# CSM Celebrates!
## April 27, 2021
## Poster Abstracts

# Graduate Student Abstracts

**Lipika Chandrashekar, Jasmine Howard, Akash Kumar, Eric Lacker, Srilaxmi Paramaiahgari**
**Research Advisor: Dr. Jongwook Kim, Department of Computer Science**

### Statistical Analysis of Eclipse Refactoring Bug Reports

Software refactoring is the process of making code changes to a program to improve its structure, design, and implementation, in such a way that it does not change the original program behavior. One example is the "rename" refactoring that changes program elements to new names that are easier to understand. Many software development tools, including Eclipse, offer various built-in refactorings such as rename, move, extract, etc. However, we discovered that over four thousand bugs related to Eclipse refactorings were reported as of January 2021. Many of these bugs get fixed after they are reported on the Eclipse bug report website (called Bugzilla), but others remain unfixed or even forgotten. This raises interesting questions - What percentage of refactoring bugs cannot be fixed or will not be fixed? How long does it take for a bug to get fixed on average? etc. Surprisingly, our analysis of the reported refactoring bugs showed that 20% of the bugs would not be fixed. Also, we found that on average, an Eclipse refactoring bug takes "223 days" to be fixed. To the best of our knowledge, our research work is the first statistical analysis of the Eclipse refactoring bug reports in Bugzilla.

**Julie Dobson**
**Research Advisor: Dr. Jessica Sullivan-Brown, Department of Biology**

### Folic Acid Metabolism's Impact on Neural Tube Closure

Every year 303,000 children are born with neural tube defects and very few treatment options exist (Zaganjor et al, 2016). Researchers understand that congenital abnormalities arise from defective growth during embryogenesis, but the processes occurring during human development are difficult to observe. However, patterns of human development considerably resemble those of Zebrafish due to the incredible genomic conservation throughout vertebrate evolution. Further, clinical trials extensively report that mothers who consume diets high in folic acid demonstrate preventative effects against neural tube defects in their babies (Spina Bifida, 2020). Investigations on Zebrafish neural tube development will be evaluated with and without internalization of folic acid. First, a procedure will be established observing typical formation of the neural tube with access to folic acid unmanipulated. Next, development will be observed in Zebrafish embryos treated with 1.7mM of methotrexate to inhibit the folic acid metabolism enzyme dhfr via competitive inhibition. The results of this investigation will provide insight into how the folate pathway influences neural tube development during embryogenesis. If researchers can understand how proper development is achieved, and uncover which disrupted processes lead to malformations, targeted treatment for developmental abnormalities may one day be established.

**Prathyusha Dongari**
**Research Advisor: Dr. Richard Burns, Department of Computer Science**

**SENTIMENT ANALYSIS OF POLITICAL TWEETS: A SURVEY OF SUPERVISED MACHINE LEARNING TECHNIQUES**

Over the past decade, the use of online social media Web sites (e.g., Facebook and Twitter) has skyrocketed. Among them, Twitter is a popular platform for users to interact in real-time, share content, express their opinion related to social events in a limited number of characters, called "tweets".

In this paper, we detail our study of the collection and analysis of political tweets related to the 2020 US Presidential Election. Sentiment Analysis was performed to visualize 17M political tweets that we collected using the Twitter API across various states in the US and modeled to predict results. We developed our code to extract live streaming tweets that had candidates' names, hashtags, and relevant keywords, then utilized user-provided location and our own features to tag tweets to their respective states. Sentiment scores were calculated on 2.6M state mapped tweets using VADER (Lexicon sentiment Analyzer). We analyzed where presidential candidates were being tweeted more favorably and used these results to build a model that predicted 2020 US Presidential Election results at the state level. The final results were compared with the actual election results. The model correctly predicts 23 states that Biden won, and 16 states that Trump won in the election.

