significantly overcharge some customers and undercharge other customers may be challenged in court and required to return collected fees, so it is important to consider how customers are charged to minimize legal exposure and encourage fair fee systems. This research aims to analyze how different fee systems based on parcel impervious area (IA) disproportionately charge customers. Parcel data was collected from Bowling Green GIS (Geographic Information Systems), and zoning laws from the cities of the fee systems evaluated were considered to calculate impervious areas. The fairness of fee systems across the United States including Equivalent Residential Unit (ERU), flat rate, and tier was quantitatively assessed and compared to the fairness of the ERU system in Arvada, CO- the gold standard for fairness for IA stormwater fee systems. Flat rate systems are most likely to be disproportionately charging customers, while tier systems are more likely to be charging

customers fairly. This research equips municipalities with the necessary knowledge to implement equitable stormwater fee systems.

Davis, Aaron; "Thereafter" (Sara Thomason)

I am presenting “Thereafter,” a film I made in the fall of 2022, with money granted to me by FUSE. This film focuses on a teacher at a Deaf school, and we were given FUSE money to meet our various needs, such as hiring Deaf talent, hiring interpreters, and feeding our crew. I am hoping to show how this film would not have been possible without the support of FUSE and encourage other students to work with them in the future.

Desai, Rasesh; Kumar, Nikhil; "Development of a Compact Broadband Leak Detector for Autonomous Vehicles Transporting Hazardous Material" (Vladimir Dobrokhotov)

There are obvious advantages to using autonomous delivery vehicles (AVs) for transportation of hazardous material, as no individual would be in the immediate vicinity of the hazard in case of accidental release. One of the significant obstacles on the path to hazardous goods transport via AVs is the lack of leak detection. The detectors work in varied environmental conditions, sense multiple or specified materials, and communicate remotely with first responders and/or shippers to allow mitigation of the problem. Applied Physics Institute (API) of Western Kentucky University developed a compact broadband leak detector for autonomous vehicles. The efficient monitoring of hazardous leaks was achieved thanks to utilizing a hybrid approach of combining real-time integrated detector and compact gas chromatograph that complement and verify each other. The outcome is the ability to monitor a broad range of chemicals from light gases (hydrogen sulfide, ethylene) to heavy aromatic hydrocarbons (ethyl benzene, xylene). The range of concentrations detectable by API leak detector is also extremely wide: from below parts per billion (sub-ppb) to percentages. In our design, special attention was given to robustness and user friendliness of the device, so that a person with minimal technical skills could operate it with ease.

Diaz Buezo, Andrea; Portmann, Abigail; Weaver, Macey; Ashley, Noah; "Comparison of Sleep Patterns of Two Arctic-breeding Bird Species Exposed to Different Predation Risks" (Noah Ashley)

Many bird species migrate northward during the breeding season to regions above the Arctic circle where they are exposed to continuous daylight. As the light/dark cycle synchronizes most circadian rhythms, its absence during polar summers can pose a challenge to these organisms. Lapland longspurs (Calcarius lapponicus) are arctic-breeding songbirds that maintain a diel activity rhythm characterized by a brief 4-hr period of inactivity that starts around 12 am. Longspurs nest on the tundra and are susceptible to predation, which might prompt a need for increased vigilance and fragmented sleep. Another songbird species that breeds on arctic grounds during summer is the snow bunting (Plectrophenax nivalis), but unlike longspurs, snow buntings nest in cavities that provide protection against predation, which might influence their sleeping patterns. This study used behavioral phenotyping of these two species to assess sleeping patterns during “night” hours

(12:00 am-5:00 am). A behavioral ethogram was developed to assess sleeping behavior, and birds were videotaped in outdoor aviaries in Utqiagvik, Alaska (71ºN). Behaviors measured were % of time active, % time sleeping, feeding, drinking, and number and length of sleep bouts. The results of this study will examine differences that might exist between these two arctic-breeding bird species, as well as continue to elucidate when these birds are sleeping.

Dick, Olivia; Brown, Jamison; McGettrick, Caitlin; Woodward, Matthew; "Instabad? Examination of Popular Social Media Platforms and their Associations with Mental Health Problems in Young Adults" (Matthew Woodward)

Social media use has been consistently correlated with negative mental health symptoms, such as loneliness, depression, and anxiety. However, research has yet to compare the relationship between specific types of social media platforms used and their associations with mental wellbeing. This study investigated associations between the amount of time spent on several popular social media platforms and their associations with a variety of mental health outcomes. Participants included 549 young adults attending a midwestern university. Individuals completed an online survey assessing self-reported time spent on prominent social media apps (e.g., TikTok, Twitter, Instagram, Snapchat), as well as mental health-related outcomes including PTSD, depression, anxiety, loneliness, social support, and self-esteem. Time spent on various social media platforms was entered into multiple regression models examining mental health outcomes. Results indicated that TikTok use exerted several negative effects, as it was positively associated with loneliness, depression, anxiety, and PTSD. Snapchat use appeared to promote better mental health, as it was positively associated with social support and higher self-esteem while negatively associated with anxiety. Results suggest that social media platforms may exert positive or negative effects on mental health depending upon the way they are structured, with those encouraging social interaction being potentially beneficial.

Disinger, Jacob; "A Look into the Meteorological Properties Behind the February 28th to March 1st Severe Weather Outbreak" (Joshua Durkee)

Strong to severe thunderstorms, for many Americans, are in incredibly common and normal occurrences throughout their lives. In 2022 alone, there were over 20,000 reports of tornadoes, severe hail and wind across the nation. Although severe weather as a whole is very common, it takes a very specific and delicate combination of various meteorological properties that exist on both large and small scales. Largely, people contribute these storms to a springtime and summer issue, not something to worry about in Winter. This study was made to find what and how those meteorological properties interacted with one another to create this event in question during the cold season. The results from the concluded study found that diverging winds aloft at 6km up created lift to support the formation of thunderstorms. Other findings from the study revealed that sufficient surface heating and moisture transport allowed for atmospheric destabilization contributing to the strengthening of developing thunderstorms. Overall, this study revealed how the necessary ingredients and atmospheric combinations needed for severe weather conditions can occur, even when in the cold season.

Downing, Jacob; "The Oasis Hotel and Resort" (Shahnaz Aly)

Miami Florida is known for its luxurious and expensive night life, which would be the perfect place to incorporate my design: a hotel/resort style tower. People would come from all over the world to experience the resort as well as its main attraction, the natural biome setting, which incorporates the surrounding area of the beach along with some city life elements to catch the eye of the tourists. It is the centerpiece of the hotel and gives people a reason to want to stay there and get to take in the beauty of the structure. There have not been many projects that have incorporated a design element such as this and I believe that it would be a place people by the thousands would come to behold. The structure I have designed will be based on the aspects of comfort and luxury, I want the guests within the building to be entranced with the views and experience, while being captivated with the interior landscape. The idea of comfort has also been a key point of my design, as I want the people staying there to have it feel like a destination and not just a stop on their trip, it must really capture their attention and make them want to return.

Drybrough, Katelin; "Complementary Handbooks for Undergraduate Accompanists and Students Who Work with Them" (Zachary Lopes)

While some music undergraduates enter college with collaborative experience, many have not had the opportunity to accompany or work with an accompanist. Whether experienced or not, undergraduate accompanists and music students often begin professional level accompaniment work or utilize the services of an accompanist upon entering college, which can leave less experienced students inadequately prepared. Many universities provide undergraduate music majors with a handbook containing guidelines and common questions and solutions for collaborative experiences. After examining other universities' handbooks and discussing common collaborative issues with WKU's accompanists and musicians, I created two complementary handbooks for the WKU Department of Music: "Guidelines for Working with a Student Accompanist" and "Guidelines for the Student Accompanist". Towards the end of the semester when collaborative relationships are more common due to juries (final exams), these handbooks will be implemented into several music studios at WKU to test their impact and integrity, noting any need for further revisions. After revisions are made, I intend to pursue the implementation of these handbooks into all music studios at WKU to facilitate a better working relationship between music students and accompanists in the future.

Dudgeon, Katie; Maksuta, Kyle; O'Shaughnessy, Parker; "A Spatial Analysis of Social Disorganization and Violent Crime in Louisville Neighborhoods" (Kyle Maksuta)

Despite not regularly making news headlines for violent crime, Louisville Metro Police Department reported 5,707 violent crime offenses within the city in 2020, which also marks the highest level of violent crime in the city's history for which data is available. Past research has demonstrated that violent crime is often concentrated in the most disadvantaged and socially disorganized neighborhoods. Largely untested within the literature is the role neighborhoods have on one another, known as spatial spillover, concerning violent crime and social disorganization. Recent advances in spatial econometrics by criminologists have begun identifying the importance

of accounting for spatial processes to avoid biased estimates. To address this concern, my research will employ the spatial Durbin model to test the spatial applicability of social disorganization theory to violent crime within Louisville neighborhoods. The study utilizes census tract-level violent and property crime data from the Louisville Metro Police Department for the years 2020-2022 and demographic data from the US Census for the year 2020. We expect the social disorganization of neighboring communities to be positively and significantly associated with violent crime within a focal community. Results from initial exploratory analyses will be presented via poster.

Durkee, Sierra; "Evaluating the Effects of Ionic Liquids on Bacteriophage Size" (John Andersland)

Bacteriophage are viruses that infect bacteria. They are so small they must be viewed using a transmission electron microscope (TEM). Unfortunately, the easiest viewing methods require the bacteriophage to be dry, but the drying process often causes the particles to shrink unevenly. We hypothesized that by replacing the water in phage particles with salts, the shrinkage may be reduced or eliminated. Specifically, I tested this hypothesis by using ionic liquids (IL, salts "molten" at room temperature) to prepare samples of an elongated bacteriophage called "MooMoo" for the TEM. MooMoo was soaked in the IL, washed with phage buffer and water, then dried. I then used a technique called shadowing to determine the height, length, and width of the MooMoo phage particles. I compared the IL treatment with several other treatments to judge their effects on shrinkage. Although IL treatment prevented the flattening of the phage, I observed it decreases the width and increases the length of the particles as compared to the other methods tested. Our results suggest that IL's may not be useful for preventing uneven drying/shrinkage of virus particles viewed with the TEM.

Eberhardt, Taylor; Funge, Simon; "Integrating Anti-racism into Social Work Education: Perceptions and Insights from BSW Program Director" (Simon Funge)

CSWE's 2022 Educational Policy and Accreditation Standards (EPAS) introduced a more explicit emphasis on education for anti-racist social work practice. A national survey of BSW program directors in the US explores their perceptions and insights in response to this mandate. The impact of the political context on program efforts as well as institutional climate and leadership, faculty preparation and commitment, and student responses are explored. Respondents' preparation and commitment to lead their programs to meet this mandate is also investigated. Insights regarding the variables impacting anti-racist education in social work as well as future related research will be presented.

Engelhardt, Grace; "Sears and its Target Demographic Across a Century" (Kristi Branham)

Sears Roebuck & Co., Sears for short, started in 1886 when Richard Sears started to sell watches from a rail shipment. In 1887 Sears moved to Chicago and hired Alvah Roebuck, a watchmaker. In 1888, Sears began using printed mailing to advertise products, which would later evolve into

the Sears Catalog, these catalogs would be used to advertises across the world and carry a variety of products. In this presentation, I intend to show how Sears uses advertising and pricing to target a demographic of middle age, middle class, predominantly male and how Sears shifts this demographic to a more feminine one starting in the 1920s. I will breakdown an set of ten, from the span of 1900 to 2012. advertisements from various times intend to relate to middle class, and how Sears shifted their target group over time by analyzing the deliberate word choice. As well as the way economic forces at work, such as Sears setting prices lower in a way to entice a middle class to buy shop with Sears. My research employs interdisciplinary methodology to prove Sears targeted middle-class, middle-aged men and shifted to a more feminine, family-focused audience.

Esmaeilzadeh, Nima; Gani, Nahid; Yan, Jun; "Lithologic Mapping of the Mountain Pass Mining District, California Using Sentinel-2 Satellite Data" (Nahid Gani)

This study intends to identify and map several rock types in Mountain Pass, California, using Sentinel-2 satellite data. The objective is to show how Sentinel-2 data can be used effectively for lithologic mapping and how it can be applied for future research. This investigation was carried out using processed and analyzed Sentinel-2 satellite data of the Mountain Pass Mining District region. The images were downloaded from the Sentinel Data Hub of the European Space Agency and processed in ENVI software to produce false-color composite pictures. These images were then examined to distinguish and map various rock types based on their distinctive spectral fingerprints. The method included the following steps: data collection, pre-processing, processing, analysis, and interpretation of the findings. The accuracy of the lithologic mapping was evaluated by interpreting the findings and comparing them to pre-existing geological maps of the region. This study assessed the potential for lithologic mapping in places with mineral reserves and complicated geology using Sentinel-2 satellite data. Geologists and exploration managers of mineral resources can significantly benefit from satellite data, and the procedure developed in this study can be adopted as a template for research of a similar nature in other high-potential areas.

Esserman, Brinkley; "An Environment That Heals You" (Shahnaz Aly)

When considering design, it is not only important to focus on the impact of man on the structure, but also the impact of the structure on the man. Society often strays from focusing on how habitable places contribute to mental health and well-being, but rather how we can place those within a structure that does not degrade. By creating spaces that are designed to invoke satisfaction in wonder and belief that we are all a part of something much greater and help guide man to a greater self-purpose. I am designing an inpatient rehabilitation facility to specifically target those struggling with drug and alcohol dependance. Although there are many different treatment options out there, many result in the program completion with immediate relapse. I want to create a place where people can not only come to heal, but the environment heals them. A place where not only you can heal but have a purpose.

Ferguson, Robert; "How Large and Regional Scaled Variables Shaped the March 5th, 2022 Southcentral Iowa Tornadoes" (Joshua Durkee)

Severe weather season in the United States can be placed between the months of March through June, which can be attributed to the volatility of the atmosphere during this time. Research shows that there are fundamental theories that apply to large scale atmospheric circulations that can be viewed as significant preconditions to regional severe weather events. The purpose of this case study is to analyze these large-scale atmospheric conditions and how they interacted with other atmospheric variables on a more regional scale to explain the severity of the March 5-7th, 2022 southcentral Iowa tornado outbreak. This outbreak was responsible for 7 fatalities, a dozen injuries, and over $1 billion in damages. Results from this case study indicate that all terms in both the Omega and Height Tendency Equations played a non-zero role in the development of the mid-latitude cyclone which caused the outbreak. The study also indicated that more localized atmospheric variables assisted in priming the volatility of the atmosphere for these larger scale lifting mechanisms. Overall, this case study depicts how large scale and regional atmospheric variables work together to create an atmosphere that in unstable enough to develop severe weather like the March 5-7th southcentral Iowa tornadoes.

Fields, Cam; Nguyen, Van Thuan; Ashley, Noah; "Inflammation from Acute Sleep Fragmentation Begins in Peripheral Tissues Instead of Brain" (Noah Ashley)

Obstructive sleep apnea is increasing worldwide, leading to disordered sleep patterns and inflammatory responses in brain and peripheral tissues that predispose individuals to chronic disease. Pro-inflammatory cytokines activate the inflammatory response and are normally regulated by glucocorticoids secreted from adrenal glands. However, the temporal dynamics of inflammatory responses and hypothalamic-pituitary-adrenal (HPA) axis activation in relation to acute sleep fragmentation (ASF) are undescribed. Male C57BL/6J mice were exposed to ASF or control conditions (no ASF) over specified intervals (1, 2, 6, and 24 h) and cytokine gene expression (IL-1beta, TNF-alpha) in brain and peripheral tissues as well as serum glucocorticoid were assessed. The HPA axis was rapidly activated, leading to elevated serum corticosterone from 1-24 h of ASF compared with controls. The tissue to first exhibit increased pro-inflammatory gene expression from ASF was heart (1 h of ASF). In contrast, pro-inflammatory gene expression was suppressed in hypothalamus after 1 h of ASF, but elevated after 6 h. Because the HPA axis was activated throughout ASF, this suggests that brain, but not peripheral, pro-inflammatory responses were rapidly inhibited by glucocorticoid immunosuppression.

Forbes, Meghan; Polk, Jason; "Sinkhole Hazard Assessment Index and Risk Analysis to Inform Karst Policy and Mitigation Planning" (Jason Polk)

Sinkholes are geologic hazards that occur in karst landscapes and can be highly destructive and costly. Sinkhole-related costs each year are unknown and sinkhole-related policies lack detail and coverage at the federal and state levels. Development and urbanization of sinkhole-risk areas continue to put lives and property at risk. This study aims to create a method to quantify sinkhole potential cost and risk. A comparison of existing sinkhole policies and regulations will occur to

assess their effectiveness using a developed scoring criterion. Additionally, a survey of past catastrophic sinkholes and their impacts will be conducted. Then, a sinkhole hazard risk assessment index will be developed based on the literature and previous indices that can quantify the risk associated with sinkholes to influence better development practices and policy implementation. Application of the index in sinkhole-prone Kentucky and Texas will allow a spatial comparison of the two areas and validation of the tool. Upon completion, a sinkhole hazard index tool will be created that can be used by developers, environmental managers, and policymakers to inform urban karst development decisions based on environmental, economic, and social factors.

Forseth, Lillian; "Covid-19 in Older Adults: Analyzing the Impact of a Bingocize Covid-19 Workshop on Behavioral Health Outcomes" (Jason Crandall)

Older adults are at an increased risk from COVID-19 and are generally advised to engage in protective behaviors that mitigate this risk. However, more than half of KY respondents 65 and older consider the pandemic to be over as it pertains to their personal lives, suggesting a need for interventions addressing misconceptions and appraisals of personal risk. A six-week COVID-19 workshop was embedded into Bingocize®, an evidence-based health promotion program, utilizing targeted messaging, and grounded in the Health Belief Model, to increase likelihood of engaging in COVID protective behaviors, including vaccine/booster uptake, nutrition, physical activity, among other behaviors. The results of the pilot test are presented and recommendations are proposed for the future.

Francis, Allison; "Impacts of Land Use and Groundwater Inputs on Biological Stream Health and Habitat of Jennings Creek, Bowling Greek, Kentucky" (Jason Polk)

In Bowling Green, Kentucky, the Jennings Creek watershed encompasses the entire city and surrounding area. Little work has been completed assessing the creek's water quality, habitat, and biological indicators. Jennings Creek is fed by several karst groundwater springs, making it highly vulnerable to contamination due to the rapid connection between the surface and subsurface via sinkholes and underground rivers. An examination of Jennings Creek's water quality, habitat, and biological indicators, along with land use data and groundwater inputs allows for a clear quantification and assessment of the watershed's health. The methodology closely follows the methods for assessing habitat by Kentucky's Energy and Environment Cabinet and approved for the EPA 319 Watershed Plan project underway for Jennings Creek. Three study sites were identified along Jennings Creek for habitat and biological assessment with concurrent water quality sampling. All data will be transcribed into a project geodatabase and modeled in ArcGIS Pro software to analyze the data spatially and temporally within the assessed reach of the stream and between each site. This can help to determine the potential impacts of pollution on the health of Jennings Creek watershed and will highlight variations between sites in relation to land use and groundwater inputs.

Gangumolu, Pranav; "What Are the Most Needed Skills for a Successful Management Career?" (Xiaowen Chen)

With modernization in the United States, managerial occupations are rising more rapidly than the average job growth; over 880,000 new manager jobs are estimated to emerge by 2031 (US Bureau of Labor Statistics). Managerial jobs are critical as the job holders carry many responsibilities to lead a team of workers. Corporations expect applicants to have a variety of skills and knowledge to fit a managerial position. My research questions are: (1) what skills are required for the managerial positions, and (2) what skills are the most popular across the managerial positions? The job advertisements are good resources to help to understand the skills required for the managerial jobs. I used a web scraper to collect 15,259 managerial job advertisements from the website. To identify and describe the skills, I will use Latent Dirichlet Allocation (LDA) and Structured Topic Modeling (STM) to analyze the job descriptions in the advertisements. My research will: investigate the skills needed to be a manager and experiment with machine learning techniques, more specific topic modeling, on conducting a thematic analysis for a large amount of text-based data. Overall, my research will demonstrate the usage of ML techniques in social science research.

Gani, Ariti; Nguyen, Ngoc; Brotzge, Jerry; "Statistical Analysis Of Kentucky Mesonet Big Data: Factors Affecting Soil Moisture and Plant Growth in Kentucky" (Ngoc Nguyen)

Although Kentucky's climate falls broadly in humid subtropical category, different parts of the state can experience very different environments. The Kentucky Mesonet has an infrastructure to monitor weather and climate statewide. Over the past 15 years, automated stations have been collecting near-surface environmental and weather conditions in about 86 locations across the state. These big data provide an opportunity for analysis with robust statistical methods. Our ongoing research focuses on different parameters of the weather, their relationship with soil moisture, and how that can affect plant growth. Initially for this project, we have selected soil moisture and other related data from the GAMA station in Monroe County. We are analyzing the data mainly through R, a versatile programming language for interpreting large amount of data. Doing this will allow us to define the relationship between soil moisture and other variables, such as air temperature, precipitation, humidity, and pressure. The results of this research can be significant in understanding how plants are influenced by soil moisture, and the optimal conditions under which they can grow. It is important to understand the relationship of living organisms with their environment, and how the climatic and environmental conditions are changing in Kentucky over time.

Gillispie, Nathan; Nee, Matthew; "Understanding Secondary Organic Aerosol Formation Through Chemical Kinetics Models" (Matthew Nee)

Secondary organic aerosols (SOAs) are carbon-based solid or liquid particles dispersed in air that arise from oxidation reactions. Sulfur containing SOAs are likely to impact human and environmental health, as well as affect the earth's albedo, yet their formation is not well

understood. The concentrations of SOA precursors can be tracked over time as reactions progress in a reaction chamber. These concentrations could be perfectly described by a set of differential equations, but only when the exact reaction mechanism is known. These mechanisms can have hundreds of steps and also require rate constants – the speed at which each individual step occurs. Through a process analogous to hyperparameter optimization in machine learning, this research tests models of the formation of SOAs against data from experiments to determine the validity of a proposed reaction mechanism. A better understanding of such a process will help determine the most important conditions/factors that promote SOA formation.

Goodman, Annabelle; Marquardt, Kathleen; Dunn, Ahria; Hartman, Sarah; Fortune, Nick; "The Effects of K-12 Mathematics Experiences on Future Teachers: Self-efficacy and Confidence" (Nick Fortune)

Research has shown that future elementary teachers often lack mathematics self-efficacy and confidence (Briley, 2012). There are numerous documented reasons for this lack of self-efficacy. In the present study, we focused on how previous K-12 mathematics experiences played a role in future teachers' mathematics self-efficacy and confidence as a learner of mathematics as well as their self-efficacy and confidence as a future teacher of mathematics. We interviewed 12 future elementary teachers at a southeastern university and conducted a qualitative case study (Creswell, 2013). To analyze the data, we did open and thematic coding (Miles et al., 2014) to categorize the themes of responses from our participants. Results indicate that specific content (e.g., geometry) may be attributed to future teachers' lack of confidence in mathematics. Further results indicated that while many of our participants acknowledged their own lack of confidence in mathematics as a learner; when placed in clinical settings as teacher candidates they realized this confidence was more socialized than internalized (i.e., there was a stigma about mathematics teaching, but it was not as difficult as they thought). This indicates the crossover between learner and teacher can have both negative and positive effects on self-efficacy and confidence.

Gorecki, Esther; Im, Dain; Chelson, Christian; "The Inflammatory Effect of Glucocorticoids on Sleep" (Noah Ashley)

Glucocorticoids are a class of primary stress hormones that play an essential role in the sleep-wake cycle. These hormones are released by the adrenal glands and are highly regulated by the Hypothalamic-Pituitary-Adrenal (HPA) Axis. Glucocorticoids (CORT) also modulate the brain's immune response through altering the level of microglia (innate immune cell of the brain) activation. We hypothesize that these chronic adjustments to neuroinflammatory mechanisms may play a major role in sleep quality and duration. Decades of research have suggested that elevated concentrations of CORT, as seen in individuals facing chronic stress, are associated with insomnia or obstructive sleep apnea. Our study examines alterations of the HPA axis in which the release of CORT is chronically manipulated. To assess the relationship between CORT, sleep, and microglial activity, we conducted adrenalectomy (ADX) surgery on a group of C57/BL6j mice. From this surgery, three groups were created: control, ADX, and ADX with exogenous CORT administration (ADX+C). Throughout 8 weeks, the percentage of sleep during the day, plasma cortisol levels, and neuroinflammation was recorded. In this review, we will examine the role of inflammation as a possible connection between sleep loss and CORT concentrations.

Graham, Sydney; Canen, Jenessa; Gregory, Caitlin; Brausch, Amy; "The Relationship Between Non-acceptance of Emotions and Non-suicidal Self-injury" (Amy Brausch)

Problem: The present study investigated the relationship between the domain of non-acceptance of emotion and three different aspects of NSSI: 1) response latency, 2) type of NSSI method used, and 3) different NSSI methods engaged in. It was predicted that more non-acceptance of emotions would negatively correlate with NSSI response latency, that certain types of self-injury methods would associate more strongly with non-acceptance compared to other methods, and that non-acceptance of emotions would positively associate with the number of NSSI methods. Procedure: Data were taken from a sample of high schools in south-central Kentucky collected between 2018-2022. The overall sample was 800, and 123 participants reported lifetime NSSI. Adolescents completed measures assessing demographics, emotion regulation difficulties, and NSSI history and features. Results: There was no significant difference found between non-acceptance and response latency. Non-acceptance was significantly correlated with the burning, hitting, and biting NSSI methods. The number of methods that adolescents engage in is significantly correlated with non-acceptance of emotions. Conclusions: Results suggest that difficulty in accepting emotions may be associated with the specific methods and total number of methods that adolescents engage in. In line with prior research, the non-acceptance of emotions significantly correlates with NSSI in adolescents.

Gregory, April; Guyton, Carrie; "Rose Colored Glasses: Thesis Film" (Sara Thomason)

The project is a short film made in conjunction with the Western Kentucky University B.F.A. Film Program as part of our Thesis Capstone project. Our story follows an impoverished young girl into adulthood as she navigates motherhood and her abusive marriage to a highly respected sheriff's deputy. After being given a pair of rose-colored glasses, her vision becomes distorted, blinding her to abuse and hindering her view of the world around her. Though our character’s sight may be altered, her pre-teen daughter has been witnessing their harsh reality with no filter. In the end, they must come together to break free of the abuse. The objective of the project is to showcase the enormous strength of women who stand up to their abusers. This is commonly portrayed in the film as a simple task, however, having gone through this experience with my mother as a child, leaving is only half the battle. We intend to highlight emotional manipulation by placing the audience inside the mind of the protagonist.

Grimmett, Tashaunda; Mienaltowski, Andrew; "Confusability of Emotion Categories for Dynamic Expressions" (Andrew Mienaltowski)

Emotion perception is an important part of our everyday life and is essential to how we interact with others. Successful emotion perception requires the accurate categorization of dynamic expressions using salient facial cues. Participants were presented with examples of dynamic expressions representing seven emotion categories. Facial cues used to identify some categories are also used in the classification of stimuli in other categories. For instance, expressions of fear and surprise often involve the widening of one’s eyes, whereas expressions of anger and disgust often involve frowning or scowling. This study explores how emotion perception occurs and

when humans may confuse examples of one emotion category with those from other categories. Participants rated the intensity of each of the seven emotion categories observed in dynamic expressions. They also selected the best category label to characterize each expression. We found that the participants confused fear with surprise but did not confuse anger with disgust. It appears that humans are not always accurate when perceiving emotions in the faces of others, especially when there are many overlapping cues between the categories that we are considering when making our emotion category judgment.

Hadden, Caylie; "Evaluating Effects of Neurofeedback Among Individuals with Trauma" (Sungjin Im)

Post-Traumatic Stress Disorder (PTSD) is a mental illness followed by exposure to a traumatic event. Neurofeedback is an emerging method to optimize brain activity via operant conditioning and thus reduce the symptoms of PTSD. Our research study aims to evaluate the preliminary evidence for neurofeedback training among people with PTSD. This case study involved five PTSD patients, and they completed three assessments (pre-, mid-, and post-treatment) and ten sessions of neurofeedback training. Neurofeedback sessions were performed twice a week, lasting 20 minutes per session. Each session consisted of participants receiving visual feedback (i.e., the movie screen became dark when their brain activity deviated from the target ranges) while watching a video of their choice. The results suggest that neurofeedback training confers noticeable beneficial effects. Three out of five participants had a significant reduction in PTSD symptoms varying between intrusive thoughts, avoidant behaviors, hyperarousal, and mood. Two out of five participants reported a small to moderate decrease in anxiety and depressive symptoms. While the preliminary empirical evidence appears promising, further research with a larger sample and an active control group is warranted.

Hall, Peter; "Critical Analysis of Mobile and Metabolic Architecture" (Shahnaz Aly)

Urban design and planning of cities has presented itself in many forms, some taking origin in concepts of walkability, green space, navigation, and vertical structure. NULU flats poses a microcosm of urbanity built into a singular plot. The concept is born in the idea of a walkable city in the clouds, that has the ability to grow and recede with the needs of the urban context in which it is established. The concept grows from the origin of metabolic theory and mobile architecture. These concepts view architecture as a living and growing form, thus reflecting the changing needs of the context itself. The theory inspired structure holds sixty plus housing units that are compiled on a total of eight stories. The eight floors hold microcosms of functions that are essential to any urban community. The first two floors make up the static structure that grows from the ground to “anchor” the modular units in place. The main concept revolves around this static megastructure that can be utilized to create new functions in the linear timeline of the urban context itself.

Hampton, Kaleigh; "How Gravity Affects Anatomical Structures in Dance" (Anna Patsfall)

This research project analyzes how gravity affects the body in ballet, contemporary, and modern dance. I also looked at how each genre experiences muscular fatigue due to gravity and how this can lead to injury. I started this project with ethnographic research at Hubbard Street Dance Chicago. Here, I was able to meet a plethora of dancers with different dance backgrounds from all over the United States. I sent out a survey and received responses about dancers' preferred style of dance, any history of injuries, and what muscles are the most sore after taking ballet, contemporary, and modern classes. With this data, I choreographed 3 different solos: ballet, contemporary, and modern. I would check with my dancers frequently on how their bodies were feeling so I wouldn't overwork them and whether or not I was on the right path with my study. This project is important to me because as a double major in exercise science, I want to become a physical therapist after I pursue my dance career. There aren't a lot of PTs that can cater to the dance community and I want to be able to provide back to them.

Hanson, Scott; Jeannette, Sadie; "Equine Health During Historic Eastern Kentucky Flood" (Marilyn Gardner)

Equine health in Eastern Kentucky was significantly affected by the historic flooding in July 2022. Pastures were decimated, stored hay and feed were ruined, and residual standing water was contaminated. Horses experienced malnutrition, injuries, and illness. Additionally, they experienced increased risk of vector-borne diseases due to standing water and exposures to displaced wildlife. As part of an initiative to assist flood-affected horses, veterinarians distributed topical insecticides and wound care spray, administered vaccines and de-wormers and assessed horses' body condition. Descriptive data from this initiative are presented and discussed from a one-health perspective.

Harness, Briana; Shreve, Molly; Pasternacka, Jagoda; Lohano, Sarisha; Banga, Simran; "Analysis of Protein-protein Interactions Between Legionella Effectors by Bacterial Two-hybrid System" (Simran Banga)

Legionella pneumophila is an opportunistic intracellular bacterium that causes Legionnaires Disease, a severe form of pneumonia that develops in elderly and immunocompromised individuals. The key to L. pneumophila's pathogenicity is a series of effector proteins secreted via the Dot/Icm complex. These effector proteins are responsible for high-jacking host cell pathways and establishing a niche within the host cell referred to as the Legionella-containing vacuole (LCV). L. pneumophila's ability to cause infection is due to the versatility of its effector proteins and the way in which they interact with each other. In Legionella pnuemophila, several effector-effector pairs have been identified which influence the function of each other. Effectors that regulate the activity of each other are termed "metaeffectors." Through the usage of the Bacterial adenylate cyclase-based two-hybrid system (BACTH), this study analyzes the protein-protein interactions between effectors that migrate to the nucleus of a cell when ectopically expressed in cultured HEK 293T. Genes LneB, LneA, RavO, RavQ, Ceg10, MavA and LegAS4

were cloned on pUT18C and pKT25 plasmids to test protein-protein interactions between these proteins by Galactosidase activity assay. Bacteria that show protein-protein interactions will exhibit a blue coloration on X-gal containing growth medium.

Harris, Desmond; Ingram, Kole; "Using Machine Learning to Categorize Political Language" (Lance Hahn)

Identifying the political bias of written and spoken language is computationally challenging. We are developing a machine learning (ML) approach to distinguish between left-wing and right-wing messages in the media. Our ML processing pipeline will begin with a pretrained embedding space (e.g., BERT, GloVe) fed into a ML model (e.g., multilayer Convolutional Neural Network, Dense layer) that is trained on text acquired from both left-wing and right-wing political sources (e.g., Newsmax, Slate). The model's task is to label the text provided as being politically left-wing or right-wing. Two technical challenges of this work are: 1) creating a web-scraper to gather articles from identified political news sources and 2) creating an ML model to train, test and validate on the acquired text. In future work, we will expand the categorization of political text to be left-wing, right-wing and centrist. Ultimately, this will enable us to computationally recognize text that is likely to be "dog whistles" - politically engaging for the intended audience, but politically neutral for the centrist and opposing audiences.

Harry, Trevor; "Recreating A Historical Landscape Of Louisville, Kentucky With Arcgis Pro" (Jun Yan)

A common application of ArcGIS Pro software is to create a historical GIS, which is done by digitizing data from historical sources like paper maps. A historical GIS will be created for the city of Louisville in 1930. Building footprints will be digitized from Sanborn fire insurance maps, which serve as reliable sources with information about buildings that may no longer exist. Road data will also be digitized from various historical maps to complement the buildings. Lastly, a flood map from the Flood of 1937 will be digitized to illustrate which areas of the city were impacted, and old census enumeration districts will help provide administrative context to the study area and facilitate spatial analysis when more data is collected. This database is part of a larger research project analyzing how the Flood of 1937 affected residents in Louisville, specifically asking how race and socio-economic status related to flood vulnerability and mobility after the flood. The Flood of 1937 is the worst flood event to date in the Ohio River Valley and has had little to no research conducted on it, which demonstrates the need for this type of research to be conducted.

Hartlage, David; "Bluegrass Backstory: How Podcasting Can Connect People to Local History" (David Serafini)

Kentucky has a rich cultural identity, built upon a storied local history. Unfortunately, accurate information on that history can often be inaccessible for Kentuckians wishing to connect to their

culture. Certain aspects of local history, such as the origins of Kentucky vernacular music or how the bourbon industry has promoted growth in Kentucky's communities, are not readily apparent. Podcasting, with its increasing popularity and accessibility, offers local historians an opportunity to address this problem. The goal of this project was to create a podcast program which makes information regarding the history, culture, and identity of Kentucky accessible to all in a scholarly—but engaging—way. Using specialized audio equipment, I interviewed scholars about aspects of Kentucky's identity and history, such as the bourbon industry and bluegrass music. These interviews were then edited into podcast episodes and made available to the public on Spotify. This podcast, "Bluegrass Backstory," provides a specialized resource for anyone to learn about Kentucky's history from reputable scholars, making it easier for Kentuckians to understand and connect to their culture. It shows how podcasting can be a valuable tool to bring local histories to the forefront and help people understand how the world around them came to be.

Hartman, Leah; Harper, Doug; Hebenstiel, Lars; Novikov, Ivan; Sherrard, Sam; "An Analysis on Rolling Oscillations of Liquid-Filled Containers Along a Curved Ramp Using ROL-FC Experimental Setup" (Ivan Novikov)

The rolling of objects down an incline is a frequently used demonstration in introductory physics courses. Phys. Educ., 38-39, 2004 demonstrated that the addition of fluids with various viscosities inside these objects alters their rolling characteristics by changing the fluid's interaction with its container. In this talk, we report progress on the development of an experimental setup to measure the oscillations of a cylindrical container filled with viscous fluid as well as preliminary results on the effects of viscosity on rolling motion. Given that rolling motion is a composite of both translational and rotational motion, we designed a setup that enables us to study them separately. To study translational motion, we employed two different techniques and compared the accuracy of the results. The first method involved a series of photogates placed along a curved ramp, controlled by a LabVIEW DAQ interface. The second method used a convolution filter developed in PyTorch to analyze position versus time data from a camera. To observe the rotational motion of the fluid, we plan to recreate it on a rotating motor and employ particle image velocimetry (PIV) to visualize the fluid motion inside the container.

Hauschild, Benjamin; Polk, Jason; "Quantifying Gaining Stream Discharge For Jennings Creek, Bowling Green, Kentucky" (Jason Polk)

Jennings Creek is situated along the northwestern border of Bowling Green, Kentucky and is a spring-fed tributary to the Barren River. Flooding along Jennings Creek and its many subterranean tributaries has increased in frequency and severity in recent years, in part due to development and urbanization throughout the city. Due to the karst landscape that lies beneath the city, predicting flooding is an extremely difficult task. The creation of a gaining stream discharge profile using the U.S. Geological Survey standard methods allows for the identification and quantification of the many surface and subterranean tributaries of Jennings Creek. A Global Flowprobe and Sontek Acoustic Doppler Current Profiler (ADCP) were used in conjunction to measure discharge and water level at five sites between the headwaters of Jennings Creek and its

confluence with the Barren River. The data gathered through this process will be helpful in estimating the discharge given a certain stage height, identifying the contribution of major springs that could influence flooding and water quality in the hydrological system, and the prediction of flood occurrences and magnitudes. In addition, this research will be a part of an EPA 319 watershed plan project for Jennings Creek.

Hayes, Austin; "An Investigation of Large-scale Atmospheric Processes Toward the EF3 Tornado Across Nashville, Tennessee During March 2nd-3rd 2020" (Josh Durkee)

Tornadoes kill and injure hundreds of people each year in the United States and these events occur mainly during the spring and fall seasons. Research has established tornadic thunderstorms can be preconditioned by large-scale atmospheric circulation features on the continental scale. The purpose of this study is to identify the role of large-scale forcing mechanisms to determine the overall contributions towards the EF-3 Nashville, Tennessee tornado on March 3rd, 2020. Results from this study show that the horizontal transport of warmer air at this scale is what ultimately preconditioned the atmosphere that led to this historic tornado. Other findings show that other large-scale forcing mechanisms were not significant for this event, but regional scale processes can be equally important in some severe weather phenomena, such as tornadoes. Overall, this study shows that impactful weather systems do not always require large scale forcing, but at least require a forcing mechanism that can be observed at other scales in meteorology. As it relates to foundational, theoretical, and conceptual frameworks for understanding these processes, this study shows that this event was not completely applicable at the continental scale.

Hebenstiel, Lars; Er, Ali; "An Experimental Design to Measure Stochastic Resonance in an Optical Interferometer" (Ivan Novikov)

Stochastic resonance (SR) is a phenomenon by which the signal to noise ratio (SNR) of a weak forcing function acting on a bistable system is enhanced by the addition of noise to the forcing function. It has been theorized that adding a nonlinear crystal with strong quadratic electro-optic coefficient to the output of an optical interferometer can create this bistable system where SR can occur. We show the results of a finite difference time domain electrodynamics calculation of interferometer signals propagating through a such a nonlinear crystal. With these results we provide an experimental design to measure SR in a nonlinear bistable optical system.

Hendrickson-Brown, Gracie; Forbes, Meghan; Brunot, Kara; Pekara, Brittany; **Esmaeilzadeh, Nima; Hermann, Grace; Pandey, Shreya; Stimson, Alexander; Petty, Madeline; Strenecky, Bernie; "Building Resilience with Rotary: Community Recovery through Service Learning via the Jennings Creek at Creekwood Restoration and Education Project" (Jason Polk)**

In December 2021, Bowling Green was hit by a tornado, causing widespread destruction. The Creekwood community adjacent to Jennings Creek was heavily impacted by loss of life,

property, and environmental damage. Working together with the Rotary International Bowling Green AM Club to secure funding, EEAS and CHNGES students are leading a recovery project to help restore the environment and support the community's recovery effort. The project aims to provide restoration to the stream and floodplain area adjacent to Jennings Creek and provide environmental and hazard mitigation education to Creekwood residents via an outdoor learning area through partnership with the City of Bowling Green and Warren County Public Schools. Elements include a water quality and flood monitoring station, educational signage, hazards kiosk, tree planting and stream access trail, remembrance garden, and an environmentally-focused outdoor learning laboratory. EEAS students are learning how to plan, manage, and implement a community development and environmental planning project. Their efforts include writing grants, forming partnerships, conducting research on restoration and education methods, and implementing them to create a cohesive project that provides a community space where citizens can gather and learn, while also developing environmental awareness and improving streamside ecosystems.

Hendrix, Matthew; Bhavaraju, Aathman; "Geodetic Ratio, Color Sequences, and their Relation on Graphs" (Mustafa Atici)

For a given graph G, the definitions of a color sequence and a (t,k)-geodetic set are given in several papers. In this study, we give the definition of a geodetic ratio derived from (t,k)-geodetic and show the relationship between the geodetic ratio and the color sequence. There is no known polynomial algorithm to compute the geodetic ratio of a given graph G. We give a polynomial algorithm that gives an upper bound of the geodetic ratio.

Hennessey, Hannah; Wilds, Alexander; "Police Presence, Social Media Consumption, and Perceived Feelings of Safety" (Christopher Peters)

Our research examines perceptions of safety based on social media consumption and perceived presence of law enforcement. We hypothesize the amount of crime statistics an individual consumes via social media will negatively influence perception of their environment and will be mediated by perceived police presence. Our study includes a self-report survey asking about social media usage, frequency of their usage regarding local crime information, and information about the police presence in their area. We used feelings of safety, police legitimacy, right-wing authoritarianism, and social dominance scales. The feelings of safety scale is the primary dependent variable, while the other scales are potential covariates. We are collecting demographic information. A portion of our participants is collected through WKU's Study Board and the majority through Prolific to increase diversity. We believe social media directly impacts the public's view of police, which in turn affects safety. Our research aids law enforcement by suggesting that police should have an impactful presence on social media instead of allowing third-parties to dictate police image, allowing police to connect with citizens effectively. Our study impacts literature by highlighting how citizens interact with law enforcement, crime news on social media, and bettering the relationship between police and citizens.

Hernandez, Kohen; "An Investigation of Continental-scale Atmospheric Contributions to the Historic Flash Flooding Event in Eastern Kentucky during July 2022" (Josh Durkee)

Flash flooding kills an average of 88 people per year in the United States and are caused by heavy rainfall from thunderstorms within a short time period. The formation and strength of the thunderstorms have been studied extensively and it has been determined to be driven by the larger-scale atmospheric circulations, roughly continental in size. The purpose of this study is to determine the atmospheric causes of the flash flood event by examining each layer of the wind field from 12 km to the surface to determine the overall influence on the event. Results from this study showed that there was not a specific height in the atmosphere that contributed the most to the event. However, there were some heights that contributed a non-zero forcing to the event. Overall, this study shows that not all levels in the atmosphere played major roles in this flash flood event. As it relates to foundational theoretical and conceptual frameworks for understanding these behaviors, this study shows that the event was not completely applicable at this scale, and that perhaps atmospheric, terrain, and (sub) surface processes on local scales were dominant.

Herrmann, Hannah; "Perceptions and Visual Awareness of Karst Flooding in Urban Areas to Inform Management and Preparedness" (Jason Polk)

Flooding is a common hazard in Kentucky that is most often associated with rivers and lakes. In addition, karst groundwater flooding also occurs because a large portion of Kentucky is built on top of karst environments. The perception and understanding by the general public for how karst flooding occurs is unknown, but may differ from the more visible, obvious surface water flooding with which most people are familiar. This study's goal is to determine the public perception and awareness of karst flooding toward improved mitigation planning. Methods include analyzing the spatial distribution of flooding events throughout Kentucky to determine the difference between karst and non-karst events. Then, Bowling Green, Kentucky will be used to conduct surveys and focus groups to determine how communities perceive their risk of flooding in karst environments. Comparison of the data will be conducted with demographic, land use, and flood vulnerability indicators to better understand the intersections of flood risk and perception in karst areas. Results will be mapped out for visualization and then integrated with regional hazard planning efforts to aid in mitigating future impacts.

Hocklander, Ryan; Compton, Katie; Gordon, Alysa; "“Reducing Pre-presentation Memory Deficits by Increasing Metacognitive Awareness and Utilizing Placebo Effects" (Qin Zhao)

Commonly known as the “next in-line” effect, anticipation of giving a presentation leads to memory deficit of the preceding presentation. The purpose of this study is to test if increasing metacognitive awareness of the “next-in-line effect” and using open label placebos can reduce pre-presentation memory deficit by motivating people to focus more on the preceding presentation and alleviating presentation anxiety, respectively. The study is being conducted in a lab. In each session, there is one participant and one confederate who are instructed to prepare a

short presentation, based on a research report. The participant is told that they will present 2nd and will take a quiz on the 1st presentation. Prior to listening to the 1st presentation, participants are randomly assigned to one of the three groups: metacognition, placebo (chewing gum), or control. Participants' resting heart rates and state anxiety are measured before and after the 1st presentation. Afterwards, participants also complete a questionnaire on how much they thought about their own presentation during the preceding presentation and a multiple choice quiz on the 1st presentation. The hypothesized result is that the two intervention groups, particularly the metacognition group, would show better memory of the preceding presentation than the control group.

Holt, Aubry; Banga, Simran; Neupane, Shreya; "Effect of Photodynamic Therapy on Legionella Pneumophila" (Simran Banga)

Legionella pneumophila is a gram-negative aerobic bacteria found in stagnant water sources. These bacteria cause Legionnaires' disease in humans. L. pneumophila infects the macrophage cell and using the Dot/Icm system has a way to ensure its survival in host cells. This process, however, is only possible because of Legionella's abilities to survive extracellularly in biofilms. In this study, I look into a way to limit the growth of Legionella extracellularly through Photodynamic Treatment (PDT) in normal water environment conditions. PDT is a treatment that combines light with a photosensitive compound to destroy cells. The Photodynamic sensitive compound chosen for this experiment was Methylene Blue. We exposed Legionella to the photosensitizer under different time conditions, concentrations of the compound, and at different stages of growth of Legionella. We detected the minimal inhibitory concentration of Methylene Blue needed to be an effective antimicrobial and tested if the compound was toxic to the bacteria without PDT. This data was then used to test the effect of PDT with Methylene blue on Legionella biofilms. Based on the statistical analysis of standard plate counts using colony forming units and microscope images, we concluded that photodynamic treatment with Methylene Blue is effective against Legionella growth and can be used to limit its growth in natural environments.

Hopkins, Annah; Srivastava, Ajay; "Assessing the Involvement of Neuronal Migration Genes During Tumor Metastasis in Drosophila" (Ajay Srivastava)

Neurons migrate to different locations by certain cues in the axonal guidance pathway. Tumors can migrate through the body, which is called tumor metastasis. The hypothesis of this project includes certain genes in neuronal migration are utilized in tumor metastasis. Current testing is being conducted utilizing Drosophila melanogaster as the model, for it is a good genetic model that also possesses a technique to visualize tumors, the mosaic analysis with a repressible cell marker (MARCM) technique. Overexpression of Ras oncogene along with mutations in a cell polarity gene result in tumor metastasis. The genetic technique utilized here labels the tumors with Green Fluorescent Protein (GFP) for easy visualization. The cephalic complexes - a structure that contains various tissues in the larval head region - will be dissected from day 8 to 10 larvae. The tumor bearing and control samples are then stained utilizing antibodies for the expression of the neuronal migration genes. Utilizing confocal microscopy, the upregulation or

downregulations of these genes will be assessed. It is expected that this project will shed light whether these neuronal migration genes are utilized in tumor metastasis.