For completeness, further investigation and a comparative performance evaluation is made on the dataset using machine learning Techniques and lexicon-based approach (VADER), together with evaluation metrics. As tweets are highly unstructured, preprocessing is performed using NLTK and Scikit-learn. Then by calculating the polarity and subjectivity measures, tweets are manually annotated into three groups (Positive, Negative, and Neutral). Thereafter, Term frequency-inverse document frequency (TF-IDF) is applied as the feature extraction method with the help of unigram, bi-gram, and tri-gram techniques, different features are extracted and assigned for each feature its associated sentiment in an efficient way, which is then subjected to prediction models such as Support Vector Machines (SVM), Decision Tree Classifier, Logistic Regression, Random Forest and Multinomial Naive Bayes Classifier. 80% of the dataset is used to train classifiers to generate different prediction models. Finally, 20% of the data is tested on those learning models. To determine which algorithm works better for a given dataset, the performance comparison of classifiers is evaluated based on the accuracy, precision, recall, and F1 score. The results suggest that SVM (0.81) and NB models outperformed when compared to the other three Machine learning classifiers and Lexicon sentiment Analyzer.

**Shelby Kreglow, Caroline Guzi, Kathleen Moser**
**Research Advisor: Dr. Stevie Grassetti, Department of Psychology**

**Parents' Preferences around Traditionally Gendered Toys and Activities**
Background: Gendered play is the practice of socializing children to culturally-constructed gender roles via the mechanism of play. In the current study, we compared modern parents' ratings of acceptability of traditionally gendered "girl" toys and activities and traditionally gendered "boy" toys and activities.
Method: Undergraduate students completed an online survey and provided their parent's contact information. The parent participants completed a similar survey. A total of n=32 parents (Mage = 52.08 years, 84% female) participated in the study.
Measure: Participants completed the Child-Gender Socialization Scale. The subscales of interest include an 8-item subscale Toys and Activities Stereotyped for Girls and a 7-item subscale Toys and Activities Stereotyped for Boys were used to measure acceptability.
Preliminary Results: A paired sample t-test compared parents' acceptability of "boy" toys and activities to "girl" toys and activities. Parents reported statistically significantly higher acceptability of girls' toys and activities (M = 3.91, SD = 0.66) compared to the boys' toys and activities (M = 3.49, SD = 0.65) t(32) = 3.314, p = .002.
Implications: Current events have given evidence of the ability of women to break the "glass ceiling" and enter into professional realms that were once exclusive to men (Newburger, 2019). Parents in this study indicated that "girl" toys and activities were more acceptable than "boy" toys and activities. Thus, recent advancement for women may be due, in part, to less gendered play, but also may be due, in part, to higher acceptability of roles and activities that were previously stereotyped for girls.

**Rex Llewellyn**
**Research Advisor: Dr. Chuan Li, Department of Mathematics**

**Matched Interface Boundary Method for Solving the Heat Equation with Interfaces**
When modeling systems made up of two materials with different thermodynamic properties, a physical interface can be introduced to account for the border where the materials meet. This interface separates our model's standard grid into two regions, each with its unique physical properties. At these interfaces, boundary conditions can be imposed to represent the difference in heat and in heat flux between the different materials so that their interaction may be modeled accurately. Because standard finite difference methods are inadequate to deal with interfaces, a Matched Interface and Boundary (MIB) technique is investigated in this work to solve the heat equation with interfaces. MIB techniques are powerful tools used to solve partial differential equations due to their efficiency and stability. Without loss of generality, this work will solve 1-dimensional interface problems to demonstrate the accuracy and computational efficiency of this method, which will create a linear system of equations to be solved at each step in time throughout the duration of the model.

**Pater Pham, Katherine Peltier**
**Research Advisor: Dr. Chuan Li, Department of Mathematics**

**Parallel Computing of Action Potentials in the Hodgkin-Huxley Model via the Parareal Algorithm**

The Hodgkin-Huxley model is a system of differential equations that describe the membrane voltage of an axon as it fires the basic signal of the nervous system: the action potential. When charge-carrying ions such as sodium, potassium, and others are enabled to cross a selectively permeable membrane, the resulting current propagates along the length of the axon as a wave of altered voltage potential. However, the degree to which the membrane is permeable to sodium and potassium is itself gated by voltage; therefore, voltage depends on permeability and permeability depends on voltage. This interdependent system is expressed as a system of differential equations with experimentally obtained initial conditions, which must be solved numerically for modeling changes in the behavior of axons. Solving the system of equations of the Hodgkin-Huxley Model by a novel time-parallel algorithm named the Parareal algorithm is another goal of this work. Parareal is a method for solving initial value problems involving either partial or ordinary differential equations. It allows expensive computation to be carried out simultaneously for improved accuracy and allows calculations to be completed in less iterations/evolutions when comparing to the sequential computing.