Hoppes, Ericka; "The Effects of Replication Crisis Instruction on the Development of Skepticism" (Cassie Whitt)

Within the past decade there has been growing concern regarding the Replication Crisis in psychology. The crisis has called into question the credibility of psychological research by highlighting the field's difficulty in reproducing findings (Open Science Collaboration, 2015), as well as the prevalence of questionable research practices amongst psychologists (e.g., p-hacking, falsifying data, incomplete reporting of measures). Given that the crisis presents psychology research through a critical lens, we suspect it can be a useful pedagogical tool for helping students develop a healthy sense of skepticism regarding scientific studies. In the present study, we investigate how teaching about psychology's replication crisis, via brief videos, affects the development of skepticism in undergraduate students. We explore skepticism as students' ability to detect a study with a low chance of reproducibility, as well as their sensitivity to pseudo-profound statements. We believe this study is helpful in providing vital information about how students consume information about replicability and has implications for how these topics are taught to both college students and lay populations.

Hoskins, Addison; "Real-time Monitoring Of Rhodamine 6G Photodegradation Using Colloidal Gold Surface Enhanced Raman Spectroscopy" (Matthew Nee)

Pesticide runoff leads to water pollution, and the lack of research regarding their degradation prevents the scientific community from finding a solution to this issue. The use of Raman allows for rapid data collection and testing in an aqueous solution, which differs from both chromatography and other spectroscopic methods. The use of surface-enhanced Raman scattering (SERS) improves the sensitivity and selectivity of spectrophotometric chemical analysis. Using gold nanoparticles, we conduct Raman synthesis of rhodamine 6G (R6G) to study patterns in the spectra peaks in order to visualize the intermediate reactions taking place. The degradation products and rate constants gathered have allowed us to see the decreasing intensity of Raman scattering in R6G.

Humphrey, Kelly; "Understanding the Blazar Phenomena by Combining Ground-based Observations with Observations from the Transiting Exoplanet Survey Satellite: BL Lacertae and 3C 66A" (Michael Carini)

Blazars are extreme examples of the Active Galactic Nuclei (AGN) phenomenon. The blazar class of radio loud AGN are those oriented such that we are looking nearly down the throat of the relativistic jet, resulting in the observed emission being dominated by processes at work in the jet and being both amplified and time-compressed in our frame. The defining characteristics of blazars are a featureless or nearly featureless optical continuum, large amplitude and highly variable polarization, and large amplitude continuum variability at all wavelengths and on

timescales ranging from minutes to decades. The lack of discrete features in their spectra leaves us with only continuum variability and/or polarization variability as a diagnostic of the emission mechanisms at work in many of these objects. In this presentation, I will discuss the results of the analysis of ground based and Transiting Exoplanet Survey Satellite (TESS) observations of 2 blazars: 3C 66A and BL Lacertae. I will compare the ground-based observations of the objects obtained by WKU's Robotically Controlled Telescope (RCT) with light curves extracted from TESS observations of the sources. I will show how the ground-based observations are key to properly extracting light curves form the TESS observations.

Hurt, Cora; Eugene, Tamia; "Exploring Psychological Detachment, Work-Related Rumination and Role-Centrality in Working from Home" (Katrina Burch)

Background: The combination of modern communication technology and a global pandemic has pushed many employees into working from home, eliminating signals for psychological detachment. Using effort-recovery theory (Meijman & Mulder, 1998), we hypothesize that work-related rumination will be associated with the inability to psychologically detach from work (Martin & Tesser, 1996) with role centrality moderating the relationship. Those with greater work-role centrality should find detachment harder while at home because they place more emphasis on their work roles (Thoits, 1992; Krause, 1994). Furthermore, research suggests that women experience higher levels of work interference with family than men, even when job demands are equivalent (Mcelwain et al., 2005), therefore we will examine whether gender differences exist in these relationships. Method: Participants will include 167 tenure-track and tenured academics who completed a survey between April-May 2020 at the beginning of the COVID-19 pandemic. Proposed Analyses: Analysis will include stepwise regression, nested model comparison to examine gender differences, and descriptive statistics such as correlation analysis to understand the sample. Preliminary Discussion: Our study will aid in understanding how this evolving work-family conflict affects well-being and the ability to psychologically detach from work responsibilities, as well as the gender differences involved in these relationships.

Jeannette, Sadie; "Sense of Belonging on Campus: LGBTQIA+" (Marilyn Gardner)

A sense of belonging has been shown to promote engagement, persistence, and success among college students, and may improve their mental health by serving as a buffer to stress. Belonging, however, is not equitably experienced among marginalized and stigmatized student populations, including LGBTQIA+ students. A cultural climate survey administered to college students at a mid-south regional university found LGBTQIA+ students experienced micro and macro aggressions significantly more than their heterosexual counterparts. Sense of belonging was significantly lower as well.

Jeffries, Westen; "Cane Craft Bourbon Distillery" (Shahnaz Aly)

Bourbon is a very important part of Kentucky's culture. My project is an eye-catching distillery to

people who pass by and the locals. My distillery is designed to accommodate the community while being a memorable experience for the tourist. In this day and age the demand for bourbon has only skyrocketed in multiple ways. The number one reason being the secondary market for bourbon, the passion for drinking bourbon, going on tours of bourbon distilleries, and buying merchandise. The main goal was to design a multipurpose distillery that will attract people from all around to come, enjoy the peaceful outdoors, and our products. The space taste testing, gift shops, barrel storage, attract tourism and have easily accessible drop off points for corn, wheat and barley. These buildings accomplish sustainability by giving back to the community, using local resources from the state such as materials and crops, along with building features such as green roofs, electrochromic glass, and grey water systems. A benefit to this project is the amount of added tourist attraction it will bring into the area.

Johnson, Brody; "Perceptions of Sexual Identity Stereotyping among Physical Education Undergraduate Students" (Jean Chen)

This study examined the perspectives of six college students enrolled in a physical education teacher education program on sexual identity stereotyping (SIS), the stereotyping of individuals as a certain sexual identity (e.g., homosexual, heterosexual, bisexual) based on external factors. The purpose was to construct a general landscape of physical education (PE) majors' views on SIS and gender roles, athletic and PE expectations in regards to gender and sexuality, and these ideas' impact on the efficacy of PE, both for students and educators. Data were collected via semi-structured interviews and analyzed using the standard interpretive methods of analytic induction and constant comparison. These findings revealed that in general, those interviewed were aware of SIS and could identify its potential impact. Still, the participants felt that SIS was not enough of an issue to prevent them from pursuing a career in PE. Multiple participants reported experiences with being stereotyped as a result of their athletic activities of choice. Through the thoughts of the interviewees, the authors of this study hope to enrich the field of PE and provide awareness towards biases that can cloud the quality of education.

Johnston, Laurel; "Entitlement and Empowerment in Sports Fans: A Marketing Perspective" (Joanna Phillips Melancon)

Today's sports fans have more resources than ever before to ensure their voices are heard. Fans debate, collaborate, and celebrate on social media. Announcing a new competition that would have broken from traditional football (soccer) models, proponents of the European Super League faced universal condemnation of their proposal by public figures, fans, and players. We seek to complete a survey study, gathering opinions of football (soccer) fans. Our primary objective is to assess entitlement and collective empowerment following this crisis. The survey is targeted to fan social media groups on Facebook and Discord. Extending Melancon et. al (2021)'s conceptual model, we seek to understand how feelings of alienation and collective empowerment ultimately alter the satisfaction and relational behaviors of sports fans (Kim et. al 2003, Nguyen et. al 2020, Spreng & Macroy 1996). Additionally, this study employs the Importance of Winning Index to control for how the performance of sports teams may affect fan evaluations of those teams (Dalakas & Melancon 2012). We rely on prior literature to examine fan identification, investment, perceived

justice, collective fairness, emotion, attitudes, and behavioral intentions (Clark et. al 2011, Colquitt 2001, Kim et. al 2003, Wann & Branscombe 1993, Xia et. al 2010).

Jones, Hadley; Kang, Jihye; "Investigations in dCas9 Binding Affinity" (Moon-Soo Kim)

An electrophoretic mobility shift assay (EMSA) measures the binding strength of protein to target via a quantitative evaluation of the species' tendency to dissociate: the dissociation constant (kD). EMSA involves a binding reaction with constant DNA and varying protein concentrations under native conditions to reach equilibrium. The samples are run in a native gel and transferred onto a membrane for imaging. Probe (biotinylated DNA) chemiluminescence is achieved through incubation with a streptavidin-HRP conjugate. When this conjugate meets a luminol-peroxide solution, a reaction catalyzed by HRP induces probe visibility after exposure. The kD is the protein concentration in the sample where the top and bottom DNA bands appear equal, as protein-bound DNA migrates slower than free DNA. A specialized, deactivated CRISPR-associated protein (dCas9) can be used for targeting specific double-stranded (ds) DNA sequences. Determining the binding affinity of dCas9 to its target quantifies its potential for use, particularly in the screening and detection of antibiotic resistance genes, which is a serious global health concern. In this study, dCas9 is paired with single-guided RNA designed to complimentary base-pair with specific dsDNA present in the tetracycline resistance gene (tetM) of Staphylococcus aureus. Results show a kD of ~64 nM, which is moderate affinity.

Jones, Malcolm; Flores, Veronica; Perry, Megan; Flores, Veronica; Perry, Megan; "Coding Attention Responses in Children during Snack Delay Tasks as a Predictor for School-readiness" (Elizabeth Lemerise)

The purpose of this research is to examine the attention and behavioral strategies that children use when given a simple task. Using top-down processing allows children to develop better critical thinking skills and make better decisions. These social competency skills are correlated to academic achievement and sociability and used as a factor to predict school-readiness. The participants in this project were preschool-aged children who were asked to complete a "snack delay task". The experimenters code their behavior during the task, including looking away from the snack, engaging with the experimenter, looking at the snack, wiggling one or more parts of their body, or getting out of their seat. Behaviors will be coded second-by-second for each trial of the task. From this research, we expect to find ways to assist children with self-regulation issues to perform better in academic and social strategies. The predicted results of this research are that children use certain behavioral strategies that show their level of self-regulation. This research is significant because it gives insight into how children interact with cognition and social aspects of psychology and can reveal the underlying issues with behavioral and attention problems in school.

Jones, Sophia; "Conceptualizing Tap Choreography" (Amanda Clark)

There is a lack of study into the choreographic process behind tap dance and its distinction from other dance genres. My research involves exploration of the choreographic elements within tap

dance through personal mentorship with professionals in the tap dance field. The hands-on experience and applied learning with the master faculty at Chicago Tap Theatre further enhances my technical and artistic skills. I am continuing my research by further developing the choreographic tap work created during the mentorship into a full tap performance piece. The culmination of the hands-on experience combined with the continuation of my applied research has enhanced my perspective on choreography. This performance presentation features tap choreography under the guidance of master faculty at Chicago Tap Theater and WKU Dance Program Faculty.

Julian, Maria; "Use of Paid Parental Leave Benefits and Relationship Quality" (Lauren McClain)

Relationship quality can be enhanced or decline over the transition to parenthood as decades of research have shown. The role of parental leave from paid employment has not been examined in the United States due to data limitations. The current study draws on new data from the Parental Leave Study, which is a quota sample (n=2649) of men and women who have had a baby through birth or adoption in the past two years in the United States in order to examine the relationship between use of parental leave after the birth of a child (whether leave was taken, length of leave taken, whether it was paid or unpaid, and type of leave taken) for both mothers and fathers and relationship quality at the time of the survey. Results can inform current deliberations about instituting a mandatory paid parental leave policy in the U.S. and ways it may strengthen families.

Kabrick, Hannah; "Purpose Makes Practice: Proposing a Framework For Teaching Metacognitive Skills in the Violin Lesson" (Lisa Duffin)

The development of metacognitive skills in the musician is crucial for the self-examination necessary for successful practice. The integration of teaching methods that facilitate these skills can help musicians become independent in the practice room. I propose a framework for teaching that includes a five-step thinking-action sequence that will allow students to critically evaluate their own playing during practice and would equip them to enact necessary changes to their technique in order to bring their playing closer to the desired outcome. This framework is meant to be a resource for teachers and students alike: teachers execute the scaffolding strategies and provide the materials during their lesson with the student, and the student utilizes the tools at home during their daily practice time. This facilitates the student in the development of listening skills, analytical thought, knowledge of violin technique, and self-regulatory skills to practice in a productive, intentional manner when a teacher or other adult is not around to guide them in doing so. The development of these skills, both musical and cognitive, will aid the student in becoming an independent and confident musician, with a well-rounded concept of the discipline of violin study.

Khuzhakulov, Zikrulloh; Kylychbekov, Salizhan; Allamyradov, Yaran; Majidov, Inomjon; ben Yosef, Justice; Kitchens, Chazz; "Formation of Picosecond Laser-induced Periodic Surface Structures on Steel and Titanium for Knee Arthroplasty Prosthetic" (Ali Oguz Er)

Laser-induced periodic surface structures (LIPSS) have been studied extensively in recent decades due to their potential applications in various areas such as engineering, medical, optical, liquid transport and surface wetting, and friction and tribology. In this study, LIPSS is obtained on two prosthetic implants such as medical grade stainless steel and titanium in air and water using 1064 nm and 532 nm picosecond laser pulses. We obtained different surface morphologies depending on the environment and laser parameters. The surface morphology is analyzed by both Atomic Force Microscopy (AFM) and Scanning Electron Microscopy (SEM). The analysis of images shows that obtained periodic structures are in Low Special Frequency LIPSS (LSFL) with periodicity of around 600 nm and 1100 nm for lasers with wavelengths 532 nm and 1064 nm respectively in air. The periodicity increased when the experiment is carried out in water medium for both wavelengths. The morphology and periodicity of the LIPSS pattern were strongly influenced. In addition, surface wettability by sessile drop method with water and diiodomethane as testing liquid will be presented subject to completion of experiments by the time of the presentation.

Kilgore, William; Gani, Nahid; "Geochemical Analysis of Volcanic Ash-layers Found at a Hominin Fossil Site in Afar, Ethiopia" (Royhan Gani)

East Africa (primarily Kenya and Ethiopia) has been a hotbed of paleoanthropological research as they hold many key early hominin fossils. Fortuitously, many such fossils have been preserved in lithified volcanic ash (tuff) beds, whose compositions can be unique and easily discernible from each other. This research deals with several tuff samples collected at the 4.4 million years old Ardipithecus ramidus fossil site in Afar, Ethiopia. Geochemical analyses are being conducted on these samples, including petrographic thin-section study, Raman microscopy, SEM microscopy, and Electron Microprobe analysis. Here, we will present initial findings, particularly variation graph-plots among different elemental oxides (e.g., Al2O3 vs. Fe2O3 and TiO2 vs. Fe2O3). Our results will serve as “fingerprints” in discerning different tuff beds, especially in comparison with other tuff beds across the region that are published. Our study can contribute significantly to tephra chronology/stratigraphy of the hominin fossil sites in East Africa. Since East Africa is important for understanding hominin and other mammalian evolution, analyzing tuff layers and publishing the data are paramount for correctly bracketing geologic ages of the fossils found in this region.

Kim, Chris; "Bach's Second Cello Suite in D minor: A Performer’s Analysis" (Matthew Herman)

Music possesses both objective and subjective qualities. It is a performer's job not only to properly play the pitches and rhythms as notated, but also to add artistic interpretation and expression. When performing music created by deceased composers, a performer needs to make informed decisions about how best to add expression to the performance while staying as true as possible to the composer’s original intent. The music of Johann Sebastian Bach is one such example. One interesting aspect Bach’s compositions is that his music predates the Common Practice guidelines commonly taught to music students. My objective was to analyze motives and phrases in the Prelude from Bach's Second Cello Suite in D minor. I have crafted an expressive performance of

this piece based on my analysis, and this performance will be disseminated to the public through a lecture/demonstration. Through this presentation, the public will gain a better understanding of how analysis can shape the performance of music.

Kitchens, Chazz; **Kylychbekov, Salizhan; Abdisatarov, Bektur; "Mechanical and Bioactive Properties of Pulsed Laser Deposited Hydroxyapatite Coatings" (Ali Er)**

Dental implants and artificial bone tissue have been ubiquitous with medicine. Also, ubiquitous to artificial bone scaffolding is bacterial colonization and lowered tensile strength overtime. Until recent years, titanium and zinc coating for interventions have been the only defensive mechanism against numerous instabilities. Hydroxyapatite coatings have offered significant increases in tensile strength and decreased colonization numbers. The structure found within our own bones is very similar to this hydroxyapatite deposit. The standard method of creating these films has been air plasma spray. The purpose of this research is to produce films, onto a silicon (100) surface using Pulsed Laser Deposition (PLD) technique. Applying PLD methods, create significant increases in maxillofacial strength, i.e., surface roughness of the implanted scaffold. We will examine one ablation wavelength of 532 nm to create a specific collection of replicable results. The wavelengths were reached using the Nd:YAG pulsed laser. Crystallinity and surface morphology is carefully examined to investigate how these features affect bioactivity and mechanical strength. Crystallinity was measured using X-Ray Diffraction (XRD) technique. Mechanical properties of the coatings, specifically adhesion strength to the implant surface, micro/nano-hardness, and dissolution resistivity, was also a research point. Scanning electron microscopy was employed for further imaging.

Knight, Dustin; "Examination of Atmospheric Contributions to the Historic 4-5 March 2015 Ohio Valley Snowstorm" (Joshua Durkee)

Over the past 10 years (2013-2023) winter weather has resulted in average damages of $3.96 billion/year. This includes damages from snow and ice storms as well as the strain that extreme cold air outbreaks places on the energy infrastructure of the United States, in some cases causing massive failures. The environment that drives these winter storms is preconditioned by large-scale atmospheric processes that extend to a continental scale. The purpose of this study is to examine the large-scale atmospheric fields to identify the primary contributions and enhancements of one such winter storm that occurred on 4-5 March 2015 which produced record-breaking ice, snow, and cold air from Texas to New England. This resulted in widespread power outages, hundreds of school closures, and crippling travel conditions across several States. This study shows that the factors that came to drive this event are evident on a large scale for up to 72 hours preceding the event onset and can be understood and analyzed using theoretical and conceptual models well-accepted in meteorological research and operational weather forecasting.

Kobylinski, Ashley; Burchett, Adrianna; Harmon, Talon; Schraml, Afton; "Applying Heat Shrinking To Minimize Pillow Effect During LSF" (Kevin Schmaltz)

Incremental sheet forming (ISF) is a dieless sheet-forming process that forms the desired final shape by incrementally deforming portions of sheet metal. One of the well-known quality problems with the ISF process is the pillow effect. The pillow effect refers to the undesired deformation of the unformed flat part of the sheet under the compressive residual stresses coming from the surrounding formed parts of the sheet resulting in the bumping or buckling of the unformed flat surfaces. While the pillow effect is unavoidable in the ISF process, the formed pillow can be flattened by the shrinking of the material at the bumped area. Shrinkage can eliminate compression and provide a slight tension to regain the flatness of the surface. Among all different metal shrinking methods, heat shrinking has been used effectively by metal workers to shrink and flatten stretched areas on sheet metals. The method can be applied to different metals including steel and aluminum. The goal of this research is to study the effectiveness of the heat-shrinking methods in reversing the pillow effect and increasing the geometrical accuracy of ISF formed products.

Kramer, Hannah; "Improving Visual Python Instruction In University Physics" (Scott Bonham)

Computational modeling is recognized as an important skill that educators need to help future science and engineering professionals develop. For this reason, Visual Python (VPython) is an integral part of the University Physics curriculum at WKU, but students commonly struggle to translate physics principles into functional code. To address this issue, new curricular materials were created and implemented for the Fall 2022 semester to assist students in experimental sections of the PHYS 256 laboratory. These interventions consisted of pre-lab questions to address common difficulties and worksheets to guide students. Experimental and control sections were compared using data from surveys (which assessed student perceptions), and student work on a midterm understanding check and the coding question on the final exam. While there is some evidence the interventions were helpful, previous coding experience proved to be the most significant indicator of student success with VPython. To bridge the gap between students with varied coding experience, it is hypothesized that a more comprehensive intervention is necessary. This semester, new in-class coding activities are being implemented into one section of University Physics I (PHYS 255) to increase student experience with VPython. Data collection is still underway for this extension of the research project.

Kreuzer, Greta; McGettrick, Caitlin; Teeters, Jenni; "Membership in a Sorority Moderates the Association between PTSD and Alcohol-Related Problems" (Matthew Woodward)

Heavy alcohol use is linked with a number of harmful outcomes among young adults. Individuals with posttraumatic stress disorder (PTSD) have a higher rate of binge drinking and substance-related problems. Women in sororities may represent a vulnerable population given their increased risk for sexual assault and substance-related issues. However, studies have yet to examine whether the association between PTSD and substance use is stronger for women in sororities, for whom

social norms around drinking may increase the comorbidity between PTSD and substance-related issues. The purpose of this study was to examine whether sorority membership moderated the relationship between PTSD and both alcohol and cannabis-related outcomes. An online survey was administered to 539 women at a midwestern university with histories of trauma. Moderation analyses showed that the relationship between PTSD and binge drinking as well as the relationship between PTSD and alcohol-related problems was moderated by membership in a sorority. Specifically, these relationships were stronger for college women in a sorority than women who were not in a sorority. Sorority women with trauma-related distress may be particularly at risk for alcohol-related issues. More targeted prevention and intervention efforts regarding alcohol use and trauma-related experiences may be useful for women in sororities.

Kylychbekov, Salizhan; Kitchens, Chazz; Banga, Simran; "Coating Biomedical Implants with Hydroxyapatite to Remedy Bioactivity Problems" (Ali Oguz Er)

With the advance of medicine and technology, biomedical implants became a major technique to remedy the most common types of bone injuries. However, it does not always end with success. In order to successfully replace or fulfill the function prescribed for the implant, it has to become integrated into the body, which is usually named as bioactivity. Over the past 40 years, 5% of the overall implants failed to do so. In this work, we propose to coat the metal surface with hydroxyapatite (Ca5(PO4)3(OH)), an inorganic material that exists in human bones, to improve their integration with human bodies. We demonstrate this using the Pulsed Laser Deposition technique. The structural, topographical, and mechanical properties were investigated using SEM, AFM, XRD, and Vicker's microhardness testing. In addition, the bioactivity of the implants with and without coating are being studied by osteoblast growth and dissolution experiments in simulated human body fluids at the WKU Biotech Center. Our results indicate that PLD is a potential tool for producing coatings with crystalline and favorable microscopic properties applicable for biomedical purposes.

Lahman, Alexandria; "Biophilic Design and its Effects on Mental and Physical Health" (Shahnaz Aly)

The design of interior spaces can greatly impact one’s mental health. Because people are spending more time indoors, the importance of well-designed interior spaces has increased dramatically. People living in urban areas have also lost their connection to the natural environment in their daily lives. Using biophilic design in architecture can increase productivity and creativity and positively impact mental health. Biophilic design involves incorporating organic materials, patterns, colors, textures, and plants into the built environment. This project aims to highlight the importance of biophilic design in architecture and how it can be incorporated into interior architecture, particularly already existing architecture. We created a 3D model of a popular student space on the Western Kentucky University campus and added biophilic design elements into the space. We then asked users to experience the space through virtual reality and solicited feedback on the design (with biophilic elements) and experience. This feedback will be used to create a guide for students to use to incorporate biophilia into their designs.