**Jennifer Ryan, William Volpe, Emily Mauser, Angela Perretti, Laura DeHart, Sydney Hendrixson, Mackenzie Medeck, Brian Fadrowski**
**Research Advisor: Dr. Rebecca Chancellor, Department of Psychology**

**Evaluating the Effects of Temperature and Time of Day on the Activity of Captive Western Lowland Gorillas (Gorilla gorilla gorilla)**

Research on captive animals reaps substantial benefits for conservation, education, and enrichment efforts. As more species become displaced in their natural habitats, it is the job of the researcher to better understand how these animals behave in captivity. To contribute to these efforts, we have been observing the activity budgets of a group of captive western lowland gorillas (Gorilla gorilla gorilla) (1 adult male, 2 subadult males, 2 adult females, 2 infant/juveniles) at the Philadelphia Zoo. Over a period of 16 non-consecutive months, we conducted 30-minute focals with 2-minute scan samples on the gorillas (54.66 hours), recording time of day, specific behaviors, temperature, and level of activity in their outdoor enclosure. We categorized behaviors as either low activity (e.g., laying down, self-grooming, sitting, and standing), or high activity (e.g., foraging, moving/traveling, nest building, chasing, playing, and self-scratching). We predicted that warmer temperatures, as well as later time in the day, would decrease the activity level of the gorillas. Our results showed a non-significant relationship between temperature and activity budget ($F_{(1,79)} = 0.059$, $p = 0.8$, $R2 = 0.001$). We also found a non-significant relationship between time of day and activity budget ($t_{(79)} = 0.637$, $p = 0.5$). Our results suggest that temperature and time of day have little to no effect on the gorillas' activity level. We discuss ways that this research could be expanded upon in the future to

further our understanding of how best to care for captive gorillas.

**Afolabi Shokunbi, Molly Murphy**
**Research Advisor: Dr. Eleanor Brown, Department of Psychology**

**Playtime and Bedtime Relate to Cortisol Levels for Young Children Facing Poverty-Related Stress**

Background: Poverty circumstances tax physiological systems that respond to stress.  Yet research suggests that supportive parenting may offer some protection. The present study uses daily interview methodology to probe how parents might structure children's days to promote lower stress levels in the context of poverty risks.

Method: Participants were 139 children who attended a Head Start preschool. Mean age was 4 years, 2 months, and 48.9% were identified as female, and 51.1% as male. Approximately 52.6% were identified as Black/African American, 16.6% as Latino/Hispanic American, 8.6% as Asian American and 22.3% as White/European American. Nearly 100% faced economic hardship.

Ethical standards were followed and all procedures were approved by the WCU IRB. Primary caregivers completed interviews, conducted over the telephone by trained research assistants, to collect information about daily routines on 10 days across two weeks. Child cortisol was measured via assays of saliva samples collected at 9am, just following preschool drop-off and prior to breakfast.

Results and Implications: Results of a zero-order correlational analysis suggested that, of the activity categories in the present study, more playtime related to lower levels of the stress hormone cortisol, and later bedtime related to higher levels of cortisol. In a regression analysis, both playtime and bedtime explained unique variance in cortisol. Implications concern how parents might structure children's days to foster physiological regulation in the context of poverty-related stress, and suggest that both playtime and bedtime matter.

**Benjamin Wolfe, Kenia Tumbiolo, Keriann Mosley, Sam Miller**
**Research Advisor: Dr. Eleanor Brown, Department of Psychology**

**Want to Change Perspectives on Social Justice?   Academic Courses Matter, but Social Movements May Matter More**

Background: Ending systemic racism and other interrelated forms of oppression depends on institutional change, as well as changing individuals' hearts and minds. The present study examines first the impact of a course focusing on social justice and second the impact of 2020, with the COVID-19 pandemic, a critical stage of the Black Lives Matter Movement, and increasing awareness of racism and classism.

Method: Participants were 139 WCU students (87% female identified, 36% BIPOC): 101 were enrolled in 2017-2019, and 38 in 2020. Measures included the White Privileges Attitudes Scale (Pinterits, Poteat, & Spanierman, 2009) in its original form as well as an adapted form to measure attitudes about middle class privilege, and the Coping with Discrimination Scale (Wei,

Alvarez, Ku, Russell, & Bonett, 2010).

Results and Implications: A repeated measures MANCOVA revealed significant change from pre- to post-course in student ratings for awareness of White privilege, willingness to confront White privilege, willingness to confront middle class privilege, and interest in advocating for education about discrimination.

A GLM comparing pre-course scores for students in 2017-2019 versus those in 2020, revealed significant differences for awareness of White privilege, remorse about White privilege, awareness of middle class privilege, willingness to confront middle class privilege, remorse about middle class privilege, interest in advocating for education about discrimination, interest in resisting discrimination, and detachment from discrimination.

If we are interested in changing perspectives about issues of social justice, academic courses can matter, but social conditions and movements may matter more.

# Undergraduate Student Abstracts

**Laurel Bowers, Lena Hull, Sierra Wolk**
**Research Advisor: Dr. Jodi B. A. McKibben, Department of Psychology**

**Assessment of a Forced-Choice Memory Measure to Detect Malingering**
The goal of this pilot research study was to develop and assess a new, somewhat challenging, probability-based measure of malingering to identify sophisticated malingerers, such as college students. Despite the general reliability of malingering-detection measures, such as the Word Memory Test and the Portland Digit Recognition Test, prior research reveals that these tools are susceptible to information leaks and can cause participant fatigue (Huskey, 2002). Thus, the Memorization of Digits Tool (MODT) was created as a shorter, more difficult forced-choice recognition test to better detect malingering behavior. This study employed a posttest-only control group design with one experimental group that was given basic information about malingering and instructed to malinger without getting caught, and a control group instructed to give their best effort. The pilot study took place virtually over Zoom meetings and required participants to take a series of cognitive tests via a Qualtrics survey program. After completing informed consent forms, participants completed the MODT, the Stroop Cognitive Interference Task, the Barkley Deficits in Executive Functioning Scale, and a socio-demographics survey. As hypothesized, participants who were instructed to fake bad on the MODT without getting caught (n=32) performed significantly worse than the control group (n=32) (p<0.001), indicating that the MODT is an effective malingering-detection measure. This finding held when the experimental and control groups were compared on the less difficult half (p<0.001) and the more difficult half (p<0.001) of the MODT, suggesting consistency across difficulty levels.

**Barbara Chen**
**Research Advisor: Dr. Jessica Sowa, Department of Biology**

***Effects of capsid and delta Orsay virus proteins on the Intracellular Pathogen Response of C. elegans***
In the evolutionary host-pathogens arms race, selective pressure between a pathogen and its host led to the necessity for pathogens doto evolve to evade detection by host immune systems, weakening the host's ability to effectively resist the pathogen. The goal of this project is to better understand the interactions between viruses and their hosts' innate immune systems. To study innate immunity exclusively, the roundworm C. elegans is a useful invertebrate model because it relies exclusively on epithelial innate immunity for pathogen defense. The Orsay virus is an RNA virus that activates an immune response in C. elegans called the Intracellular Pathogen Response (IPR). The Orsay virus has a very small genome containing only four proteins. Preliminary evidence suggests that either one or a combination of these Orsay virus proteins can suppress the IPR (unpublished data), which is surprising considering the small size of the genome. In this

project, the effects of the viral capsid and delta proteins located on the RNA2 genome segment of the Orsay virus on the IPR will be investigated. Thus far, molecular cloning has been used to construct plasmids that will be microinjected into C. elegans, which will create transgenic animals that overexpress each of the two Orsay proteins. We will then test the animals under stresses that activate the IPR to observe the individual effects of the capsid protein and delta protein on IPR suppression. From this we will better understand how viruses evolved to evade the host immune system.