Lane, Katelyn; Bledsoe, Lee Anne; "Working with Kentucky Amish and Mennonite Communities to Develop Solutions for Contaminated Drinking Water Sources" (Christopher Groves)

Karst areas, like Southcentral Kentucky, are susceptible to groundwater pollution due to water's ability to move quickly through limestone bedrock with little filtration. Most in Kentucky drink municipally-treated water; however, many "Plain" (Amish and Mennonite) communities drink untreated and often contaminated karst groundwater. The purpose of our research is to identify and test water sources used by these communities, and to identify potential treatment strategies. We found streams, wells, and karst springs supply drinking water. Treatment methods depended on whether electricity was used in a given community. Some families used reverse osmosis filtering or a commercial device known as "The Water Solution," while others had no treatment. Of these methods, reverse osmosis ensures clean drinking water; however, it requires electricity to produce sufficient pressure. From our testing, we conclude that "The Water Solution" had no impact on bacteria contamination. Additionally, we tested Madi Drops, a nonelectric, passive treatment system using silver disinfection that had promising results but may have complications. Now, we have started to educate Plain communities on the risks of contaminated water and potential solutions; some Kentucky families have become sick from untreated karst groundwater and we hope that education can help ensure the safety of these communities.

Laney, Hannah; "Synthesis of 4d- and 5d-element Based Transition Metal Oxides" (Jasminka Terzic)

Transition metal oxides (TMOs) have long been the topic of research due to their wide range of potential technological applications (e.g., high-density magnetic data storage and spintronics). 4d and 5d-element based TMOs in particular exhibit properties that have not been observed in 3d-TMOs, as a result of the presence of strong spin-orbit interaction (SOI), as well as competition of SOI with comparable energy scales, like Coulomb interaction. This research focused primarily on the synthesis of TMOs containing the elements molybdenum, niobium, ruthenium, and tungsten. Both polycrystalline and single crystal synthesis were performed. Characterization techniques such as powder x-ray diffraction (powder XRD) and energy-dispersive x-ray spectroscopy (EDS) were done on the crystals to determine the resulting phase(s) of each attempted crystal growth. The results of various synthesis and characterization techniques will be discussed, along with the anticipated technologically applicable properties and the methods to study them in the near future.

Lawler, Trayson; "A Predictive Model for Urban Karst Groundwater Systems" (Jason Polk)

Urban karst environments are often plagued by groundwater flooding, a type of flooding where water rises from the subsurface to the surface through the underlying caves and karst features. The heterogeneity and duality of karst systems make them very unpredictable, especially during intense storm events and residents in such areas are frequently disturbed and financially burdened by the effects of karst groundwater flooding. The City of Bowling Green, Kentucky experiences frequent, unpredictable groundwater flooding making it the ideal study area for this project. This project attempts to aid the flooding problem in Bowling Green through the creation of a predictive flood

model for the Lost River Basin – a 150 km^2 groundwater basin that contains most of the city. The machine learning model will be trained using precipitation and antecedent moisture conditions to predict fluctuations of the potentiometric surface. High-resolution data monitoring of 1-minute intervals have been employed at 44 water level monitoring sites and 15 precipitation sites to ensure accuracy of the model. As a result, this study will give advanced warning for flood events, offer additional information on the storage and response times of the aquifer, and create a strong methodology for other flood-prone, urban karst areas.

Lee, Nick; "Functionalist Philosophy in Architecture: The Kentucky Technical Institute" (Shahnaz Aly)

Each school has a noticeable effect on its community's prospective achievements and outward perception. Utilizing a functionalist design approach to new construction, educational architecture can be optimized for the community it serves. The design process behind a new Career and Technical Education (CTE) facility in Frankfort, Kentucky achieved this by focusing on three major aspects: inclusion of community and culture, feasibility, and placemaking. Construction utilized local lime and shale stones as well as gothic revival architecture to relate to the community. The curriculum considered culture-defining industries for the local area, including woodworking, computer science, computer aided drafting (CAD), engineering, manufacturing, and automotive technology. The project targeted feasibility through sustainability, incorporating cost-effective insulating materials, Trombe walls, and other green technologies. The process of placemaking was achieved through purpose driven site selection, landscaping, building orientation, and architectural design. Completion of this project shows that geographical and socio-economic limitations can be addressed in any project, resulting in functional structures solidified within the community.

Lewis, Joseph; "An Analysis of the April 4th-7th, 2022 Tornado Outbreak in the Southeast, with an Emphasis on Synoptic and Mesoscale Meteorology" (Joshua Durkee)

In 2022, from April 4th through the 7^{th}, 89 tornadoes touched down in the Southeastern United States, injuring 17, and taking one person's life. Through extensive research, the cause of storms has been shown to be caused by synoptic and mesoscale characteristics. The purpose of this research is to understand the features that played a role in developing and producing this tornado outbreak. Results have shown that there is synoptic solid forcing, while there were mesoscale features, the synoptic forcing was the main contributor to the outbreak.

Lin, Flora; "The Immersive Virtual Experience Through Virtual Reality CAVE: The Approach to Improve Spatial Perception in Architectural Design" (Fatemeh Orooji)

Virtual reality (VR) applications are transforming the way that architecture is taught. VR provides a context for creative dialogue with users of residential schemes and other buildings, as well as a more comprehensive understanding of architectural concepts. One form of virtual reality, the Cave Automatic Virtual Environment, has proven to be an important resource in education. Cave Automatic Virtual Environment (CAVE) uses projectors to allow users to experience an immersive

virtual environment without the use of headsets. In this project, a multi-faced CAVE system was built to project architectural models using Unreal Engine as a medium to interact with multiple applications in nDisplay. The study involves the creation of 3D models in the computer-aided modeling software SketchUp and rendering the models using software such as Enscape to present the structures in a way that investors and architectural students can gain invaluable information about the building models. The developed virtual reality system was created in hopes of increasing accessibility to virtual reality and determining whether the implementation of various virtual reality systems will benefit university students using quantitative evidence in the architectural sciences.

Linet, Ashlynn; Llorens, Daniela; Carlton, Landon; "Discovery and Analysis of Mycobacterium Phages Ciggy, Llorens, and Spouty" (Rodney King)

The goal of this project was to examine the diversity of bacteriophages in the environment. Here, we describe the isolation and characterization of three mycobacteriophages named Ciggy, Llorens, and Spouty. Bacteriophages Ciggy and Llorens were isolated from a soil sample, while Spouty was isolated from a water sample. Although these bacteriophages were enriched on the same bacterial host, Mycobacterium smegmatis, and purified using the same techniques, each had a unique plaque morphology. However, when viewed with an electron microscope, all the phage particles had similar morphology and were determined to be members of the Siphoviridae family of phages. Ciggy, Llorens, and Spouty's DNA was purified and analyzed using restriction enzyme digests and gel electrophoresis. Our results suggest that these phages differ at the genetic level, consistent with the different observed plaque phenotypes. Our analysis suggests that the environmental phage population is diverse and that different phages can infect the same bacterial host.

Lobe, Austin; "Simulation of Precursor Environments Leading to Formation of Secondary Organic Aerosols" (Matthew Nee)

The goal of this project is to investigate the formation of Secondary Organic Aerosols (SOAs) in which may exist in water ways such as rivers, as well as lakes and streams, even our atmosphere, and the various ways in which they are formed from precursor molecules found in common air pollutants. In the case of this study, the AmberMD computational tools suite is utilized to simulate the interaction of a sulphur dioxide (SO2) molecule as it travels through the air and lands on the surface of a water slab, from which its interactions with the water slab are monitored. Ideally this will provide insight as to what kinds of molecular interactions occur between the water and the precursor molecules on the surface, and as the precursor molecule sinks, if it sinks.

Loewy, Charles; "The Effects of Synoptic-scale Weather Systems on Midwest Snowfall" (Zachary Suriano)

In recent years, the term “climate change” has become much more frequently used than “global warming”. This is because the former more accurately characterizes our current climate situation

– with our average surface temperature rising year by year, there also comes a slew of other climatic effects, from increased frequency of severe weather events to more sporadic teleconnections. One such phenomenon that seems to work counter to our preconceived idea of rising temperatures is the fact that seasonal snowfall is on the rise in some regions (The US Midwest being one of them). An understanding of this trend will be important in managing snow-based resources in the 21st century. Our research looks at (1) the various synoptic-scale weather patterns that cause snowfall in the Midwest region of the US, (2) the spatial footprint of snowfall for each weather pattern, and (3) the meteorological conditions and interannual frequency of the snowfall-producing weather patterns over time. Results indicate that trends in snowfall can be partially explained by the frequency and intensity of these snowfall producing weather patterns.

Lord, Emma; Tolbert, Melissa; Scali, Sarah; "Effectiveness of Nintendo Ring Fit in improving balance deficits after recovery from ACL reconstruction" (Whitley Stone)

The knee's anterior cruciate ligament (ACL) is commonly injured. Despite surgery and rehabilitation, bilateral deficits often persist. Virtual reality games have become a therapeutic technique to improve physical function post-ACL injury. Nintendo Ring Fit has several balance and strength activities to help patients with relevant therapeutic outcomes while also keeping them engaged and motivated throughout their recovery. The purpose of this study is to evaluate the effectiveness of this new technology to further improve balance and strength in post-ACL reconstruction patients. Eight participants (18-24 years) will be recruited. Participants must have had ACL reconstruction surgery in the last 1or 2 years, discharged from formal physical therapy, and have a continued history of participating in physical activity at least three times a week. Four participants will complete 6 weeks of guided programming on a Nintendo Ring Fit at-home while the other four will serve as the control group. Pre- and post-testing will include hop testing, a Functional Movement Systems Motor Control Screen, and strength assessments. Data will be analyzed using repeated measures ANOVAs. It is anticipated that the Nintendo Ring Fit programming will reduce asymmetry deficits between involved and uninvolved legs in both strength and balance.

Lunday, John; "SEM and EDS-based Elemental and High-resolution Petrography-based Analyses of Basalts from East Africa" (Nahid Gani)

Over 500,000 square kilometers of flood and shield basalt rest in a region of East Africa known as the Ethiopian Plateau, locate within the East African Rift System (EARS). Three main volcanic events occurred here during the Oligocene and Miocene times, followed by present-day volcanism relating to the development of the EARS. However, the detailed elemental and mineralogical composition of these basalts to decipher the nature of magma is poorly understood. Twelve basalt samples collected from Ethiopian Plateau were studied from their thin sections using a high-resolution petrographic microscope. Four of these thin sections were chosen to undergo further analysis using energy-dispersive X-ray spectroscopy in the scanning electron microscope (SEM-EDS). The use of SEM allows for a new perspective on observing the spatial distribution of minerals within these basalts. Our analytical observations help distinguish these basalt samples as belonging to Low-titanium (LT) and High-Titanium (HT) containing magma. High magnification

of small, Titanium-bearing minerals reveals a unique structure only found in the sample within the eastern part of the Plateau. The results of this study will allow a better understanding of the composition and distribution of minerals within magma that might shed light on similar magmatic regions, such as Hawaii.

Lynch, Samuel; Whitt, Savannah; Coffey, Olivia; "The Beauty of Community" (Shahnaz Aly)

The purpose of this research was to show that architecture can create a sense of community. Our projects provide residents a place to gather and connect with one another. We introduced a rock climbing gym to a community in Utah, created an animal sanctuary in Kentucky, and provided a refuge for children in Belize. Our common goal was to fulfill the need for community in small towns. In creating these spaces, we took into consideration sustainable features. Our buildings were designed to avoid negative impact on the environment and incorporated recycled materials, solar energy, and gray water systems. We had a common objective of making the surrounding environment better than it initially was. Along with a sustainable approach, our designs are welcoming through the use of simplistic but contemporary forms and materials. We integrated natural lighting by using floor to ceiling windows, and used a neutral palette of colors with an occasional splash of color to form a modern look. We wanted our designs to bring an essence of unity to their overall environment. Altogether, the designs will be incredibly beneficial to their environments in both sustainability and human connection, exemplifying what it is to feel connected.

Lyvers, Ashton; "Masculinity, Femininity, and Dignity: Examining The Relationship Between Gender Expression and Respect" (Amy Brausch)

Gender expectations can create complications in various aspects of our lives, including feeling respected in our relationships, education, and career. This study aims to explore the relationship between gender expression and respect. It is hypothesized that participants are more likely to associate a negative connotation with stereotypically feminine characteristics and that higher levels of conformity to femininity will be associated with lower levels of respect received from peers. Participants were 294 college students recruited from Western Kentucky University. Participants completed the following measures: two versions of the Bem Sex Role Inventory (BSRI), a Feelings of Respect Inventory (FRI), the Conformity to Feminine Norms Inventory (CFNI), and the Conformity to Masculine Norms Inventory (CMNI). The BSRI was modified to measure the connotation participants associate with stereotypical gender traits. Data collection is ongoing and preliminary analyses are reported here. One-way ANOVA results indicated that feminine traits are more likely to have a negative connotation than masculine traits. Non-cisgender individuals reported feeling significantly less respect, while also conforming to feminine traits more than males and masculine traits more than cisgender individuals. Future research should examine any recent changes in gender roles. A larger sample of males and non-cisgender individuals could reveal more patterns.

Majidov, Inomjon; Allamyradov, Yaran; "Laser-induced Smart Surface Patterning" (Ali Er)

An advanced direct imprinting technique that uses laser pulses to produce a thermally controlled surface pattern is quick, easy, and inexpensive. Using an Nd: YAG laser operating at 1064 nm together with a suitable transparent overlay, a sacrificial layer of graphite, and a copper grid, patterned micro indents were created on Ni50Ti50 shape memory alloys and aluminum. The copper grid was ablated to form plasma, and the grid pattern was then transferred to the surface using laser pulses of various energy densities that produce pressure pulses up to a few GPa on the surface. Images from optical and scanning electron microscopes demonstrate that a variety of designs were successfully generated on the surface. The depth of the patterned sample initially grows with the laser energy and then levels out, according to a one-dimensional profile study. Our models of the laser irradiation process also show that when a laser with a 2 J/cm2 energy density is utilized, significant temperatures and high pressures may result

Mansour, Omar; Cambron, Morgan; "Investigating Efficacy of Euler Buckling Formula Vs. Other Formulae in Calculating Critical Failure Loads for Columns with Pinned End Conditions: Engineering Statics Case Study" (Kirolos Haleem)

The study objective is two-fold: (1) determine where Euler's buckling formula and other similar formulae fail in predicting critical load in columns with pinned supports, and (2) apply Statics concepts in educational engineering software. This case study utilizes a simulation software, named "MD Solids", in calculating critical loads in pinned-pinned columns. The critical load is the point of instability where a column will start buckling. Euler's formula provides a framework for the calculation of these critical loads and is commonly taught to undergraduate engineering students. However, our results suggest that this formula has several limitations, which prevent it from accurately predicting column buckling in pinned end conditions. MD Solids allows for effective comparison of Euler's buckling formula, along with other buckling formulae, under identical real-world conditions, to assess which formula provides the most accurate results. Additionally, MD Solids provides a visual representation of column buckling. Understanding how to utilize different formulae (e.g., Euler's, Johnson's, and others) to calculate critical loads is necessary to help engineering students better visualize those factors affecting column buckling, such as slenderness ratio and elastic modulus. This study further proves the efficacy of supplementing Statics learning concepts with educational simulation programs, e.g., MD Solids.

Martin, Graham; "April 2020 Severe Weather Breakdown" (Joshua Durkee)

An examination and regional breakdown of a severe weather event that contributed to tornadoes and damaging winds across Cincinnati, Ohio, on the night of April 8th, 2020. Tornadoes affect millions of people every year, changing lives forever. In this region of the United States, most tornado outbreaks occur overnight in intense lines of storms that hide these short-lived tornadoes in rain. The purpose of this breakdown is to determine if any atmospheric continental or regional factors contributed to an outbreak of these "ghost tornadoes" in the Greater Cincinnati Area

during the overnight. Results from this study show that different wind speeds with changing height may have contributed to this outbreak of tornadoes. Overall, this study will focus on what regional atmospheric features drove these storms to produce tornadoes compared to continental factors.

Mathis, Hunter; "An Analysis of Atmospheric Contributions Toward the Resulting Severe Wind Event Across the Midwestern United States During August 2020" (Joshua Durkee)

A derecho is a widespread, long-lived windstorm that is associated with a band of rapidly moving showers or thunderstorms. Research has shown that these events are affected by a combination of large-scale atmospheric circulations and local-scale features that change the weather on a smaller scale. The purpose of this study is to identify the role of the large and local-scale atmospheric features to determine overall contributions towards this event. Results from this study show that while large-scale features had some influence with the overall set-up of this system, local-scale features helped to strengthen this system as it impacted the Midwestern United States. Other findings show that while there was a large area of circulation in the atmosphere, this did not directly cause the event. Overall, this study shows that a shortwave, or a small fluctuation in the atmosphere, caused this event to take off at the large-scale, and that local-scale features helped this event to be so impactful. As it relates to foundational frameworks for understanding these weather systems, this study shows that the event was not completely applicable at either scale, but that it was a hybrid of both scales.

McCroskey, Felicia; "Amour d'Arthur: Modern Love for a Medieval Man" (David Bell)

Most people may know a few specifics of Arthurian Legend: The Holy Grail, the sword in the stone. Key names are recognizable to many: Merlin, Guinevere, Lancelot, Galahad, Gawain. These are the basic details, but there is more to the legend than just those facts. It is about religion. It is about the qualities of a good ruler. It is about the tenacity of women. It is about love between men. These themes are what keep the legend alive for scholars and artists. The nuances, however, are often lost on those who don’t read the original texts. Morte d’Arthur by Thomas Malory is an 800-page medieval text—not the kind of thing that shows up on the average summer reading list. As a result, I have been inspired to write a creative retelling as my Mahurin Honors Capstone: Amour d’Arthur. The purpose of this is to spark interest in the original texts by returning to the themes and details of Arthurian Legend long forgotten by the public, while also vamping up latent ideas in Malory’s chronicle and examining them through the eyes of a modern, relatable narrator.

McDaniel, Adalin; Barnes, Makenzie; "Leadership Communication and Job Satisfaction" (Katrina Burch)

Communication between supervisors and subordinates has consistently been viewed as a primary element of leadership. Recently, with the massive shift to virtual working, leadership

communication has gained more prominence in research and practical settings. Therefore, examining the role that virtual leadership communication plays in employee job satisfaction is an important first step in beginning to understand the shift to predominant work settings from home. I propose to examine the influence of employee perceptions and preferences of leadership communication on job satisfaction via a panel design which employees a two-time point survey with a one-month lag. Data will be analyzed via regression in order to examine how perceptions of communication influence subsequent job satisfaction. Implications for practice and research will be discussed.

McGettrick, Caitlin; Dick, Olivia; Woodward, Matthew; "The Relationship Between Smartphone Addiction and PTSD: The Role of Avoidance Coping" (Matthew Woodward)

Studies have identified a link between problematic smartphone use and worse mental health problems, such as anxiety and depression. Despite this, little research has examined whether smartphone addiction is associated with worse PTSD symptoms, nor mechanisms that may account for this association. The current submission examined whether smartphone addiction, assessed by the Smartphone Addiction Scale-Short Version (Kwon et al., 2013), was associated with worse PTSD symptoms, assessed by the Posttraumatic Stress Disorder Checklist for DSM-5 (Weathers et al., 2013). We also examined whether avoidance coping strategies of self-distraction, denial, substance use, and behavioral disengagement, assessed by the Brief-Coping Orientation to Problems Experienced Inventory (Carver, 1997), mediated the association between smartphone addiction and PTSD. A sample of 592 students from WKU (77% female, 18% male, M age = 19.4 years old) completed an online survey assessing smartphone addiction, coping strategies, and PTSD. Results showed a significant positive correlation between smartphone addiction and PTSD. Furthermore, the relationship between smartphone addiction and PTSD was mediated by self-distraction, denial, and behavioral disengagement. These results suggest that smartphone addiction may exacerbate or maintain PTSD through its utility as an avoidant coping strategy, indicating clinicians should attend to trauma survivors' smartphone use during trauma treatment.

McIntosh, Isabella; "Variation in Maple Sap Sugar Content" (Michael Stokes)

Sugar Maples (Acer saccharum) and other maple species in Kentucky are becoming more important as components of the forest canopy as green ash trees succumb to emerald ash borer. As maples become more prevalent, they become more accessible to use for resources. Sugar maples are known for producing sap that is used for making syrup, and those with the highest sugar content in sap are the most valuable for production. This study investigates the potential relationship between sap sugar content and the diameter of trees. Twelve sugar maples in close proximity were measured for diameter at breast height and tapped on the Western Kentucky University Green River Preserve in January 2023. Sap sugar content (in brix units) was measured with refractometers. The sugar content of sap from trees = 40cm. Sap was then cooked down to a syrup (66 brix), and a spectrophotometer was used to grade it according to USDA standards to understand the inter-tree variation in syrup grade. No statistically significant difference was

found in sap content between large and small trees, but sap of small trees was significantly more variable in sugar content.

Mean, Linder; "Trammel Fork Distillery" (Shahnaz Aly)

Bourbon is a very important part of Kentucky's culture and its tourists. This distillery will be one-of-a-kind due to its own location in Alvaton, Kentucky. From Corvettes, white squirrels, and the Western Kentucky Hilltoppers, the backstory to this distillery is based around the culture of Bowling Green, Kentucky. The goal is to design a multipurpose distillery that will attract people from all around to come enjoy the peaceful outdoors and our products. It'll include taste testing, gift shops, barrel storage, attract tourism, and have easily accessible drop-off points for corn, wheat, and barley. Spaces for pop-up shops will also be provided for venders to rent out and have the opportunity for their business to grow. These buildings will maintain sustainability by giving back to the community, using local resources from the state such as materials and crops, along with building features such as green roofs, electrochromic glass, and grey water systems. These distilleries will be loved and grown locally. This distillery will capture the eyes of the bourbon world and draw in profitable tourism as well as new competition between the big competitors of the bourbon industry.

Middleton, Gavin; "InSAR Investigation of Subsidence in Northern and Central Bangladesh" (Nahid Gani)

Groundwater exhaustion and exploitation are one of the greatest challenges facing agricultural and urban development. Groundwater consumption continues to increase the quality of surface water decreases due to industrialization and as urban centers evolve into megacities. Bangladesh is a microcosm of these challenges; it is a nation with a mainly agricultural-based economy, with a major urbanized center in Dhaka. Water consumed in the nation is primarily sourced from the aquifer system due to polluted rivers. The easiest to observe record of groundwater withdrawal is the subsidence that follows prolonged groundwater exploitation. The research conducted aimed to observe subsidence across Bangladesh by using cutting-edge satellite technology known as Interferometric Synthetic Aperture Radar (InSAR). By using phase displacement data from the radar, subsidence can be measured. Results from the satellite data showed stable displacement values in Rajshahi, Rangpur, and Dhaka, which were concluded to have been affected by the Bengal Water Machine. Mymensingh was found to have been uplifting, possibly due to a combination of the Bengal Water Machine and tectonics. Sylhet is subsiding due to tectonic activity. Dhaka City was found to have been rapidly subsiding due to anthropogenic activity. This raises concerns about the longevity of groundwater aquifers in Bangladesh.

Miller, Cameron; Simpson, Xavier; Pickle, Blair; "Testing Dice Fairness" (Warren Campbell)

People use dice for all sorts of things, from simple tabletop games to games of chance with money on the line, making it valuable to know if dice are mechanically fair. Our research hopes to establish how to test if a die is fair. Our work has investigated how many rolls are required to accurately test dice and which goodness-of-fit tests should be used. Some specific things done include making code to simulate dice rolls, rolling various dice to gather data, applying lesser-known goodness-of-fit tests, evaluating said tests, and investigating the automation of rolls. The goodness-of-fit tests employed include the Chi-Squared, Kolmogorov-Smirnov, and "Double-Binomial" goodness-of-fit tests. We've evaluated these by rolling dice and comparing the results across the tests, as well as calculating the power of the test and confidence levels through roll simulation. We've determined that the Chi-Squared goodness-of-fit test with 3000 rolls is best. Amounts below 3000 often yield inaccurate results. We're still testing different types of dice, like fate dice, which produce a single number from several dice rolls. We're continuing to investigate ways to test dice and how you can choose fairer dice, which will hopefully go on to help people have a better dice-rolling experience.

Moser, Meredith; "Molecular Evolution of the Cancer-related Mitogen-activated Protein Kinase Kinase Kinase 1 (map3k1)" (Emani Chandrakanth)

The study aims to interpret the molecular biological evolution of the MAP3K1 protein. In prior research, MAP3K1 has been targeted to increase inhibition in growing tumors in multiple forms of aggressive cancers. In this specific study, we analyze FASTA sequences of MAP3K1 from a diverse array of life forms using computational tools. Analysis was performed using bioinformatics software databases NCBI and EXPASY. Conserved domains and evolutionary ancestors were identified through PSI-BLAST and neighbor-joining phylogenetic trees. The initial BLAST analysis has identified a hypothetical evolutionary ancestor, Poecile atricapillus (Black-capped Chickadee).

Moskal, Katie; McCollum, Diamonde; Ali, Mawsoof; "Simultaneous Alcohol and Marijuana (SAM) Use and PTSD Symptoms Predict Blackouts in Emerging Adults" (Jenni Teeters)

Alcohol-induced blackouts and simultaneous use of alcohol and marijuana (SAM) are both associated with negative consequences. Past research revealed SAM users report more blackouts than non-SAM users; little is known about other risk factors for blackouts. Given the relation of PTSD symptoms to alcohol use and insomnia rates among college students, this study investigates whether SAM use, PTSD symptoms, and insomnia are predictive of blackouts. Participants were 313 emerging adults (55% female; 48% White; average age = 23.3) who completed an online survey with measures assessing SAM use, PTSD symptoms, insomnia, and alcohol-related problems (including blackouts). A binary logistic regression analysis was conducted with total PTSD symptoms, SAM use, and insomnia as independent variables and past

month blackout (yes/no) as the outcome variable. Results showed that SAM use was associated with experiencing a blackout (p = .023, OR = 2.25), and PTSD symptoms were associated with experiencing a blackout (p = .001, n.s.). These results indicate that two factors influencing experiencing a blackout are SAM use and PTSD symptoms. Focusing on the connection between PTSD and SAM use informs interventions aimed at reducing blackouts.

Munoz, Samuel; "WKU E-sports Coliseum" (Shahnaz Aly)

WKU E-sports Coliseum Gaming Community: the WKU E-sports Coliseum brings together a community of gamers in an open and high-tech space. The E-sports complex brings together a community that would normally be physically distant from each other. The open spaces invite this group to come together and share their passion in the many Game Lounges, Game Labs, and streaming rooms. The arena creates a place for this group to share comradery for their favorite games and E-sports teams. The arena allows for competitions among students on campus as well as a place to cheer our E-sports team on in various events. The E-sports complex brings together this community of gamers to share what they love in competition and leisure. The high-tech equipment and classrooms also allow this group to further pursue what they love with E-sports, editing, and other various gaming-related classes.

Muradova, Yasmina; "Molecular Evolution of the Cancer-related Mediator of RNA Polymerase II Transcription, Subunit 12 Homolog Gene (med12)" (Chandrakanth Emani)

This study examines and analyzes the molecular biological evolution of the MED12 gene, found on the X chromosome. Mutations to MED12 have been linked to X-linked dominant mental retardation, FG syndrome, Lujan-Fryns syndrome, instances of prostate cancer, uterine leiomyomas, and breast fibroepithelial tumors such as fibroadenoma and phyllodes tumors. The gene encodes for the protein mediator complex subunit 12, one of the 25 proteins that form the mediator complex. The mediator complex is a part of the pre-initiation complex (PIC) which regulates promoter-specific transcriptions of the RNA polymerase II (pol II) enzyme, making it classified as a general transcription factor. In this study, the FASTA sequences of the MED12 gene was analyzed from a variety of life forms using computational tools. Analysis was performed using bioinformatics software databases NCBI and EXPASY. Conserved domains and evolutionary ancestors were identified through PSI-BLAST and neighbor-joining phylogenetic trees.

Muse, Matthew; "Plastic Development in Disc Golf Production" (Benjamin Dinan)

Disc golf has been a fast-growing sport for the past decade. Disc golf companies must tailor their products to a wide market. The easiest way for a company to develop new discs is by altering the plastic compounds. There are three main plastic types that companies focus on: base, midgrade, and premium plastics. Base plastic is great for putters because of its grip and straight flight. However, the material breaks down quickly resulting in deteriorating flight characteristics.

Premium plastic is the strongest and most resistant to chipping and cracking, often used in drivers which are more likely to impact obstacles. Midgrade plastics provide a balance between strength and performance of the premium and base plastics and are used for mid-range distances. There are also many subsets of these three plastics, the formulation and properties of which are dependent on the manufacturer. By combining different plastic compounds and disc geometries, manufactures can tailor disc flight characteristics and performance, and even make discs which glow.

Naidugari, Divya; "Road Safety in Gambia and Tanzania" (Grace Lartey)

Road traffic injury is the seventh leading cause of death in low-income countries and the tenth leading cause of death in low-middle-income and upper-middle-income countries; however, it is the leading cause of death for the 5–29-year-olds. Globally, about 1.35 million people die from road traffic crashes each year, and between 20-50 million sustain various forms of non-fatal injuries. This study seeks to provide information on youth's perception about risky road traffic safety behaviors. Self-administered surveys were distributed to students at six universities and colleges in two African countries: The Gambia and Tanzania. Driver impairment and distraction were identified as the two road safety risk behaviors among the youth. Driver distractions are a major component of safety culture on the roads in The Gambia and Tanzania. Cellphone use is particularly a great concern. Prevention efforts should focus on not only roadway designs and vehicle factors, but also safety culture of other road users, especially the youths.

Naidugari, Divya; "Regional Control of Hairless and Hair Bearing Skin: with DKK2 and SOSTDC1 Wnt/β-catenin Signaling Pathways with the LEF/TCF Family" (Sam Earls)

The majority of our body regions contain hair follicles of varying density, length, and thickness; however, some areas of our body are entirely hairless. Examples of this in human anatomy include the ventral wrist, underside of toes, soles of feet, and the palms of hands. Basic laboratory mice contain the exact genetic coding for hairless regions including the plantar epidermis and the eccrine gland-bearing footpads. This skin in the footpads, however, contains a wide mixture of hair follicles in many different mouse strains. By manipulating these genes, we can begin to scratch the glass on creating a cure for ongoing diseases, specifically alopecia. Hair follicle regeneration signaling pathways play important roles in how each follicle is spaced, how it began, and its possible postnatal growth, specifically the Wnt/β-catenin signaling. When Wnt ligands and LRP5/6 co-receptors interact, nucleus translocation complexes react with the LEF/TCF family of DNA to activate the transcription of target genes, specifically DKK and SOSTDC1. In this project, we analyzed skin phenotypes in DKK2 null mice to address this question. We hypothesize that the patterning of hair follicles in hairy developed skin will proceed in regular function in the loss of the DKK2 gene.

Nath, Rajib; "Towards Using Iron/Nickel Hybrids to Replace Platinum in Light-harvesting Materials." (Lawrence Hill)

Photocatalysts use light to initiate chemical reactions. For example, water can be photochemically “split” to generate hydrogen gas and oxygen gas to use as a renewable energy source. Metal-semiconductor hybrids have been studied extensively as photocatalysts for the water-splitting reaction. The semiconductor component converts light into electrochemical energy, while the metal component provides a site for chemical reactions with water. Here, the choice of metal can have a significant impact on the efficiency of the catalyst. Platinum efficiently catalyzes the water-splitting reaction and is therefore commonly used in metal-semiconductor hybrids to generate hydrogen. Platinum is very expensive, which motivates research into improving less costly metals like iron or nickel that do not have nearly the catalytic performance of platinum. Recent results have shown that iron and nickel can be combined into structures with oxygen that behave similarly to platinum at a fraction of the cost, but these hybrids have not been tested in photocatalysts. This presentation will describe our work towards using hybrids of iron and nickel with oxygen to replace platinum in metal-semiconductor hybrid photocatalysts.

Nichols, Madeline; "Synthesis, Characterization, and Study of Biomimetic Metal Complexes for Important Oxidation Reactions" (Rui Zhang)

In nature, the ubiquitous cytochrome P450 enzymes containing an iron protoporphyrin IX active site efficiently catalyze important oxidation reactions with remarkably high efficiency and stereoselectivity. Thus, numerous transition metal complexes, including metalloporphyrins and metal phthalocyanines, have been synthesized as enzyme-like catalysts to mirror the oxidative capability of cytochrome P450 enzymes. In this presentation, a series of manganese(III) and iron(III) porphyrins were synthesized and spectroscopically characterized by 1H NMR and UV-vis. Under optimized conditions with iodobenzene diacetate as the oxygen source, these manganese complexes function as efficient biomimetic catalysts for the oxidation of sulfides to sulfoxides with high efficiency and selectivity. Furthermore, the competition catalytic studies by the manganese(III) phthalocyanine complex provided insights into the transient oxidant in the catalytic oxidation reactions where physically active intermediates are not spectroscopically observable.

Norman, Katie; Groves, Chris; "Quantitative Groundwater Tracing Experiments in the Great Onyx Groundwater Basin, Mammoth Cave National Park, Kentucky" (Lee Anne Bledsoe)

Karst landscapes are characterized by soluble bedrock, with much water flowing underground through caves to reemerge at surface springs. As groundwater flow in karst areas cannot be determined with surface mapping, fluorescent dye tracing can be used to trace the routes of underground rivers to delineate groundwater flow direction and aquifer characteristics. To improve hydrogeological conceptual models of the Great Onyx (GO) Groundwater Basin, two fluorescent dye traces were conducted in June 2022. The GO basin is located wholly within Mammoth Cave National Park (MACA), so, in partnership, Crawford Hydrology Laboratory

(CHL) designed the traces to support park resource management efforts and directly inform a CHL Master's thesis. After simultaneous injections of fluorescein and Rhodamine WT dye into the ground above the karst aquifer, an Aqua Troll 500 datalogger deployed at GO Spring electronically measured dye concentrations every 30 minutes for 28 days. This preliminary data allows analysis of the dye breakthrough curve for time to dye arrival, peak concentration, center of mass, mean travel time and percentage of dye recovered. With further analysis, the breakthrough curve could provide information regarding the conduits and storage characteristics of the aquifer.

Nowaskie, Gabriel; "Quarkonium Dynamics in Quantum Phase Space" (Tony Simpao)

Since the groundwork published by Torres-Vega and Frederick, the Quantum Phase Space Representation (QPSR) has been explored as a method for solving a multitude of physical systems and describing phenomena. Most recently, Valentino A. Simpao has developed a method, the Heaviside Operational Ansatz, to solve the Time Dependent Schrodinger Equation (TDSE) in the QPSR, but there are still no general, direct methods to solve the Time Independent Schrodinger Equation in the QPSR. There is also no current formulation of quarkonium in phase space. In this paper, we describe the strong interactions of non-relativistic heavy quarks using the Cornell potential, and present a scheme to solve for the phase space wave function and its energy eigenvalues using the Nikiforov-Uvarov method. This solution can be generalized for any two particle system with a scleronomic potential made up of polynomial and reciprocal terms. These results are compared to experimental results and other theoretical models. We also analyze the behavior of these wave functions, which suggest a correlation between radial momentum and the upper limit of existence in charm-anticharm meson.

Ochoa, Galilea; "Distance to RR Lyrae AO Tuc" (Ting-Hui Lee)

RR Lyrae stars exhibit a linear period-luminosity relationship and are useful for measuring distances to globular clusters in our galaxy and nearby galaxies. Our research is a segment of an extensive effort investigating variable stars with robotic telescopes, with the primary goal of improving the period-luminosity relationship of RR Lyrae stars. We used Las Cumbres Observatory Global Telescope Network to obtain images of RR Lyrae variable star AO Tuc every four hours for three weeks in four filters: B, V, ip, and z-s. We analyzed AO Tuc's light curves to find the period and calculate its distance. The metallicity of a star (abundance of heavy elements relative to hydrogen) can also affect the distance calculation. For a metallicity value of -0.46, the measured distance of AO Tuc is 904 ± 23 pc, and for a metallicity of -1.25, the measured distance is 993 ± 24 pc. The distance values obtained were compared with those of the Gaia Space Telescope, and two versions of Gaia data were used for comparison: Gaia Data Release 2 of 1313 ± 49 pc and Release 3 of 1253 ± 22 pc. We found that our distance value with lower metallicity is more consistent with Gaia.

Ogbebor, Elisha; "Liquid Chromatography-Mass Spectrometry (LC-MS) Method Development for Determination of β-defensins in Bovine Milk" (Eric Conte)

Bovine mastitis is caused by a wide range of pathogens which results in a substantial economic loss for the dairy cattle livestock industry. β-defensins are a part of the innate immune system and act as the first line of defense against mastitis in bovine. β-defensins (~6-10kDa) are antimicrobial peptides that contain about 28 to 67 amino acids, the presence of six cysteine residues results in three disulfide bonds formed and a β-sheet structure. A few β-defensins have been identified in cows based on site of occurrence and time of expression in tissue, but not in milk. A Solid Phase Extraction (SPE) and Liquid Chromatography Mass Spectrometry (LCMS) method is developed for the identification of β-defensin in bovine milk of healthy and mastitis infected cows. The LC-MS responses for infected bovine milk was compared with the response obtained from the healthy sample. The peptides were separated on a C8 column (150 x 2.1 mm, 3.6 µm) on a Thermo Scientific HPLC system using an acetonitrile:H2O in 0.1% formic acid mobile phase gradient coupled with the TSQ Thermo Fortis mass spectrometer. A scan range from 100 –2000 m/z in the positive ion mode was used for the acquisition. Other antimicrobial β-defensin peptides are expected in mastitis-infected bovine milk and will be presented.

Oliver, Travis; "Using Standards-Based Grading to Promote Student Success and Learning in Introductory Physics" (Scott Bonham)

We are systematically evaluating an implementation of standards-based grading in an introductory physics course, an innovative instructional approach that seems to be able to increase student success in the class while also raising standards. Standards-based grading is a form of mastery learning where students demonstrate mastery of learning objectives instead of accruing points, including opportunities to learn from mistakes and reassess. We are assessing conceptual learning and self-efficacy through a pre-test and post-test design and assessing problem-solving skills by analyzing student quizzes throughout the semester. Additionally, we are seeking to better understand the dynamics and different factors that most affect student growth throughout the course by looking at student work and communication. We seek to fill a gap in the research literature on standards-based grading in introductory physics. We hope that by filling this gap in educational research and demonstrating the effectiveness of standards-based grading, we can motivate other educators to utilize the approach in their classrooms.

Otieno, Natasha; Menuz, Karen; Mohapatra, Pratyajit; "Analyzing the Effect of Anoa Mutation on the Firing Pattern of Olfactory Neurons" (Cheryl Kirby-Stokes)

Animals of all species rely on olfactory cues to analyze chemicals in their environments. Insects, especially, use this system for their own survival. Insect olfactory systems are highly specialized and are used in locating mates, identifying plant and human hosts, and species communications (van der Goes van Naters and Carlson, 2006). Prominent advances have been made in understanding the insect olfactory system at the molecular and cellular levels, including odorant receptor mapping, sensilla distribution and odor coding. Since insects have very specialized olfactory systems, identifying conserved genes can be crucial in determining the cellular

functions and mechanisms that ensure survival within species. Using Drosophila melanogaster as a model organism, an evolutionary conserved gene, anoA, has been identified as an antennal enriched gene (Mohapatra and Menuz, 2019). It belongs to the anoctamin family, some of which function as calcium-activated chloride channels (Whitlock and Hartzell, 2017). This project works to analyze anoA's role in odor responses after stimulus termination. By using bioinformatics to assess wild type and anoA mutants' responses to different odorants, we can identify how this gene impacts olfactory signaling.

Pace, Connor; "The Hill Resort" (Shahnaz Aly)

I have brought a resort tourist attraction to Bowling Green, Kentucky. The resort has amenities for adults as well as minors to have fun, including billiards, slot machines, arcade games, swimming pool, and a massive lounge bar and restaurant. One of the things that Bowling Green is lacking is having a place that guests of the city can stay and enjoy resort/cruise-like amenities. Many people come to see the university for their kids, Lost River Cave, The Arling, and many other things. This resort changes the way guests stay in Bowling Green. The amenities of The Hill Resort are a tourist attraction of its own, even though the building is supplying a nice place to stay while visiting other attractions. The significance of a building like this is that it has never been done before in Bowling Green, so the first all-inclusive resort has to be done right and in a way that the whole family can feel included.

Pandey, Shreya; "Source Tracking and Contaminant Transport Mechanisms of Nitrates and E. coli in Karst Groundwater Systems Under Agricultural Land Use" (Jason Polk)

Karst areas face severe groundwater contamination that degrades the quality of water because these landscapes are susceptible to pollution. When agriculture is practiced, contaminants are released into the groundwater, which impacts the water quality. This study focuses on how agricultural contaminants, specifically nitrates and E. coli (Escherichia coli), are transported through the karst system by identifying the contaminant transport mechanisms and using source tracking analysis. The study areas for this research are Crumps Cave in Smiths Grove and Church Karst Window in Bowling Green, Kentucky. Grab samples will be collected during storm events at high-resolution to capture contamination that occurs during storms throughout the growing season. Geochemistry will be recorded using a YSI ProDSS and samples will be analyzed at the HydroAnalytical and USDA labs for nitrate, bacteria, and source tracking (DNA). The data will be compiled in OriginPro spreadsheet software to statistically analyze time-series occurrences of each parameter, which will be regressed to determine relationships between them and environmental drivers. ArcGIS Pro will be used to create maps that visually represent the agricultural land use areas in the karst regions to identify and quantify contamination impacts.

Pansuria, Kareena "Building a Spectrometer for Photometric Titrations" (Eric Conte)

EDTA (ethylenediaminetetraacetic acid) titrations of metal ions are commonly used to synthesize compounds for commercial applications. Calmagite is a common indicator chosen for these titrations. Color perception can differ drastically from person to person resulting in a large standard deviation in endpoint volumes. Building a simple, inexpensive spectrometer can reduce the degree of uncertainty when undergoing this titration. Currently, the light source, sample cell, and detector are held in a 3D printed model, and an Arduino program controls the mechanical syringe pump that holds the titrant. Calibration curves are being performed to ensure accuracy of the spectrometer.

Patel, Shiven "A Stay at The Live Oak Inn" (Shahnaz Aly)

My project involved a hotel and restaurant located in Orlando, Florida. When I was younger, my family and I would go on vacation, and staying at hotels always felt like that was also a part of the vacation and not just a place to stay. Rooms with big beds, free breakfast, movies on big TVs, room service, and a pool all made staying at a hotel fun for my family and me. One city known as a popular vacation spot is Orlando, Florida. Many families travel there for vacation because of the theme parks, such as Universal Studios and Disney World. This influx of people means places where they need to stay will be needed. My design gives the same feeling I had when I was younger and went on vacation. The goal of this project is to create a design that has an eye-catching exterior while keeping a functional layout in the interior.

Patterson, Kellen; Schulte, Connor; Williams, Julian; "Polystyrene Beads with Incorporated Photocatalyst" (Matthew Nee)

Oil pollution in aquatic environments is an issue that has become more relevant in recent years, especially since many ecosystems are now cornered by climate change, habitat loss, and other human activity. Harnessing photocatalysis by using polymer beads as a substrate is crucial in solving this decades-old problem. Photocatalytic beads would float over a body of water and use the light of the sun to speed up the degradation of organic pollutants. Our group has previously synthesized polydimethylsiloxane (PDMS) beads with incorporated titanium dioxide that effectively degraded organic material. Similar beads composed of polystyrene rather than PDMS are a cheaper alternative. A process called dispersion polymerization was used to synthesize small, polystyrene beads. Experiments focused on achieving a surface structure with high porosity to maximize the amount of titanium dioxide that could be incorporated. After achieving the ideal bead structure, further experiments that included titanium dioxide in the reactant mixture yielded solid bead product. Energy dispersive X-ray spectroscopy confirmed titanium dioxide had been successfully incorporated into the beads' surface structure. Ultraviolet-visible spectroscopy trials were done to assess the polystyrene beads' effectiveness in degrading organic material. Data showed that methylene blue degraded faster in the presence of the photocatalytic beads than it did alone.

Payne, Garrett; "An Innovative and Healthful Approach to Community-based Design" (Shahnaz Aly)

The intent of Barren Springs Senior Living is to create a comforting and healthy lifestyle for the elderly population in Glasgow, KY. Current facilities typically are cold, dark places that are lacking in design, so when designing the facility, it was important to ensure that residents felt welcome. This is done through the use of warm and earthy tones, such as natural wood, natural stone and a neutral color palette. This provides residents with a feeling that one can only get from a place called home. The implementation of communal spaces and amenities such as a gym, outdoor gardens, lounge areas, a general store, salon etc. provide residents with the ability to socialize with one another and helps to maintain their overall happiness. Together, all aspects of the design help to contribute to the mission of overall wellness.

Peake, Susanne; "An Analysis of the Large-scale Atmospheric Contributions Towards the Dual Derechos Across the Midwest and Mid-Atlantic States in June 2013" (Josh Durkee)

Derechos are widespread straight-line windstorms that prosper in the summer months and lead to tornadic and severe wind development that endanger lives across the states. Research has established that derecho events are derived from existing cyclones, which are conditioned to form by large-scale atmospheric circulation features on a continental scale. The purpose of this study is to identify the role of slowly-evolving wind fields from the surface to 12 km to determine their overall contributions towards a consecutive derecho event on June 12th and 13th, 2013. Results from this study show constant pressure fields that sufficient moisture and velocity to develop thunderstorms, and increased in magnitude due to cold air movements. The findings using a large-scale atmospheric circulation theory indicate that the theory was not pertinent in this case, and was not deeply involved with the development of the two derechos. Overall, this study shows that large-scale atmospheric elements did contribute to the origin and magnitude of the initial storms, but not to the expansion into two consecutive derechos. As it relates to foundational theoretical and conceptual frameworks for understanding these behaviors, this study shows that the event was not completely applicable at this scale.

Pearley, Lamont; "Blues Narrative: Blues People, Covid-19, and Civil Unrest" (Ann Ferrell)

The “Blues Narrative: Blues People, COVID-19, and Civil Unrest” focuses on African Americans born between 1945 and 2004. The article delves into the establishment of homes, lifestyles, and traditions on a concrete terrain with Southern and country values. Blues Narrative shares how those values not only weathered the storm of many generations but how they armed interviewees to defend what some call an all-out attack on the Blues People in the present day. This is an ongoing project conducted from the perspective of a folklorist and ethnographer.

Peden, Travis; "Expansion of Solar Eclipse Research Project through Extended Reality (XR), Experience-based Digital Media to Promote Citizen Science" (Mark Simpson)

As an extension of research derived from the WKU XR lab, the Solar Eclipse Megamovie project was expanded by focusing on the citizen science aspect of our projected scope. Initially, the project was intended to collect data on Baily's Beads in the form of images of total solar eclipses, particularly of the upcoming 2024 eclipse. We anticipated one million downloads of the app to produce adequate data to send to NASA. Strategic advertising is required to spread awareness of both the solar eclipse event and the app to produce results. I intend to produce two main extended reality projects to accommodate this advertising process. A social media-based augmented reality filter will be created to engage the targeted audience. The second asset will be an integrated augmented reality training experience as a means of preparing our users beforehand. By giving our audience the opportunity to practice the data-collection process before the actual event, the margin of error significantly decreases. Introducing gamified elements into this application makes the learning process more engaging for users of all ages. By approaching this project from the lens of citizen science, we are making scientific endeavors more approachable to society.

Pekara, Brittany; "Virtual Watershed Management Planning Framework for Hazard Mitigation Using GIS and Smart Sensor Technology Integration" (Jason Polk)

Watersheds are continuously threatened by environmental hazards, like flooding and water pollution, particularly in vulnerable karst areas. Addressing these issues requires the creation of watershed management plans to improve water quality conditions and protect drinking water sources. Recently, the Internet of Things (IoT) has offered substantial technological advancements for real-time "smart sensor" data collection by combining the real and virtual world through a global, dynamic network. Here, an assessment of watershed planning under the EPA's 319h plan and data collected will be conducted and a framework developed to mechanize best practices using technology, outreach, and software integration to implement watershed safety planning. This management planning framework will be tested and evaluated using the EPA 319 Jennings Creek Watershed Project. Real-time data collection using smart sensing will be used to continuously monitor water at site locations in comparison to grab samples collected at lower-resolution in the study area for one year. The goal is to assess the effectiveness of environmental smart sensing for watershed management via a framework that integrates Geographic Information Systems (GIS) to improve overall planning and hazard mitigation when dealing with watershed planning hazard mitigation.