**Kevin Codd, Tyler Clark**
**Research Advisor: Dr. Linh Ngo, Department of Computer Science**

**Studying Break-In Attempts Across Multiple Servers Using Apache Spark and Security Logs**
In this work, we analyze month-long security log data from various departmental servers that are exposed to the Internet. The analytical tasks involve identifying temporal patterns and sources of attacks in order to provide insights for system administrators. We utilize Apache Spark, a data-intensive computing framework, to conduct our analytical tasks in anticipation of future extension and scalability. The final analytical results are presented. This work provides the foundation for our next project, a real-time security monitoring dashboard using streaming data analytics.

**Emily Cooper**
**Research Advisor: Dr. Jessica Sowa, Department of Biology**

**Effects of the Orsay virus alpha-delta protein on the Intracellular Pathogen Response of C. elegans**
To successfully cause infection, a pathogen must evade the host's immune system. How viruses evolve to elude immune systems is not entirely understood. The roundworm C. elegans is a useful model system to study host-pathogen interactions because it relies exclusively on innate immunity, excluding complex interactions that take place in adaptive immunity. The goal of this study is to investigate the effects on the Intracellular Pathogenic Response (IPR) of C. elegans when the alpha-delta protein of the Orsay virus is over-expressed. The IPR is an innate immune response in C. elegans that provides defense against certain types of stress and pathogens. The Orsay virus is a positive single-stranded viral pathogen known to activate the IPR. To study the individual effects this protein has on IPR activation, Gibson Cloning will be used to construct plasmids that over-express the alpha-delta protein in C. elegans. This construct will be microinjected into the C. elegans gonad, creating transgenic progeny. We will trigger the IPR in these animals using known activators, and determine the effect alpha-delta protein expression has on IPR activation. To visualize IPR activation levels, we will use the GFP IPR reporter pals-5p::GFP, which drives expression of the green fluorescent protein when the IPR is triggered. From this project, we will be closer to identifying the innate immune signaling pathways of C. elegans that are targeted by Orsay virus to suppress host immunity, and ultimately gain a better understanding of how viruses evolve

to evade host immune systems.

**Laura DeHart**
**Research Advisor: Dr. Jessica Schedlbauer, Department of Biology**

**Assessing different control methods for invasive plant species Microstegium vimineum and Alliaria petiolata on individual homeowner property scale**

Invasive species are a major contributor to biodiversity loss throughout the world, and more then 1.4 trillion dollars are spent worldwide managing invasive species. Homeowners who address this issue can help control invasive species spread in rural communities, which can help lessen their impact on overall ecosystems. This study examined two ways to control the growth of invasive Microstegium vimineum, Japanese stilt grass, and Alliaria petiolata, garlic mustard, in northeast Pennsylvania. Separate sites were set up monitoring the growth of both a garlic mustard and a Japanese stilt grass population, over seven weeks in 2020. Each site was separated into three adjacent 4 m2 plots at each plant site. Each plot was subjected to a different treatment; one plot was treated with a homemade herbicide, one plot hand pulled, and one plot was a control. The homemade herbicide consisted of vinegar, Epsom salt, and Dawn dish soap, and proved efficient in stopping the growth of Japanese stilt grass, but had no visible effect on the garlic mustard treated with the same solution. The homemade herbicide showed an increase in soil potassium by 45% compared to the control plot. The hand pulled plots showed a complete stop in growth for both species of plants. Since hand pulling effectively stopped the growth of both garlic mustard and Japanese stilt grass, it shows that homeowners can effectively use this method over the homemade herbicide to stop the growth of these plants on their property.

**Corinne Gallagher**                                                 **Research Advisor: Dr. Eric Sweet, Department of Biology**

**Investigating Parthenolide as a Cocaine Antagonist in Mice Using the Elevated Plus Maze**

With over 900,000 Americans meeting criteria for cocaine dependence, exploring a potential cocaine antagonist is a crucial research topic. A compound that blocks the cocaine high could be useful in cases of misuse. We are exploring parthenolide as one such antagonist. Preliminary research indicates parthenolide reduces cocaine induced hyperkinesia in planaria. Our lab aims to establish if parthenolide is a cocaine antagonist in mice using the elevated plus maze. The elevated plus maze measures anxiety by comparing time spent in the open versus closed arms. As an anxiogenic, cocaine increases the time spent in the closed arms. Thus, the ratio of closed to open arm time can be compared in the cocaine and cocaine plus parthenolide groups to understand if parthenolide is effective and reduces anxiety.