Pemberton, Will; Woodard, Tyaha; McElroy, Benjamin; "Investigating Distracted Driving Crashes in Kentucky: Pre- and Post-covid-19 Pandemic Comparison" (Kirolos Haleem)

Distraction is one of the primary reasons for traffic crashes and it resulted in 3142 fatalities in 2020 in the United States. This study aims to investigate and compare the impact of distraction-related crashes in the state of Kentucky pre- and post-COVID-19 pandemic. Distraction-related crashes were collected from the Kentucky Transportation Cabinet (KYTC) between 2018 and

2021 and used in the analysis, with “2018-2019” crashes representing pre-pandemic, while “2020-2021” crashes representing post-pandemic. Descriptive statistics on various geometric (roadway condition), environmental (weather), driver (age and driving under the influence), and crash (severity and time) related factors were performed to compare the trends pre and post pandemic. The results showed that distraction-related crash severity increased by 0.4% post-pandemic even though the total number of distraction-related crashes went down. Middle age drivers’ (30-49 years) involvement in distraction-related crashes increased by 0.5% post-pandemic. Single-vehicle and angle distraction-related-type crashes increased by nearly 2% post-pandemic, whereas rear-end crashes decreased by 5% post-pandemic. A concerning statistic was the increase in distraction-related crashes related to driving under the influence (of alcohol and drugs) by 0.54% post-pandemic. The study findings can help provide safety countermeasures to KYTC to reduce distraction-related crashes in the state.

Petty, Madeline; "Completing and Improving the Collection of Data for Sustainability Reporting at WKU” (Leslie North)

Global carbon emissions from individual, organizational, and institutional activities influence the environment. Organizations and institutions use sustainability reporting methods to regularly track and report metrics relating to emissions from collective activity, yet data needed for such reporting can be difficult and time-consuming to collect. Multiple institutions, particularly universities, often use digital, standardized carbon footprint reporting tools to help overcome these challenges. Still, using digital reporting tools does not alleviate all challenges faced in regular carbon reporting due to the lack of data collection structure among university departments. This scholarly activity attempted to calculate the carbon footprint of Western Kentucky University (WKU) for academic year 2019-2020. The net carbon footprint was calculated at 44,896.19 metric tons of carbon dioxide equivalent. Additionally, a data collection structure was developed and evaluated to effectively collect and report carbon data annually. The data collection structure was distributed to and tested by respective departments. Feedback was collected via surveys and implemented, resulting in a custom, simplified data collection process for each department. The project resulted in a completed carbon footprint for 2019-2020 along with an efficient data collection structure to support regular benchmark and comparison of WKU carbon data, allowing for improvement of campus sustainability.

Petty, Madeline; "Differences in Renewable Energy Generation and Renewable Energy Policy Across California, Kansas, and Tennessee" (Jun Yan)

Renewable energy (RE) is an increasingly widespread source of low-emission electricity generation. RE plants may differ in plant density, megawatts of generation, and renewable type across the United States. Individual states within the U.S. enact differing policies to establish RE portfolio standards and clean energy standards that influence the development of renewable energy. This study used ArcGIS to analyze RE power plants in three U.S. states: California, Kansas, and Tennessee. Kernal density estimation is utilized to compare the density of RE generation of the study sites, each representing a different U.S. region (West, Midwest , and Southeast). The density by type of renewable generation is also compared across the states. State

policy regarding renewable and clean energy standards was analyzed and compared to the density of renewable generation of power in each state. A set of density maps were produced that compare the chosen U.S. states along with written descriptions of key state RE policies. The study is important in understanding the distribution of different RE types across the U.S. and what state policies or lack thereof may support or prevent RE implementation.

Pfeifer, Maria; "Hormonal Contraceptive Use: An Assessment of Executive Function" (Sam Earls)

Hormonal contraceptive use has increased significantly since the beginning of the twentieth century, and with it, research investigating its potential effects. Numerous studies have suggested significant relationships between the use of hormonal contraception and its effects on the brain and cognition. Our study sought to investigate the potential relationship between hormonal contraceptive use and executive function in adult women. Our sample consisted of women (N = 910) in the United States. An anonymous survey was sent to all students aged 18 or older at Western Kentucky University and Franciscan University of Steubenville in Steubenville, Ohio. It was also distributed via social media. The survey consisted of demographic questions, contraceptive use questions, Executive Skills Questionnaire - Revised, reproductive health demographics, an adapted version of the Knowledge of the Female Body Scale, and substance use questions. 34% of participants reported currently using some form of contraception, with 50% of those participants reporting oral contraceptive use. Oral contraceptive users reported significantly lower executive function in the areas of Response Inhibition, Metacognition, and Emotional Control, with a tendency towards significance in the areas of Task Initiation and Goal-Directed Persistence. Our analyses suggest the potential for hormonal contraceptive use to negatively influence executive function with the potential for significant behavioral and social consequences, thus indicating the necessity for additional future research.

Philpot, Kyler; "Container City" (Aly Shahnaz)

My project will be a multi-family shipping container complex. It consists of spaces like a pool, outside activities, and storage. This project will draw attention to Bowling Green and create affordable housing. Bowling green is in between Nashville and Louisville and creating a massive influx of people with housing. The objective is to create a sustainable complex made of shipping containers to help with recycled goods and create a multi-family purpose home area for newcomers and residents of Bowling Green. This is a more sustainable approach to the future of this city's architecture. A primary goal is to establish green architecture along with affordable living for its occupants. By doing this it will reduce our carbon footprint and increase the amount of recycled goods.

Poore, Ethan; "Studying Blazar Variability with TESS: Comparing Data Reduction Pipelines with ZTF Observations and Power Spectrum Density (PSD) Plotting" (Michael Carini)

Blazars are characterized by largely aperiodic variability on timescales ranging from minutes to decades across the electromagnetic spectrum. The Transiting Exoplanet Survey Satellite (TESS) mission is able to capture the rapid variability of these targets at optical wavelengths with its 30-minute sampling rate. TESS surveys the entire sky in 2 cycles comprised of 13 sectors each, with each sector observed for at least 27 days. Proper removal of both the background, thermal ramping, and onboard systematic effects is crucial to provide correct analysis and interpretation of blazar variability. Multiple publicly available procedures claim to properly correct for these effects utilizing a range of methods to model the background, thermal and systematic effects. Using ground-based observations from the Zwicky Transit Facility (ZTF) as “ground truth” observations, we compare 6 different methods to each other, and to our “ground truth” data, in order to identify which methods properly correct the light curves for 10 different blazars. In addition, we determine the effect these different methods have on one of the most common tools used to characterize the variability: the PSD. We find that only three of the six methods compared simple differential photometry, Eleanor background subtraction and Quaver pipeline methods) produce TESS light curves consistent with the ground-based ZTF observations.

Powell, Lindsey; "Using Biometric Technology to Measure Physiological Stress in Child Welfare Workers" (Austin Griffiths)

Frontline child welfare workers perform essential services to promote the well-being of Kentucky’s children and families. These services in frontline child welfare can elicit significant stress, with the potential to negatively impact the health and wellness of the child welfare workforce. Previous research has utilized self-report measures to document high levels of stress experienced by child welfare workers. However, little research has examined the health of the child welfare workforce and no prior studies have examined the physiological impact of the stress related to working in this position. The present study begins to address a significant gap in the current body of research. Using wearable biometric technology, the Kentucky Child Welfare Workforce Wellness Initiative explored the physiological indicators of stress and recovery in child welfare workers over continuous 72-hour periods, while using an innovative methodological approach and an evidence-based mindfulness intervention. This presentation will discuss the process of the initiative, and highlight student involvement throughout.

Powers, Jackson; "Atypical Tornado Climatology and Vertical Profiling" (Xingang Fan)

During the night of December 10-11th, 2021, an EF3 Tornado struck Warren County and Bowling Green, Kentucky, reaching 165 mph winds and affecting the entire community. Both a nocturnal and winter tornado, it took plenty of people off-guard, reducing the effectiveness of warning measures. This study will examine the climatology of tornadoes in the United States going back to 1960, particularly out-of-season and nocturnal tornadoes. The particular danger of these types of tornadoes put people at a higher risk than other types of tornadoes. Included in the

analysis will be strength, track length, fatalities, estimated cost of damage, and total number of tornadoes. These variables are looked at on a seasonal and monthly basis. This study will also examine and compare the vertical thermodynamic profiles of both typical tornadoes and out-of-season tornadoes. The prediction is that out-of-season and nocturnal tornadoes are more dangerous and potentially stronger on average than typical tornadoes, due to the higher-than-usual barrier-to-entry for tornadogenesis.

Railley, Airelle; "Examining the Impact of Holistic Practices on LGBTQIA+ Wellness" (Michelle Reece)

The project involved surveying the before and aftereffects of holistic healing for ten undergraduate Kentuckians who identify as LGBTQIA+. The purpose of this pre-test/post-test quasi-experimental project was to assess LGBTQIA+ participants' experience with holistic and wellness care, by utilizing on or off-campus holistic wellness activities. Participants enrolled in the project and were split into two groups of five. Both groups completed the pre and post-tests. The intervention group was required to attend at least one yoga session per week whereas the control group was lightly "encouraged" to attend any health and wellness activities. Each participant was instructed to complete and submit documentation of their activities over the span of three months. Those documents included surveys and weekly journal entries. Early qualitative and quantitative results indicate that at the beginning of the study, 80% of participants included the keyword, "challenging" in their journal entries. Towards the middle of the study, 50% used the keyword, "comfortable" in their journal entries. In addition, students were able to identify forms of alternative healing, natural remedies, and embrace the various dimensions within the eight aspects of wellness. As for the end of the project, data gathering is still in progress.

Raines, Meghan; Bledsoe, Lee Anne; "Great Onyx Cave: A Natural Laboratory and Outdoor Classroom for Learning About Karst Hydrogeology, Mammoth Cave National Park, Kentucky" (Chris Groves)

This research describes an innovative set of processes to measure flow rates in an underground steam setting, and ties into a larger project aiming to inform a better understanding of karst landscapes and their relationship with global climate change. Cascade River, located within Great Onyx Cave in Mammoth Cave National Park, begins at the base of a small waterfall where it sinks into the rocky streambed and underneath a cave wall. The stream reemerges at Cascade Spring and into a small pool roughly 75 meters downstream where it flows up to and over a large waterfall, falling approximately 25 meters. Due to the anisotropic and heterogeneous nature of this terrain, four independent methods are being utilized or are in-progress to collect discharge data to measure the flow rates. These include a barrel weir, a time-to-fill bucket method, a salt dilution tracer method, and a wading rod method. This set of processes along Cascade River has created a natural laboratory for demonstrating various techniques for conducting research in karst hydrogeology. A significant outcome of the project has been the numerous students who have assisted with both the set-up of these sites and with the data collection, gaining hands-on, real-world experience.

Ramic, Ella; "Architecture with Personality" (Shahnaz Aly)

Architecture was meant to uplift and inspire individuals, in return, to gather the community and bring individuals together. Dull architecture kills life. It kills our connections, passions, and drive. Monotonous architecture kills our Earth and our people by increasing the carbon footprint. It creates stress and fear among our communities, because this architecture has no soul. It is mundane and plain, dragging along our people with it. Unique, engaging architecture will steal the show every time, and be understanding to its environment. Through faith, emotions, and appeal, buildings can be the remedy to our dreary society. Statement architecture will always be inclusive, everlasting, and expressionistic of both its people and its personality. Find yourself in architecture, and you will find life.

Ranger, Ashley; “Long, Hot Summer: Freedom Summer and Human Rights Abuses” (Patricia Minter)

The civil rights movement of the 1960s began to create national attention to the immense discrimination experienced by Black Southerners. Organizations such as the Student Nonviolent Coordinating Committee (SNCC) would launch “Freedom Summer” as a campaign to give Black Mississippians their human right of autonomy, education, and the right to vote without fear. However, this would become a nightmare for white supremacists within Mississippi. This research focuses on the tactics used by white supremacists during Freedom Summer and how the Black community’s common experience drew national attention to Black voter disenfranchisement in the Deep South. Sam Bowers, the leader of the white supremacy movement within Mississippi, shows how white Christian nationalism played into his platform against Black Mississippians and civil rights workers. This research examines how Bowers and his followers viewed the social structure of Mississippi as a divine contract that served white interests. Bowers and his followers viewed themselves as crusaders in SNCC’s interruption of the divine social contract. As a result, the murder of three civil rights workers, James Chaney, Andrew Goodman, and Michael Schwerner, would become martyrs within the national context of the Civil Rights Movement.

Ray, Trinity; "Costume Design to Convey World and Character in Historical/Fantasy Video Games" (Jane Fife)

Fantasy video games and literature are on the rise. The details of fantasy fiction costume design are often overlooked; however, there is meaning and purpose behind their creation. By connecting best practices within the creation of video games and costumes with the details written in fantasy fiction novels, a large amount of information can be shown about the characters. To illustrate the process of adapting a fictional character to video games, I have reviewed Tricia Levenseller’s Daughter of the Pirate King to show the correlation between written and visual costume design details. Taking the information from the main character in Daughter of the Pirate King, visual depictions of how to create a costume design for this character were explored, as if there were a video game adaptation. The depictions represent her personality and characteristics, without having the written story. After combing the novel

carefully for details crucial to the development/essence of the main character of Alosa, concept art sketches were produced that illustrate her strong, independent, and resourceful personality. This art also highlights the early process and research behind video game creation that is generally never seen by an audience, and draws on relevant costume design concepts.

Reyes, Adelle; Morris, Maggie; **Hartman, Sarah; "Teacher Expectations for English Language Learner (ELL) Students' Mathematical Ability and Performance" (Nicholas Fortune)**

Research has shown that bilingual, multilingual, and second language learners are successfully able to learn mathematics in a variety of settings (Barwell, 2005). However, it is important that teachers are able to understand not only their students' mathematical abilities but also their linguistic skills (Gutiérrez, 2002). In this study, we conducted a qualitative case study (Creswell, 2013) with three elementary teachers (one classroom teacher, one mathematics teacher, and one English Language Learner (ELL) teacher), where we explored their beliefs about their ELL students' mathematical ability and performance. To analyze the data, we did open and thematic coding (Miles et al., 2014) to categorize the themes of responses from our participants. Preliminary results are being collected. We anticipate that there will be a difference in how the three teachers perceive their ELL students' ability because of their differing professional backgrounds and experiences. Further, we anticipate that the mathematics teacher will focus on linguistic inhibitors rather than the mathematical understanding of their ELL students. Qualitative results of the study will be presented.

Riggs, Jacob; "Building an Avenue for Learning" (Shahnaz Aly)

This Senior Research project presents a design of a multipurpose center that provides many avenues for learning. The design includes a planetarium, a craft area, and many multipurpose rooms intended for a variety of educational programs and other services. Lower income areas tend to have less resources for education, as well as less resources for families and individuals. This multipurpose learning center is a safe space to learn freely for people of all ages, as well as a central location for the less fortunate, allowing them to have access to information regarding the resources available to them. The area chosen for the project was impacted by the tornados that came through Nashville, TN and would benefit from this center. The goal was to design a functional, safe, and educational space that will assist in bolstering the relative community.

Rios, Logan; Swift, Alyssa; "Examining Reports of Parental Involvement, Marital Satisfaction, and Infant Temperamental Anger from a Multi-reporter Perspective" (Diane Lickenbrock)

Studies with self-report of parental involvement have often found inconsistencies across mother and father reports. Mothers report lower father involvement compared to fathers' own reports (Mikelson, 2008). Couple relationship quality may influence the degree of this discrepancy; reports of parental involvement being more similar among couples with higher relationship

satisfaction (Charles et al., 2018). Family interactions can shape infant temperament, or individual differences in reactivity and self-regulation (Rothbart & Bates, 2006). Specifically, exposure to stressful family interactions, like conflict, can lead to increased expressions of child anger (Cummings & Davies, 2011). The current study aimed to examine associations between parental involvement, marital satisfaction, and infant anger. Parents rated their own/partners' parental involvement (Cronenwett et al., 1988) and independently completed a measure of marital satisfaction when the infant was 4 months old (Locke & Wallace, 1959). Trained coders objectively rated infant temperament during laboratory tasks designed to elicit infant anger and frustration at 8 months (Braungart-Rieker et al., 1998; Goldsmith & Rothbart, 1999; Tronick et al., 1978). Preliminary analyses (n= 66 couples) revealed correlations between mother marital satisfaction and mother report of father involvement. No significant results were found with fathers or infant temperament data. Subsequent results will include additional couples.

Rivera, Vivian; "Study on the effect of plant-derived chemicals on the growth and longevity of yeast cells (*Saccharomyces cerevisiae*)" (Chandra Emani)

Beyond the traditional nutrients of proteins, fats, or sugars, plant foods have a reservoir of unique chemicals, generally known as phytochemicals. Phytochemicals are biologically active compounds with potential to interact with clinically measurable markers of health and disease in humans. In recent years, clinical interest on the medical potential in phytochemicals have actively increased in response to current medical challenges. Different plant foods contain different phytochemicals. This study analyzes the effect of three phytochemicals: quercetin, eugenol, and naringenin. Liquid yeast cultures were grown, and the OD checked every hour. Once the OD reached 0.4-0.6 the designated cultures were treated with the phytochemicals. Yeast growth curves were generated to assess the effect of the phytochemicals on growth. After determining growth phases in the cultures, continuing research will focus on isolating DNA and RNA for expression studies using RT-PCR. As aging and chronic disease are the cornerstone of modern medical research, intervention in these processes needs a thorough examination of the role of natural dietary nutraceuticals. Our study is expected to generate data on the anti-aging role of these phytochemicals through growth curves and survivorship patterns.

Rodriguez, Alexis; "Winter Weather Analysis and Atmospheric Contributions in Global and Local Scales for Major Winter Storm in The Rocky Mountains of March 2021" (Joshua Durkee)

Winter weather generally begins in late December and goes on until late February to early March, but certain areas in the United States favor conditions to have winter storms on unusual days. Severe weather discussions that have been made prior to these events have established that conditions in the large scale of the atmosphere have contributed to its development. The purpose of this study is to research the components from the wind fields from the surface to over 50000 feet that will develop to the March 2021 winter storm event in the Rocky Mountains region. Results from this study present that from the two scales of the atmosphere, the components of major winter storms are highly unpredictable. Other findings from the study show that some components that will contribute to winter storms do not generally apply to other types of severe

storms. Overall, this study shows that some components of development for winter storms do occur while some others do not on a different scale. With meteorological discussions, research, and conceptual models for understanding the behavioral structure of the storm, this study shows that the event had components half on the global scale and half on the local scale.

Roehm, David; Hatfield, Alecia; **Funge, Simon; "Going to the Source: A Qualitative Analysis of Challenges Facing Kentucky's Foster Care Communities" (Austin Griffiths)**

Foster parents provide a safe but temporary environment for thousands of foster children today. While foster parents serve a critical role in the lives of children, there are intricate challenges that hinder the effectiveness of foster care today. To investigate these issues, researchers surveyed foster parents from a statewide public and private sample concerning foster parent turnover, recruitment, training, and barriers for achieving a timely permanency for children within the child welfare system. Thematic analysis was utilized to reveal themes of dissatisfaction with the current foster care system, issues with state workers, the child welfare system, and issues with biological parents. Additionally, they voiced a need for increased services, support, and additional parenting and resource trainings. The present study contributes rich insight into foster parents' perceptions from the public and private sector concerning persistent issues faced by these important individuals, which promotes avenues for educating the next generation of child welfare workers. These insights can be utilized to address persistent issues in foster care communities to create better outcomes for our nation's most vulnerable population.

Rone, Jaci; Stevens, Riley; "Comprehensive Roadway Interchange Design Along Interstate-65" (Kirolos Haleem)

Simpson County is the sixth fastest growing county in Kentucky and is expected to grow by 32.5% in the next 30 years. This growth has initiated the idea of expanding the roadway network in and around this area. The objective of this study is to accommodate the increasing vehicular traffic through Simpson County, with emphasis on truck traffic. The study involves designing a new interchange along Interstate-65 and creating a connector road between the interchange and US-31W. All engineering specifications were followed per the American Association of State Highway and Transportation Officials (AASHTO) "Greenbook" and the Kentucky Transportation Cabinet (KYTC) design manual. A series of comprehensive analyses were performed using both hand calculations and numerous software, including AutoCAD, Open Roads Designer, ProjectWise, and the crash information website. Each software provided unique capabilities to aid in the full roadway design. Examples of the analyses performed include: earthwork quantities (either cut or fill) estimation, vertical and horizontal alignment design, level-of-service (LOS) analysis, crash and traffic safety investigation, and material cost calculations (e.g., for pavement design and construction). The benefit-to-cost (B/C) ratio will be then used to assess the different design alternatives. The highest B/C ratio will provide the best roadway design alternative.

Sadeq Ibn Emran, Md. Rafi As; "A Robust Algorithm for Designing an Actuator in Suppressing Vibrations Propagating on a String" (Ahmet Ozkan Ozer)

A one-dimensional wave equation, modeling vibrations on a string, is considered with a boundary actuator/sensor design. It is known that this design helps suppress all vibrations to the equilibrium exponentially fast. however, the "approximated wave equation by standard semi-discretized Finite Differences or Finite Elements lacks to suppress all vibrations to the equilibrium exponentially fast as the approximation parameter tends to zero. This is due to the loss of a uniform gap among the high-frequency eigenvalues as the approximation parameter tends to zero, which is not true for the original wave equation. One remedy to overcome this discrepancy is to design an actuator/sensor by a numerical filtering technique, where the high-frequency spurious eigenvalues are directly filtered. The exponential decay rate, mimicking the original wave equation, can be retained uniformly with the filtered solutions. However, the existing proof techniques, involving numerical filtering, in the literature do not provide optimality of the stability results. In this talk, we prove these results using a novel Lyapunov-based direct approach for filtered Finite Difference and Finite Element approximations. The maximal decay rate in terms of the filtering parameter and the optimal sensor feedback gain is explicitly provided. Several numerical tests are provided to support our results.

Salloum, Grace; "Diagnosed by Dr. Hollywood: The Media's On-Screen Depictions of Mental Illness and Scripting the Public's Perceptions" (Andrew Mienaltowski)

Media serves as a source of knowledge that shapes attitudes toward individuals with mental illnesses. Portrayals of mental illness that evoke stigma, the devaluing of an attribute when rejected by society, are characterized by status loss, stereotyping, and discrimination; frame attributions toward the afflicted social target. In this study, participants observed a media-based portrayal of mental illness that either stigmatized a target or did not. In the stigmatized condition, stereotype-consistent negative behaviors were emphasized as the primary source of information from which one might create attributions about a social target. In the non-stigmatized condition, the social target's behaviors reflected a balanced accounting of the individual's mental illness, so attributions should be less biased toward stereotype-consistent negative behaviors. Participants completed questionnaires measuring public and perceived stigma toward mental illness, familiarity with mental illness, perceptions of social implications of living near to and interacting with individuals with mental illness, and perceptions of the responsibility that the afflicted bears for the illness and their likelihood of successfully experiencing treatment. Participants exposed to the media-based stigmatized portrayal of mental illness used this portrayal to inform their understanding of mental illness, resulting in a biased evaluation of the afflicted social target.