The lab has collected control data for saline and parthenolide administration, indicating no significant difference in anxiety. Thus, parthenolide alone has no adverse behavioral effects, allowing us to continue research on cocaine and cocaine plus parthenolide groups. We also found no gender differences between the saline and parthenolide group. Because females experience

drugs differently due to hormonal flux, our lab tests females' hormonal estrus stage prior to behavior testing. Although no estrus-based behavioral differences were observed in saline and parthenolide females, this research is continued to establish if cocaine and cocaine plus parthenolide groups will have varying responses based on gender and estrus.

**Joanna Gerasimidis, Mikayla Zeigler**
**Research Advisor: Dr. Kristen Breit, Department of Psychology**

**Prenatal Nicotine and THC Exposure via E-cigarettes in Rats Alters Select Maternal Factors**

Nicotine and cannabis are two of the most commonly consumed drugs among pregnant women, often consumed via electronic cigarettes. However, the longitudinal effects of prenatal e-cigarette use with either drug are not well understood. Moreover, the effects of combined use of these drugs has not yet been examined, particularly when consumed via e-cigarettes. The current study sought to develop a clinically relevant co-exposure model of prenatal nicotine and THC exposure in pregnant rats via vapor inhalation. Pregnant dams were exposed to nicotine (36 mg/mL), THC (100 mg/mL), the combination, or an e-cigarette vehicle (propylene glycol) daily from gestational days (GD) 5-20, mimicking the first and second human trimester. Maternal food and water intakes were recorded daily, along with weight gain, and core body temperatures before and after exposure. Neither body weight nor weight gain during gestation were significantly altered by prenatal exposure to nicotine, THC, or the combination via e-cigarettes. However, prenatal exposure to nicotine and THC had separate effects on core body temperatures throughout the paradigm. Prenatal nicotine exposure via e-cigarettes gradually decreased the starting core body temperatures each day as the paradigm progressed. However, exposure to THC alone caused a significantly greater temperature decrease more than the vehicle, nicotine, or the combination during the individual e-cigarette sessions. Taken together, these data suggest that this prenatal co-exposure paradigm elicits both separate and interactive physiological effects of nicotine and THC on pregnant dams, while avoiding basic, nutritional confounds. Use of this paradigm will have important implications for preclinical research in this field, which will help inform both the public and public policy on e-cigarette use during pregnancy.

**Alyson Hally**
**Research Advisor: Dr. Sullivan-Brown, Department of Biology**

**Identification of a mitochondrial transfer sequence in a folic acid metabolism gene, mel-32**

Neural tube defects (NTDs) are common malformities resulting in exposed spinal cord or brain tissue caused by the inability to close the neural tube in embryogenesis. Previous research has shown folate deficiency increases the risk of NTDs. A folic acid metabolism gene, serine hydroxymethyltransferase (SHMT) is responsible for the synthesis of thymidylates, purines, and methionine which are important for DNA replication especially during embryogenesis. Typically, eukaryotes have two copies of SHMT which are either localized to remain in the cytosol or

transferred to the mitochondria. The different localizations are a result of mitochondrial target sequences in the N-terminus. Interestingly, the model system Caenorhabditis elegans only have one homolog of SHMT called mel-32 and it was unclear if this gene's product was cytosolic, mitochondrial, or both. To address this question, a bioinformatics approach was taken to identify if mel-32/SHMT has a mitochondrial transfer sequence. We identified putative mitochondrial transfer sequences that are present in specific isoforms. Molecular phylogenies of different organisms were then generated to show prominent cytosolic SHMT and mitochondrial SHMT clustering especially around the phyla Nematoda, Arthropoda, and Tardigrada. By comparing isoforms with different SHMT localizations, potential mitochondrial target sequences were identified for organisms that could later be experimentally assessed.