Scott, Aimee; Boateng, Ama; Tipirneni, Suchita; Naas, Alexa; Warren, Amia; "Skillsets Associated With Effective Retrieval Strategy Use" (Jenni Redifer)

Retrieval practice is an effective strategy that can take the form of free recall, practice quizzing, test question generation, or keyword generation; however many students choose ineffective study

methods. Skillsets developed through college majors may influence students' strategy choices (Li & O'Boyle, 2008) and effectiveness (Achter et al., 1999). Differences in skill development may cause students in majors with greater writing requirements to more effectively use strategies utilizing writing skills, like free recall. In this study, college majors were categorized as having low, medium, or high levels of writing. Participants studied a passage using a randomly assigned retrieval strategies and were tested one week later. Major writing level did not significantly influence test performance overall, $F(2,208) = 1.491$, $p = .227$, or differently as a function of assigned retrieval strategy, all ps > .05. However, major writing level significantly influenced performance in the rereading (control) condition, $F(2,53) = 3.401$, $p = .041$, $\eta 2 = .114$. In the rereading condition, low writing majors significantly outperformed medium writing majors, 95% CI [.025, 4.577]. When utilizing rereading, the level of writing required by students' majors impacted test performance; however, major writing level did not affect performance in the retrieval strategy conditions.

Seadler, Bailey; "Molecular Evolution of the Caner-related Myeloid/lymphoid or Mixed-Lineage Leukemia 3 Gene (MLL3)" (Chandrakanth Emani)

The study examines the molecular biological evolution of the MLL3 protein. MLL3 is a tumor suppressor that when unregulated causes leukemia. The protein's primary function is the methylation of histone 3 lysine 4 (H3K4), which promotes gene activation and transcription. In this study, we analyzed FASTA sequences of the MLL3 protein of various organisms using several computational tools such as NCBI. Conserved domains and evolutionary ancestors were identified using NCBI BLAST and phylogenetic trees. The initial BLAST report identified the farthest evolutionary ancestor as the Iberian mole.

Seadler, Jocelyn; **"Molecular evolution of cancer-related myeloproliferative leukemia virus oncogene (MPL)" (Chandrakanth Emani)**

The current study analyzes the molecular biological evolution of the MPL protein. MPL has been shown to correlate with the abnormal formation and overproduction of megakaryocytes and platelets. MPL is unregulated in several cancers, such as essential thrombocythemia and primary myelofibrosis. The protein primarily regulates the number of blood cells produced in the bone marrow through the JAK/STAT signaling pathway. In this study, we analyze FASTA sequences of MPL from various organisms using computational tools. Analysis was performed using bioinformatics software database NCBI. Conserved domains and evolutionary ancestors were identified through BLASTP and neighbor-joining phylogenetic trees. The BLAST initial report indicated an evolutionary ancestor, acinonyx jubatus (cheetah).

Shahid, Shahriar; "New Insights into the Tectonic Framework and Geological Features of The Bengal Basin, Southeast Asia" (M. Royhan Gani)

The Bengal Basin holds key evidences concerning Southeast Asian tectonics and structural framework. In this research, NASA's high-resolution surface elevation data shed light on the

tectonic elements, where the published seismic data revealed a shallow down-warping Indian crust to challenge the earlier assumption of high-angle subduction. Seismic imaging also shows >30 km thick subduction zone crust, implying continental origin instead of oceanic. Moreover, the Indian passive margin collapse beneath the Shillong Plateau created a ~20 km thick sediment pile, posing significant earthquake risks. The dry season satellite imagery was used to update the surface geology of the study area alongside the conventional geologic map. Surficial lithological variations over the past three decades are mainly attributed to river avulsion and sea-level fluctuations, where active tectonics and adjusting landscapes may control river switching. The Meghna Estuary in the southeast coast was found vulnerable to present sea-level rise, whereas the mangrove forest in the southwest coast is relatively stable. An updated geologic map of Bangladesh and new tectonic findings of this research can be critical in natural resource management and hazard mitigation. However, tectonic elements need further investigation through gravity/magnetic anomaly to validate the crustal or basin thickness around the Bengal Basin.

Sharma, Maharshi; Taylor, Cole; Fields, Cam; Nguyen, Van; "Characterizing the Onset of Peripheral Inflammatory Responses to Acute Sleep Fragmentation Among Female Mice" (Noah Ashley)

Obstructive sleep apnea (OSA) is a common sleep-related breathing disorder that is characterized by partial airway collapse, reduced oxygen saturation, and disorganized sleep patterns, leading to the development of inflammation in peripheral and brain tissues. This type of sleep fragmentation (SF) is prevalent in obese men and women, but whether the onset of inflammation is affected by sex is unknown. Previous studies on adult male C57BL/6j mice subjected to automated SF or control (no SF) for 1, 2, 6, and 24 h have demonstrated a rapid onset of inflammatory response, and peripheral organs such as the liver, heart, spleen, and white adipose tissue (WAT) were evaluated. In this study, we conducted the same experiment in female mice and measured gene expression of a proinflammatory cytokine, tumor necrosis factor (TNF), using RTPCR. Results from this study will help elucidate the role that sex may play in modulating the peripheral inflammatory response to SF.

Sherrard, Samuel; Hartman, Leah; Hebenstiel, Lars; Harper, Doug; "Experimental Determination of Coefficients of Friction in Rolling Oscillation of Liquid-Filled Container (ROL-FC) Experimental Setup for Generation of Cycloid" (Ivan Novikov)

The ROL-FC project studies oscillations of a cylindrical container filled with viscous fluid rolling on a curved ramp. In this experiment, the cylindrical container is rolling along an isochrone curve, and the period of oscillation is measured. The goal of the project is to determine how the period of oscillations depends on the properties of a viscous liquid. In this presentation, we describe the development of a cycloidal ramp and discuss experimental measurements of coefficients of static and rolling friction. Using the technique presented at Am.J.Phys 52, 180 (1984) we determined the parametric equations for the appropriate isochrone curve, developed a CAD model of the ramp and manufactured it using available materials. The coefficient of static friction for the ramp and container materials was experimentally measured. To accurately

determine the period of rolling oscillation from experimental data, the dissipative forces should be determined. To measure the coefficient of rolling friction we will analyze the angular position of the container using a set of photogates as well as using a video camera.

Shreve, Molly; "Evaluation of Ionic Liquids as a Means of Preparing Environmental Biofilms for Observation by Scanning Electron Microscopy" (John Andersland)

Biofilms are the slimy ooze secreted by bacteria that allow them to live on surfaces without washing away. The structural details of biofilms are too small to see with light microscopes but can be observed in electron microscopes. However, samples in an electron microscope must withstand a vacuum, be electrically conductive, and strong enough to withstand the power of the electron beam. Existing methods for preparing samples for electron microscopy poorly prepare biofilms – they shrink when water is removed, and structural components made up of carbohydrates can be lost. In this study, I sought to evaluate replacing the water in biofilm samples with a room-temperature ionic liquid. Ionic liquids are salts (like table salt) that happen to be "molten" at room temperature. Their ionic characteristics prevent them from evaporating in a vacuum, thus if water in a sample could be replaced with the ionic liquid, the sample could be viewed "wet" without shriveling. I found that compared to standard methods, the ionic liquids gave poor preservation but were much cheaper and faster. This suggests that ionic liquids could be used to quickly view many samples to choose the best to observe by the more costly and time-consuming standard methods.

Sileo, Sofia; Smith, Hunter; "Assessing Various Card Hand Probabilities of the ‘500 Card’ Deck" (Dominic Lanphier)

Any novice poker player can tell you that some hands are rarer than others. The probabilities of the standard poker hands are well-known and often a topic in a course on discrete mathematics. This research project deals with determining the probabilities of being dealt various card hands in poker, but instead of using the standard 52 card deck, we are using a deck - originally used for the '500' card game - consisting of 62 cards. A standard poker deck contains 13 ranks (cards per suit) and 4 suits; a '500' card deck still has 4 suits, but there are 2 suits with 15 ranks and 2 suits with 16 ranks. The differences of the ranks dramatically changes the likelihood of being dealt various hands and the computations of the probabilities become more interesting. Our goal is to re-rank all the possible poker hands of the '500' card deck, using the standard deck as reference.

Simmons, Molly; Brown, John; "Investigating The Daily Effects Of Workplace Email Incivility On Work Interference With Family" (Katrina Burch)

Background Using affective events theory as a guiding framework, we investigated the association between daily experienced email incivility and work interference with family. We hypothesized that daily experienced email incivility will be associated with work interference with family through the mediated mechanism of emotional exhaustion. Method Using a sample of approximately 60 individuals employed in a variety of industries, we collected daily diary data

every day for ten working days. We will use multilevel path modeling to investigate the hypothesized relationships. Results, discussion, and future directions to be discussed.

Skopek, Carson; "Healing Through Architecture" (Shahnaz Aly)

The Resort and Spa shall allow those who attend to release all worry, through the calm and collected ambiance that is present throughout. The resort is to show expression and healing to one's mental stability and recollection of oneself as an individual through the architecture of the building. I want to change the connotation and the way people view mental health facilities by pursuing a more luxurious and redefined way people can view them into a resort and spa. My design is to truly change the way people view these facilities as well as bringing those out into nature through more well-rounded approaches instead of traditional methods. The healing process starts when you enter the resort.

Slown, Olivia; "Studios On 6th" (Shahnaz Aly)

Evansville has many 19th and 20th century storefronts which are unused. In larger cities, these historic buildings are being reimagined as flexible work, retail, restaurant, event spaces; some even include housing space for those who work in the building and immediate area. My project involved the adaptive reuse of historic buildings like the Hulman Building, L.E. Long Building, and O' Donnell Building in Evansville, I turned them into art studios and event space for the Evansville community. These buildings are in the heart of downtown Evansville and are perfectly located in a thriving theater district. This space encourages art exploration by artists and patrons alike. This space provides 4 art studios, 4 art galleries, 2 classroom spaces, and 4 one-bedroom apartments which further embrace the hybrid work-living space trend that has boomed since the beginning of the COVID-19 pandemic. Further, this type of space is the first of its kind in the area. The buildings bring artistic growth to the area and allow artist and artisans to display their works. This space could even spark an interest in art for the citizens of Evansville and the surrounding tristate area.

Smith, Justin; "Narrative Of The Black Woman's Upbringing" (Ann Ferrell)
Oral histories are vital to the ethnographic process of understanding a particular experience or perspective. My research into the oral histories of African American women included conducting ethnographic interviews to gather experiential motifs that could be compared. These interviews serve as a deep dive into the various African American vernacular English phrases and words utilized among African American women that serve as a reflection of their historical and cultural experiences. Oral histories of African American women often contain motifs that vary across the demographic of African American women and their experience as a minority within the United States. Struggles with identity, expression, and understanding are consistent factors in the worlds and experiences of African American women. Gaining an understanding of the impact that comes from oral histories that are passed down through oral traditions, surroundings, and circumstances help folklorists fulfill the narrative gaps that allow for more developments to contribute to the history of a people. This research will offer more insight for folklorists, ethnographers and

anthropologists who specialize in the minority experience in America as it pertains to topics of representation.

Sorensen, Melissa; "Through The Looking Glass: Investigating Incivility And Depletion Through A Cognitive Process Lens" (Katrina Burch)

Experiencing incivility at work is a common phenomenon that individuals encounter. The effects of experiencing incivility are not bound to the workplace and continue to negatively impact individuals after they leave work. However, little is known about the mechanisms which transmit the experience of incivility at work to one's non-work domain. One such mechanism that may be associated with the negative impact of incivility at work in the non-work domain is depletion, which represents a reduced state of cognitive impact. However, the use of active coping mechanisms may buffer the effects of experienced incivility on depletion. Specifically, I will examine how an individual's cognitive appraisal of experienced incivility influences coping mechanisms, which in turn may buffer (through active coping) or exacerbate (through maladaptive coping) the relationship between workplace incivility and depletion. Approximately 100 working adults will be recruited via Prolific to complete a baseline survey and daily-diary for 10 working days. In this proposed study, I will conduct multilevel analysis via path modeling, with hypothesized relationships modeled at the within-level (level 1); I will examine the use of statistical control at the between- and within- levels.

Sparling, Sara; "Lágrimas De Pasión: El Pasillo, Ecuador's Bleeding Heart" (Liza Kelly)

University level music programs should expand their curricula to include music from all cultures. Therefore, I have gathered and assembled materials to create a performance guide of Ecuadorian art song for use by all music teachers and vocalists. The importance of this research is to create diversity in the classical music community by bringing awareness to Ecuadorian art song and broadening curricula used for university vocal programs. The problem addressed through my research is the limited access to and awareness of vocal music by under-represented composers in university music programs. The methodology of creating a performance guide of Ecuadorian art song started with materials research. After information and music scores were gathered, experts on Ecuadorian music and history were interviewed. Finally, in person lessons with an Ecuadorian vocalist helped define performance practices specific to the genre. The result of my research is a collection of scores and knowledge on how to perform Ecuadorian art song. This performance guide is a beneficial resource for all vocal students to learn and grow in their technique while appreciating another culture that is typically not represented in university curricula.

Stewart, Tyson; "An analysis of the large-scale atmospheric circulation features behind the 2019 Veteran's Day extreme cold wave" (Joshua Durkee)

Extreme cold waves or cold snaps have become an increasingly more frequent trend during winter seasons. Notable cold snaps such as the 2021 "Valentine's Week" cold snap in Texas, and the December 2022 cold snap affecting much of the Midwest and Mid-South caused millions of dollars

in damages and several fatalities. Research on the causes and predictability of these events may reduce fatalities and damages. This study seeks to analyze the 2019 “Veteran’s Day” cold snap in order to determine whether large-scale atmospheric variables and conceptual frameworks can successfully be used to forecast these types of damaging winter events in advance. Results from this study show that the use of statistical linkages or teleconnection patterns help identify the pre-established relationships between variables such as vorticity, pressure, and temperature that can successfully be used to describe and predict these extreme cold snaps.

Stichter, Zach; "Conformational Space Search Techniques to Improve Rapid Protein Structure Prediction" (Sarah Edwards)

Proteins interact within a cell to affect many biological processes including signal transduction, cell regulation, gene expression, enzyme inhibition, and more. Similarly, these biological processes work together to support life. A deeper knowledge of the protein interactions behind these complex biological systems and pathways will have wide-ranging impact drug discovery, disease progression, pathology, and more. Previous work in the field developed TagDock, an open source rapid protein structure determination software. TagDock performs admirably when compared against “rigid” proteins which do not change shape during protein-protein interaction, but does not in its current functionality account for “flexible” proteins which undergo significant shifts during interaction. The purposes of this study are threefold: first, optimize previous molecular dynamics simulations results by adjusting protocol and simulation parameters to achieve consistent improvement in TagDock simulations by searching for alternate protein conformations. Second, consider and explore other established or novel conformational space search (CSS) techniques for modeling protein flexibility. Third, package and distribute these CSS tools for use in off-the-shelf applications and write documentation targeted towards a general scientific audience.

Stinson, Bailey; Bunnell, Maddie; Deep, Jackson; Reid, Charles; "Noise And Vibration Mitigation in a Top Loaded Washing Machine" (Morteza Nurcheshmeh)

The goal of the project has been to design, implement and test design concepts meant to reduce the vibrations in a top loading commercial washing machine in an unevenly loaded spin cycle. When conventional washing machines interact with uneven loads in the spin cycle, more severe vibrations can occur in the z-direction of the tub. The designs will reduce the vibrations created by the current motor system of the test bed with a minimal cost to the washing machine manufacturing. The team’s goal been to implement the concepts researched and created in the Fall semester and collect data relating to the vibrations seen in the z-direction.The team’s designs consisted of spring mounts installed in the bottom frame of the washing machine, a set of spring mass dampers, as well as replacement feet with new rod coating. Each implementation is tested based on the weight added into the tub as well as the RPM the tub is operating at with different speeds being considered. Using an accelerometer, the team is collecting data about the acceleration in the z-direction of the tub as compared to a baseline empty tub at each speed.

Strehl, William; "Preliminary Survey Of Caves in the Glen Dean Limestone Of Southcentral Kentucky" (Chris Groves)

Karst landscapes are underlain by soluble limestone bedrock containing sinkholes, caves, and springs. Many of those in Southcentral Kentucky are well-studied, including the longest cave in the world, Mammoth Cave. However, higher in the stratigraphic section the Glen Dean Limestone has had little study of caves and hydrogeology. The overall purpose of our research is to better understand the karst hydrogeology of the Glen Dean Limestone, and to document its caves, providing a better understanding of how its karst features are formed. In this phase of the research, we are identifying known caves and promising areas for additional work to determine if undocumented, or even undiscovered, Glen Dean caves might be present. So far we have used three approaches: 1) fieldwork by exploring areas where the Glen Dean is exposed and interviewing landowners in these areas, 2) analysis of high-resolution, topographic map (LiDAR) data to find promising areas with potential cave entrances, and 3) a formal data request to the Kentucky Speleological Survey. So far, we have identified 46 entrances and of these, only four caves have maps. Our next phase will be to explore and make maps for caves we have identified, but which so far have no maps.

Stryker, Shane; "Puerto Rican “Second Class Citizenship” Results in “Second Class Justice”: What That Means For The U.S. Territory" (Anthony Harkins)

For over a century, the United States' relationship with Puerto Rico has been harmful and neglectful. This paper assesses the concept of “second class citizenship” in the history and present-day reality of the US territory of Puerto Rico, and how that has led to “second class justice” for Puerto Ricans. The paper first explains the idea of second-class citizenship and covers key moments in its development such as the Jones Act of 1917 that established a US-dependent Puerto Rico. It then moves to more recent examples of Puerto Ricans’ second-class citizenship, such as unfair tax policies and a lack of social welfare programs, and how this has resulted in what I define as second-class justice. Such second-class justice has meant that Puerto Ricans have had an unequal struggle to obtain the justice available to mainlanders and that American justice has failed them. The paper then considers competing future possibilities of Puerto Rico’s status as means of positively transforming this second-class justice. The paper considers arguments for each of these “remedies” and concludes by arguing that the end to second class citizenship and justice for Puerto Rico can only result from allowing Puerto Rico to self-determine its future status.

Swift, Alyssa; Lickenbrock, Diane; Rios, Logan; "Examining Associations Between Infant Behavioral Inhibition, Autonomic Responses, and Regulatory Behaviors With Mothers" (Diane Lickenbrock)

Early infancy is a critical developmental period when emotion regulation emerges, and specific behaviors (i.e., distraction) are known to support infant regulation (Planalp & Braungart-Rieker, 2015). Children high in behavioral inhibition, characterized by patterns of salient behavioral responses to novel stimuli (Henderson et al., 2015), have an increased risk for regulatory problems (Fox et al., 2015). However, activity in the autonomic nervous system (i.e., parasympathetic and

sympathetic branches) also facilitates regulation and is likely influenced by such behavioral inhibition patterns (Suurland et al., 2018). The current study examined longitudinal associations between infant behavioral inhibition, autonomic cardiac reactivity, and regulatory behaviors. Data at 4- and 8-months from a larger longitudinal study were utilized (n=91). Mother-infant dyads participated in a face-to-face play task designed to measure infant frustration (Tronick et al, 1978) during which infant cardiac physiology (respiratory sinus arrhythmia and pre-ejection period) and regulatory behaviors were assessed (Ekas et al., 2013). Experimenters rated infant behavioral inhibition globally post task (IBR, Stifter et al., 2008). Preliminary results revealed significant associations between infant behavioral inhibition (irritability, positive affect) and infant regulatory behaviors (looking to parent, distraction). Inhibited infants may be using less effective regulatory strategies. Additional models will be analyzed and reported.

Tate, McKenna; Canen, Jenessa; "Religious Conflict, Centrality, and Affiliation in Sexual Minority Young Adults" (Amy Brausch)

"In a sample of young adults, it was hypothesized that those identifying as a sexual minority would 1) have a higher religious conflict for childhood religious affiliations versus adult religious affiliations, 2) score lower on religion centrality, and 3) report more religious conflict when they maintain a Christian religious affiliation in adulthood. Data was collected online from 278 young adults (ages 18-26) enrolled at a mid-sized university. Out of those 278 participants, 85 identified themselves as a Sexual Minority. An ANOVA compared participants who were Christian in their childhood with participants who endorsed other religions in childhood. Results indicated no significant differences in religious conflict with sexuality or centrality of religion. However, ANOVA results did indicate a significantly higher average for centrality of religion (p-value

Taylor, Cole; Sharma, Maharshi; Nguyen, Van Thuan; Ashley, Noah; "The Neuroinflammatory Response to Acute Sleep Fragmentation in Female Mice" (Noah Ashley)

Obstructive sleep apnea is a common disorder in which breathing becomes disrupted by airway collapse during sleep. Repeated breathing disruptions can alter sleep patterns and lead to acute sleep fragmentation. Obstructive sleep apnea is most diagnosed in males, although the exact cause of this increased prevalence is unknown. Prior studies have established that acute sleep fragmentation does cause neuroinflammatory responses. To determine the location and extent of the neuroinflammatory response to acute sleep fragmentation in female mice, two groups were created. The experimental group was subjected to automated acute sleep fragmentation for 1-24 hours. The control group received no sleep fragmentation and were collected after 0-24 hours. After each mouse was collected, their hippocampus, hypothalamus and prefrontal cortex were extracted. Real time PCR was then used to measure the gene expression of the pro-inflammatory cytokines interleukin-1 beta and tumor necrosis factor-alpha. It was expected that there would be significant differences in the gene expression of these two cytokines because of the acute sleep fragmentation treatment. Results from this study will provide clarity on the female neuroinflammatory response to acute sleep fragmentation.

Tekoe, A.; "Influence of Large-Scale Atmospheric Conditions on the January 22-24, 2016, Eastern United States Winter Storm" (Joshua Durkee)

Winter storms are weather events during which the precipitation is mainly snow, sleet, or freezing rain. These events can immobilize a region by stranding commuters, closing airports, and stopping the flow of supplies. According to the U.S. Department of Transportation, more than 365,000 vehicle accidents, 138,745 injuries, and 1,705 fatalities occur during winter precipitation events each year (Steenburgh, 2021). In January 22-24 2016, a major winter storm affected the majority of the eastern United States, bringing winter precipitation which included heavy snow, sleet, and freezing rain. The purpose of this study is to investigate the influence of large-scale atmospheric conditions on the development of the late January 2016 storm. Large-scale weather patterns from the North American Weather Model (NAM) have been examined, including winds pattern at 30,000 feet in the upper-atmosphere, upper atmospheric wave forms, areas of rising air, and more. The study shows that large-scale atmospheric conditions and wave forms have been the primary forcing in the development of the late January 2016 winter storm.

Tipirneni, Suchita; Scott, Aimee; Boateng, Ama; Warren, Amia; Naas, Alexa; "To See or Not To See" (Jenni Redifer)

Aphantasia is the inability to form mental images of objects that are not present. Aphantasia is most commonly measured via a questionnaire that measures the vividness of visual imagery. Individuals with aphantasia often have difficulty with visual recall tasks. However, whether aphantasia impacts cognitive load during visual recall is unknown. Two participants (one with high visual imagery and one with low visual imagery, indicating aphantasia) completed visual memory working trials (Jacobs et al., 2017) followed by measures of cognitive load. The purpose of the study was to determine a) whether aphantasia impacted memory and recall by blocking access to visual memory, and b) whether visual recall required more mental effort for individuals with aphantasia. Results showed that lower visual imagery (i.e., aphantasia) did not negatively impact visual recall performance. However, scores on the mental demand, temporal demand, and mental effort subspaces of the cognitive load measure during visual recall tasks were higher for the participant with aphantasia. Overall, having or not having aphantasia did not impact visual recall ability; however, the participant with aphantasia experienced higher cognitive load during recall tasks.

Towery, Mason; Molina-Lopez, Sadie; Alexander, Sarah; Eastham, Ruthie; "Melanoma Incidence Rates and Outcomes in Rural vs. Urban Areas in Kentucky" (Doug McElroy)

Melanoma accounts for 4% of U.S. skin cancer diagnoses but nearly 75% of deaths. UV exposure and outdoor occupations are significant contributors to skin cancer rate, while early diagnosis and care are critical factors in survival. Kentucky has a large percentage of medically-underserved communities, paired with an abundance of outdoor occupations, making it a valuable study population to examine the impact of rurality and provider shortage on melanoma incidence rates, stage at diagnosis, and death rate. We used the SEER database to query all cases of superficial spreading and nodular melanoma among white/non-Hispanic Kentuckians from 2010-2017. We

hypothesized patients living in rural areas could be at a greater risk of melanoma and have worse survival outcomes. We created a rural-urban continuum code which we used to test for differences in stage upon presentation and melanoma-caused mortality. Stage upon presentation was not statistically different across the rural-urban continuum. We found no relationship between rurality and nodular melanoma mortality. For superficial spreading melanoma mortality, however, there was a highly significant relationship; patients residing in rural areas were much more likely to die from than those in urban areas. These findings suggest long-term care and treatment could be lacking in these areas.