**Amanda Hearn, Emma Gorczyca, Megan Mercer, Maxwell Herbst**
**Research Advisor: Dr. Aaron Rundus, Department of Biology**

**Examination of long-term data on temperature, rainfall, and humidity in Gishwati forest, Rwanda**

The behavioral ecology of primates such as chimpanzees (Pan troglodytes schweinfurthii) is highly dependent on the availability and distribution of food in their habitat. Food distribution and abundance are in turn heavily influenced by environmental factors such as rainfall, temperature, and humidity. Here we examine 12 years of data on temperature, rainfall and humidity from Gishwati forest in Rwanda, home to a population of approximately 30 chimpanzees. We analyzed these data to look for any cyclical or long-term changes. We plan to use the results from this initial analysis along with phenological data collected during the same time period to assess how changes in climate affect food availability how they might impact the behavior of the chimpanzee population.

**Madison Joynes**
**Research Advisors: Dr. Eric Sweet, Department of Biology**
**and Dr. Erin Kirschmann, Department of Psychology**

**Open Field Behavior in Adolescent Mice**

According to the National Institute of Mental Health, anxiety disorders are the most common mental illness within the United States and these disorders affected 19.1% of the population within the prior year (2020). Anxiety disorders give rise to other disorders including drug addiction and substance abuse disorders. Effects and costs of the aforementioned disorders have led anxiety disorders to become a point of research as studying them can lead to possible treatments and solutions.

The novelty seeking trait within mammals is one that has been identified by researchers as to giving rise to anxiety. Novelty seeking is defined as the propensity for an individual to desire new environments (Wingo et al, 2015). An open field (OF) test using adolescent mice (p21) has been used to observe anxiety levels in relation to their novelty seeking. Previous experiments by Dr.

Kirshmann of Immaculata University have shown the novelty seeking in adult rats was conserved throughout testing, but there was no correlation between behavior observed throughout testing in adolescent rats. In our experiment, an OF environment was changed each time to conserve novelty by altering olfactory, visual, and tactile cues as the mice were tested three times over a five-week period to conserve novelty over short and long intervals of time. Conservation of novelty throughout testing allows us to study the novelty seeking trait within adolescent mice.

**Sophia Martonick**
**Research Advisor: Dr. Eric Sweet, Department of Biology**

**The effect of parthenolide on male and female mouse open field behavior**
Of all drug overdoses, cocaine overdoses are occurring at the fastest rate from 1.4 in 2012 to 4.5 in 2018. This fast-growing trend becomes concerning due to no chemical combats available to reverse its affects unlike Narcan and Naloxone for opioids. This research experiment focused on investigating if parthenolide has the potential to act as an antagonist to reverse the effects of cocaine in an awake animal model. It is also crucial that sex differences be examined due to females, with the ovarian hormone estradiol, showing robust locomotor sensitization to cocaine. Using an open field, mice locomotor behavior, rearing behavior, and estrus status, for females, were analyzed to examine the effects that cocaine, parthenolide, saline or a combined 1:1 of 10 mg/kg cocaine and parthenolide injection had on the behavior. Based off of results obtained, parthenolide treated mice did not show a significant change in rearing events or with locomotor behavior such as total distance travelled. The effect of cocaine alone, if parthenolide can reduce the effects of cocaine on mouse behavior, and estrus status analysis for each treatment are still being examined to expand the data. It is expected that mice who receive the combined injection will show reduced locomotor behavior when compared to cocaine treated mice supporting that parthenolide be a combat by reducing the effects of cocaine. For that reason, studying parthenolide as a cocaine antagonist provides one step closer to developing a combat that can work against the fast-growing trend of deaths by cocaine.