Towoju, Victor; Gani, M. Royhan; Gani, Nahid; Yan, Jun; "Sediment Waves or Structural Folding? A Seismic Study of the Undulating Beds in the Port Isabel Fold Belt, Gulf of Mexico" (M. Royhan Gani)

The northwestern Gulf of Mexico has a complex tectonic setting with a highly debated geologic history. Sediment waves are large-scale geomorphological features reported on the seabed and at the uppermost part of the stratigraphic succession of the Gulf of Mexico. This study uses high-resolution 2D seismic data to study the undulation patterns in the Port Isabel fold belt. The morphology of these undulations, which are ~670m in wavelength, is very similar to that of some known sediment waves. However, various factors constrained their definition as sediment waves. Seismic data revealed that these undulations, interpreted as “sand dunes” at the seabed in previous bathymetric studies, are more complex and dynamic in the subsurface than previously thought. Bathymetric data show that these structures exhibit bifurcation, a likely characteristic of sediment waves. However, the subsurface geology shows features characteristic of structural folding. Our data suggest that activities such as fault movement and salt halokinesis might contribute to the dynamic geometry of these structures through variable reactions of the competent vs. incompetent sedimentary layers to differential tectonic stress. Further investigation of these undulating features is needed at various locations in the Gulf of Mexico to differentiate between sediment waves and structural folding.

Traxler, Sidney; Al, Mawsoof; Moskal, Katie; Teeters, Jenni; "Examining Sexual Assault Instances as a Moderator Between PTSD Symptoms and Drinking Behaviors" (Jenni Teeters)

Sexual assault survivors often experience many negative mental health outcomes, such as post-traumatic stress disorder and alcohol use disorder symptoms after the assault has occurred. Although previous research has consistently shown a link between experiences of sexual assault, PTSD symptoms, and alcohol use, most of the work to date has focused on whether an individual has experienced a sexual assault rather than on the frequency of sexual assault experiences. The present study examined whether the number of instances of sexual assault moderates the association between PTSD symptoms and average drinks per week among college student sexual assault survivors. Participants were 77 college students (78% female, 83% Caucasian) who took an online survey that measured PSTD symptoms, experiences of unwanted sexual contact, and drinking behaviors. A moderation analysis showed that the number of instances of sexual assault moderated the relation between PTSD symptoms and drinks per week ($p = .05$). The results imply

that the connection between PTSD symptoms and alcohol use is significantly stronger for those experiencing multiple instances of sexual assault. This information can be used to guide intervention and therapeutic approaches aimed at reducing hazardous alcohol use among college student sexual assault survivors.

Unseld, Janessa; "Coleus Academy: Creating a Digital Encyclopedia of Adulthood" (Mark Simpson)

Life skill-centric education has been deemphasized and, at times, omitted entirely from American curriculums. As such, there exists a gap between the degree of knowledge seen as necessary to engage with adult life and the extent of that knowledge that is actually possessed by emerging adults. Numerous resources have been created to address this issue. They exist across a myriad of platforms, at different price points, and in both physical and digital forms. Yet, these tools tend to be hyper-specific in their focus. Compounded with disparities in when, where, and to whom these avenues are available, there is no guarantee that the typical young adult will have access to or be able to find the information they are searching for. Coleus Academy is to be a nonprofit e-learning platform. The web application targets the skills essential to adult competency and effective citizenry and was programmed from scratch using HTML, CSS, JavaScript, and PHP. Described conceptually as “an encyclopedia of adulthood,” Coleus prioritizes comprehensiveness and accessibility. This presentation dives into the shortfalls of standardized education and provides an overview of the endeavor in its current form, the processes involved in its creation, and strategies that will be implemented going forward.

Vaccaro, Dakota; "Impacts of African Savannah Elephant (Loxodonta africana) Habitat Modification on Avian and Mammal Habitat Use" (Bruce Schulte)

Elephants play a significant role in the modification of their habitat. For bird and mammal species that depend on forested patches, increased modification could lead to displacement and/or population declines. While multiple studies have examined the effects of elephant habitat modification (EHM) on small birds and large carnivores, little is known regarding the effects on raptors, vultures, ground birds and many mammal species, especially smaller herbivores and mesocarnivores. To inform this knowledge gap I compared avian and mammal species detections in differing severities (low, medium, high) of elephant damaged habitat to determine the effect of EHM on species populations and habitat use. During the summer/fall of 2022 I worked in Rukinga Wildlife Sanctuary in Southeast Kenya where I collected wildlife detection data via 6 wildlife transects and collected EHM data through observation of elephant tree damage and vegetation surveys. We recorded data on 6,762 individual birds and mammals across 55 species. Elephant tree damage was recorded from 1,135 trees across 259 vegetation plots. Data comparing species detections to EHM is currently under analysis. Given the immense impacts elephants have on their habitat, understanding the effects of EHM on other wildlife is vital for informing wildlife management and conservation decisions.

Van, Aaliyah; "The Effect of Adapted Cardio Drumming in Adults with Down Syndrome" (Janice Smith)

In this Communication Disorders & Exercise Science collaboration, we led a fun, moderate to vigorous exercise modality for a group of individuals with DS. This novel exercise had participants using pool noodle floats as “drum sticks” and yoga balls as “drums” to complete “cardio drumming”. The project began in late January and continued over the course of eight weeks. . Participants will be given their own set of “cardio sticks” at the end of the study for their effort and participation. Activity level and physical characteristics were measured and monitored by KRS collaborators throughout the study using their equipment that estimated BMI and wrist units that tracked physical exertion. Cognitive skills were assessed prior to the first session using a standardized measure, The Peabody Picture Vocabulary Test, which will help estimate mental age (Dunn & Dunn, 2016). Executive function was measured through the administration of the Delis Rating of Executive Functions – Adult (D-REF), and two skills tasks: a modified card sorting task to assess the ability to change cognitive tasks, and a response inhibition task based on the Knock-Tap task (Korkman et al. 1998).

Waddey, Bethany; "Improving Diagnostic Outcomes for Individuals with Autism Spectrum Disorders Within the Hispanic Community in Bowling Green, Kentucky" (Leisa Hutchison)

Despite the importance of early identification and intervention of Autism Spectrum Disorder (ASD), Hispanic children are significantly under-diagnosed with ASD in comparison to non-Hispanic, white children (Pederson et al., 2012). The purpose of this research is to determine the levels of autism knowledge in the Hispanic community in Bowling Green, the barriers that may contribute to why autism is under-diagnosed in Hispanic children, and how to mitigate these barriers. This project includes the translation and distribution of the Autism Spectrum Knowledge Scale- General Population Version (McClain et al., 2019) in Spanish, the creation and distribution of resources in Spanish and English about autism and other relevant topics, and the compilation of a list of bilingual medical, educational, and therapeutic service providers in the area. Through the distribution of the Autism Spectrum Knowledge Scale-General Population Version (McClain et al., 2019), the author expects to discover what misconceptions the Hispanic community may believe and what knowledge they may lack regarding ASD. The results of this survey will inform the creation of resources that aim to increase autism awareness, dispel misconceptions, and alleviate the barriers to autism identification in a population where autism is currently under-identified.

Wade, David; "Multipurpose Venue For Healthy Lifestyle" (Shahnaz Aly)

In order to create a community dedicated space for individuals who are interested in fitness, I designed a multifunctional space for healthy living. I haven't yet come across a region that caters to every aspect of the fitness lifestyle in my studies, a location where everyone may congregate and improve themselves. Anyone looking to live a healthy lifestyle should feel at home in this region. Fresh, organic vegetables will be cultivated in this area. Sections will be dedicated to powerlifting, bodybuilding, and commercial weightlifting, and there will be additional spaces for

palates, yoga, and cardio as well as spaces for meetings with nutritionists or dieticians who may assist customers to stay on track. This location will provide a space where people can dine without thinking about their diets or weight reduction objectives. This project might completely alter Knoxville's approach to exercise. In the Knoxville region, there are no places that provide a variety of services for a healthy lifestyle, including culinary services. Such a building would bring in incredible amounts of money and attract a lot of attention to the neighborhood. Creating a sanctuary where everyone has a home for whatever they train is my aim in developing this.

Walterman, Jacob; Ozer, Ozkan; Emran, Rafi; "Wolfram Demonstrations Simulating Boundary Stabilization/Control of Linear PDEs" (Ozkan Ozer)

Novel reduced models of partial differential equations (PDE) for piezoelectric (smart material) beam equations are developed by Finite Differences and Finite Elements. These reduced models accurately predict feedback-controlled vibrations on piezoelectric beams and utilize a paired controller and sensor that are collocated at the tip of the beam. First, it is shown that the feedback sensor placed at the tip of the beam can be designed by eliminating the short wavelength and high-frequency components of the solutions through the direct Fourier filtering technique. This way, the sensor becomes more able to distinguish one vibrational frequency from another. The filtered sensor data is then fed back to the controller, resulting in all of the vibrations on the beam being successfully suppressed exponentially fast, replicating the dynamics of the PDE case. Another approach, based on order reduction, accurately simulates the suppressed dynamics without the need for direct filtering. Finally, all Mathematica simulations are converted to the computational framework Wolfram’s Computable Document Format (CDF) to be published at open-source-code website called Wolfram Demonstrations Project (WDP). As a side note, each Demonstration Project is peer-reviewed and edited by Wolfram experts and engineers for content, clarity, presentation, quality, and reliability.

Weaver, Vivianna; Sanders, Jacob; Pan, Amy; Wood, Lyla; "Cloud Forest Herbaceous Plant Diversity Declines as Forest Age Increases" (Martin Stone)

The cloud forest is a rare habitat on a global basis. The nature reserve Cloudbridge, located in the Talamanca Mountains of Costa Rica, is such a habitat. It has been significantly deforested in the past hundred years. For the past twenty years, the 600 acres of Cloudbridge have been undergoing intentional reforestation, so it presently consists of trees from a few years old to true old growth forests at over 150 years of age. We investigated the herbaceous plant diversity on the forest floor that ranged from 5,200 to 5,700 feet above sea level. Eight square foot quadrats were used to determine herbaceous plant diversity. Species richness and evenness were calculated using the Simpson Diversity Index. The herbaceous plant diversity declined from 0.2947 in the youngest ages to 0.1714 in the old growth forest. Individual plants in our quadrats declined from 110 in the youngest plot to only fifteen in the old growth forest. We found that herbaceous plant diversity on the forest floor declined as forest age increased and we speculate that was likely due to competition for water and sunlight.

West, Mia; "Sub-basin Delineation in Hidden River Cave System, Horse Cave" (Patricia Kambesis)

Industrial and agricultural pollution significantly determine groundwater quality in South Central Kentucky; local farms and industrial parks are located within the boundaries of Horse Cave, Kentucky's largest groundwater basin. Microplastics have also been detected within the groundwater basin, specifically in the Hidden River Cave System, located under Horse Cave, Kentucky. Previous dye tracing delineated the larger Gorin Mill Groundwater basin, which drains to Gorin Mill, Kentucky's largest discharge spring. The Hidden River sub-basin is part of this drainage system, and the aforementioned dye trace provided a general delineation of its basin boundaries within the larger hydrogeological system. In this study, further dye tracing was used to better define the southern and eastern limits of the Hidden River subbasin, home to large farms and major plastics-producing industries. Charcoal dye receptors were placed at specific locations within Hidden River Cave which drains the Hidden River sub-basin; dye injections were conducted along the loosely defined southern and eastern boundaries of the sub-basin. Results revealed the specific groundwater flow paths from local industrial parks and agricultural properties into the groundwater basin. Data from this study will be used to better manage groundwater pollution in the eastern segment of the Gorin Mill groundwater basin.

Whaley, Anna; "Comfort Women: A Case Study in Imperialism, Patriarchal-State Building, and Rape as a Tool of War" (Patricia Minter)

While a majority of the academic discourse regarding World War II focuses on the Western Front, less research has breached the topic of sexual enslavement by the Japanese Imperial Army in comfort stations. When looking at a wider discussion of violence against women in times of war, this project delves deeper into the history of comfort women as a prime case study in patriarchal state-building and rape as a tool of war. Analyzing first-hand accounts of comfort women is vital to center lived experiences in the dialogue of Japanese imperialism. Using a holistic lens of scholarly historical analysis as well as first-person accounts contextualizes comfort stations, examines international laws that denied justice to women, and explains the modern redress movement in Asia. Employing a feminist approach to the topic allows for an interdisciplinary examination of the shifting cultural narratives toward comfort women and explores how modern acknowledgment of victimhood may impact future geopolitical relations.

Wheeler, Kendall; Kambesis, Pat; Philips, Keith; "Life in the Dark: H_2S-Oxidizing Microbes and Their Impacts in Parker Cave" (Pat Kambesis)

In terrestrial ecosystems, primary production is occupied by plants or photosynthetic microbes. However, many bacteria and archaea utilize a sulfur-oxidation metabolism and act as primary producers in their ecosystems. Such microbes have been observed in Parker Cave in Edmonson County, Kentucky, along with hydrogen sulfide (H2S). Parker Cave has been noted as a place of high biodiversity, even among eukaryotes. High microbial productivity due to H2S-metabolism has been speculated as the cause, but little research has been done there in support of this. Traditionally, H2S in Parker Cave has been thought to occur from manmade oil wells, but more

recent studies suggest the opposite. Isotope analysis of the Phantom Waterfall in Parker Cave could lead to better understanding of the age, origin, and distribution of sulfide resources in the Mammoth Cave area. Sampling diversity at Parker Cave and other MACA sites could lead to a greater understanding of how this H2S-metabolism affects community diversity. At present, it is unknown whether sulfur-oxidizing bacteria play a major role in primary production within Parker Cave, however analysis of the flowstone surrounding the Phantom Waterfall can further illuminate this topic.

Whittle, Madison; "Continuation of Museum Visitor Engagement Research Derived from the Mobile Application Muser" (Kara Glenn)

Within the past two years, the museum industry took a devastating hit in attendance rates during the COVID-19 pandemic and still continues to suffer from its lasting impacts. While the cultural and historical importance of museums on society is undeniable, how might we foster an invaluable industry that is rapidly declining? My advisor and I strove to answer this question last summer with the development of our Muser app. Muser is a mobile application utilized by museums to boost visitor engagement via the heatmap generation of a user's journey through a given museum. With this heatmap, we are then able to revisit the space and make decisions based on contextual clues to implement informed, design-based decisions. After testing Muser's viability and analyzing the data during a study abroad program in the UK, we felt confident moving forward to our next phase of research: Partnering with the National Blues Museum, Missouri History Museum, and Soldier's Memorial in St. Louis. We conducted our research using Muser on a wider scale and collaboratively implemented design-based, informed changes in an effort to boost visitor engagement. Thus, our latest phase of research allowed us to implement Muser in a wider, more diverse, testing pool.

Wilkinson, Lindsey; "Creating A Sense of Home" (Shahnaz Aly)

Over 8,629 children in Kentucky foster care will never live in just one house. Just because these children have been delegated a house to live in, it does not make that house a home. When a house becomes a home, it establishes a feeling of comfort and a sense of belonging. Everyone's house may appear different, however there are common attributes within the form and design that aid in recreating a feeling of home. Designing a large group home allows foster children and foster parents a place that feels like home and allows interaction with others in similar circumstances. This sense of home is created through intentional design beginning with the first impression of the building to the interior makeup. Architectural design plays largely into the buildings functionality and establishing how residents see or feel within a space. Ensuring that residents have private and social spaces allows them to maintain their independent lifestyles while also catering to their social needs. A sense of home varies per person, but maintaining common elements and parameters are crucial to creating a sense of home. Designing a space that provides this atmosphere creates a healthier environment promoting self and safety to the resident.

Williams, Julian; "Comparing SAV Ratios of Emulsion-Polymerized Polymethyl-Methacrylate Beads" (Matthew Nee)

Although water pollution has become a serious issue in the modern world, efficient and effective ways to counteract it have become increasingly more prevalent. Despite this, very durable molecular pollutants are resistant to most conventional water remediation methods. With the use of photocatalytic degradation, these persistent pollutants can be converted to harmless gases such as carbon dioxide and oxygen gas in the presence of particular frequencies of light. Adding a photocatalyst to the water directly, however, would create a suspension that would prevent the photocatalyst from being retrieved and ultimately reused again. A solution to this problem would be to adhere the photocatalyst to a macroscopic, buoyant polymer substrate, as this would allow for retrieval and reuse of the photocatalyst. These polymer beads are created using oil-in-water free-radical emulsion polymerization. Potential polymer substrates polystyrene (PS) and polymethyl methacrylate (PMMA) were both polymerized using divinylbenzene (DVB) as a crosslinker, and both formed spherical porous beads. After synthesis, potency of photocatalytic activity of PS substrates and PMMA substrates is assessed using UV/visible spectroscopy; utilizing methylene blue as a model pollutant for degradation.

Win, Shwe; Taylor, Ritchie; Macy, Gretchen; Basham, Jacqueline; "Workplace Violence Among Young Black Workers Ages 18-24 in Southcentral Kentucky" (Edrisa Sanyang)

Workplace violence and work-related attacks may go unnoticed, but this important public health problem can affect populations across the lifespan. However, young black workers are at a higher risk, not only because they are a minority, but also due to age-related psychological development. They are also commonly left out in occupational health databases because they are not thought of as workers. This study includes young black workers ages between 18 and 24 years in Southcentral Kentucky. Participants identified themselves as victims of workplace violence by completing a recruitment survey. The survey was distributed via social media posts including sharing recruitment YouTube video on the Western Kentucky University (WKU) Student Support Services (SSS) TRIO program and Intercultural Student Engagement Center (ISEC) Instagram. It was also shared via email feeds of majority black associations or other groups. Data collection is complete. We used Key Informant Interviews (KIIs) to solicit information from victims of workplace violence. Participants discussed risk factors and characterized workplace violence, described the relationship of perpetrators to the workplace, supports received from the employer, and how the violent event was resolved. Participants also described the effects of the violent event on their education and employment. The data analysis is ongoing.

Wisenden, Matthew; "Utilizing Show Cave Tours to Assess Nonformal Karst Educational Outcomes In Youth" (Leslie North)

Karst landscapes are regions with geological features such as caves, sinkholes, and underground streams created by the dissolution of highly carbonate bedrock. The aesthetic, historical, and ecological significance of many karst features has resulted in human modification of some caves to allow public visitation as ‘show caves.’ Although unregulated commercial development of karst

areas can threaten regional ecological health, if properly managed, show caves can be integral to the region's economic development, societal culture, and environmental conservation and serve as platforms to disseminate knowledge of the vulnerabilities of karst regions. Using Lost River Cave in Bowling Green, KY as a case study site, this study aimed to reveal how nonformal karst education can enhance youth understanding of cave and karst environments. Pre- and post-assessments were distributed to school children on fieldtrips, then data were analyzed to determine improvements in scores. Semi-structured interviews with tour guides and teachers were conducted with transcripts thematically coded to reveal what is incorporated into their pedagogy when teaching about karst environments. This study revealed the importance of clearly communicating scientifically accurate karst information during school show cave tours to promote a sense of value of these sensitive areas in younger generations.

Wood, Jeffery; "A large-Scale Meteorological Feature Analysis of a High-Impact Winter Storm over Texas on February 13-15, 2021" (Joshua Durkee)

A high-impact winter storm affected Texas February 13-15, 2021, which resulted in widespread collapse of the power grid system and consequently resulted in 246 fatalities due to hypothermia and carbon monoxide poisoning. The purpose of this study is to identify large-scale meteorological factors that contributed to the development and maturity of the mid-latitude weather system that led to these unfortunate outcomes. Results from this study showed that regional-scale circulation features played a substantial role dictating the storm's development and movement across Texas. Further, this study also showed that near-surface temperature profiles were a key driver in the hazardous winter weather precipitation that fell across the affected areas. Overall, this study showed that this historic winter event conformed considerably well to expected cyclone morphology, which resulted in relatively high forecast verification.

Wood, Kenyan; "Changes to Travel Plans to Mammoth Cave Due to Weather and Covid" (Jacob Byl)

This research project uses data from a survey of 349 visitors to Mammoth Cave National Park to study how factors like weather and the COVID-19 pandemic affect travel plans. When looking at unfavorable weather during a park trip, a regression model indicates that students, those who drive farther, and those who are willing to donate to nonprofits are less likely to want to reschedule their trips to another time. Other demographic variables are not statistically significant predictors—either positive or negative—of wanting to reschedule. When looking at unfavorable COVID-19 numbers that may affect park activities, those who have a college degree and older visitors are more likely to say they would want to reschedule their trips. Those with higher income and people who report always wearing seatbelts—a proxy for risk aversion—are less likely to want to reschedule. Further research will look at alternative options for visitors, such as switching to another park or cave, canceling their trips, or keeping their plans, and seeing who tends to opt for each option and test whether that differs for disruptions from weather versus disruptions from COVID.

Woolums, Julia; "The Reality of Bipolar Disorder: A Dance Film to Bring Awareness to the Misconceptions of Mental Health" (Meghen McKinley)

The Reality of Bipolar Disorder: A Dance Film to Bring Awareness to the Misconceptions of Mental Health. For my project, I researched bipolar disorder to create a dance film highlighting the associated symptoms and emotions of hypomanic and depressive episodes. The purpose of this research is to bring awareness to and educate on the reality of these mental health symptoms to reduce mental health stereotypes and stigma. I researched academic texts and peer-reviewed articles about bipolar disorder written from the perspective of those diagnosed with it and used the symptom criteria in the Diagnostic and Statistical Manual of Mental Disorders to compose, choreograph, film, and edit my dance film. The completed film showcases what daily life could look and feel like to those with the disorder. The film highlights pedestrian activities and symptomatic behaviors as well as the internal thoughts and emotions expressed through modern dance choreography. This film was presented in two Western Kentucky University Dance Program student choreography shows; Last Chance to Dance and The Dance Project. This dance film will also be uploaded on the internet for public access, creating a research archive and allowing the message to spread beyond its initial release.

Yankee, Elianna; "Checking-In on Mom: An Examination of Paid and Unpaid Leave on Maternal Postpartum Depression" (Lauren McClain)

As it stands, the United States exists as the only developed country that does not mandate paid parental leave federally. It also ranks among the highest in reported rates of postpartum depression across several internationally comparative studies. A general lack of data on this topic has influenced my research project's focus on the relationship between use of a paid parental leave benefit and maternal mental health status measured by postpartum depressive symptoms. The study uses data gathered by Dr. Lauren McClain, a recipient of Fall 2021 RCAP funding for our study's Parental Leave Survey. The online survey was administered to 2649 parents who had a baby through birth or adoption in the past two years. This was a quota sample based on race/ethnicity, household income, and region of the country. The survey limits the sample to working mothers who gave birth (n=864) to study their experience with postpartum depression. Through ordinary least squares regression analysis, our study will test the hypothesis that access to paid parental leave through an employer is associated with lower incidence of postpartum depression as compared to mothers who took alternative paid leave options, took only unpaid leave, or did not take leave at all.

Yonts, Kaden; Kasturiratna, Dunil; "Properties of Time Series and Analysis in Mathematica" (Ngoc Nguyen)

Often, mathematical ideas are hidden behind complex textbooks, thus depriving students of an experience in which they create and refine ideas for themselves. Time series analysis is one such topic where the available resources are difficult to refine through self-experimentation. This paper describes a user interactive Mathematica program intended to showcase the relationship between parameters and the behavior and properties of time series. Three main parts: simulation,

estimation, and prediction, are used to formulate predictive models in time series analysis. Some facets of time series analysis include: AR models, MA models, and correlation functions.

END OF ABSTRACTS