**Chelsey Moore, Jake Sullivan**
**Research Advisor: Professor Wade Catts, Department of Anthropology & Sociology**

**Where is The Battery in Battery Park? History, Geophysics and Archaeology in New Castle, Delaware**
Where is The Battery in Battery Park?
History, Geophysics and Archaeology in New Castle, Delaware
Chelsey Moore and Jake Sullivan
The City of New Castle along the Delaware River has a long history of defensive fortifications. This paper discusses the ongoing research at one of these locations in the city called Battery Park, one of the city's public parks. There are historical records of defenses here beginning in the late 17th century that include the apparent construction of a major fortification in 1757 during the French and Indian War, may have been refitted during the war of 1812. Through the collaboration

between the West Chester University Anthropology program and the Trustees of New Castle Commons, faculty and students have undertaken research into the possible location of the 1757 fortification or the 1812 refitted battery. This includes primary and secondary document research, a geophysical survey using ground-penetrating radar (GPR), and limited test unit excavation. The GPR outputs reveal a group of anomalies that may represent a fort bastion as shown in the 1757 map. Archaeological investigation was undertaken in Spring of 2021 to examine one of those anomalies thought to potentially be associated with the bastion. This presentation summarizes the historical research, reviews of the GPR results, discusses preliminary results of the archaeological fieldwork and artifact analysis, and proposes an initial interpretation of the research project.

**Jaden Paley**
**Research Advisor: Dr. Jasmin Tahmaseb McConatha, Department of Psychology**

**Effects of COVID-19 on Modern, American Women**
The Covid-19 pandemic has transformed the lives of women, particularly women of color and mothers, in dramatic and unforeseen ways. Unfortunately, there has been a disproportionately negative impact on the concerns, fears, and anxiety experienced by American women during this difficult period. This presentation reviews the stressors and concerns of working women and addresses the ways that the popular media (25 articles from March 2020 to February 2021), has addressed women's overall health. A thorough examination of the impact (by multiple stressors including the responsibilities of paid and unpaid care work), of the COVID-19 pandemic, is explored. News articles about the well-being of women who are providing care for children and aging parents reveal significant stress levels. An evaluation of the research would indicate that there is a "Mom Penalty" and "Dad Premium" when it comes to managing pandemic family responsibilities and coping with related stress. The many vulnerabilities that women face and how they manage to cope with this difficult global pandemic will be discussed, including the rise in domestic abuse patterns and unsafe environments. The presentation will also focus on possible solutions and support strategies that can help women of diverse backgrounds.

**Michael Quin**
**Research Advisor: Dr. Michael Gawrysiak, Department of Psychology**

**Identifying Risk, Resilience, and Adjustment Factors in Student Service Members/Veterans (SSM/V)**
Student Service Members/Veterans (SSM/V) are an important proportion of the college student population and may be at risk for unique mental health difficulties in comparison to civilian students. Prior research has indicated that the SSM/V population (1) is at greater risk for depression, anxiety, and posttraumatic stress (PTS), (2) experiences greater stigma surrounding mental health issues and treatment, (3) is more likely to engage in problematic alcohol/drug misuse, and (4) experiences greater difficulty adapting to college. Currently, there is limited research attempting to identify risk and protective factors that may exacerbate or attenuate the

difficulties SSM/V may face. The present study is actively recruiting SSM/V participants (current n = 33) with the aim of identifying mental health risk/resilience factors among this understudied population. It is hypothesized that: (1) SSM/Vs will report greater rates of anxiety, depression and posttraumatic stress compared to civilian student peers, and (2) SSM/Vs experience greater difficulty in adapting to college life relative to civilian students. It is further hypothesized that (3) SSM/V reported resilience will positively correlate with dispositional mindfulness and that (4) mindfulness will mediate the relationship between conflicts and adjustment to college. Participants are actively being recruited and anonymously completing study measures through an online research portal.

**Rachael Resuta**
**Research Advisor: Dr. Jessica Schedlbauer, Department of Biology**

**Native Tree Seedling Regeneration and Survival in the Gordon Natural Area**
Native tree seedling survival and regeneration are integral to the continued resilience of temperate forest ecosystems. However, the overabundance of white-tailed deer in many temperate deciduous forests in the eastern U.S. causes regeneration of seedlings to decrease and dramatically reduces species diversity. Management strategies to protect seedlings need to be put in place to keep forests close to normal successional trajectories, and to prevent forest understories from being dominated by a few unpalatable species. This study characterizes patterns of health, size, and survival of managed native tree seedlings in the Gordon Natural Area, a 51-hectare, temperate deciduous forest fragment in southeastern Pennsylvania. Within, 146 native tree seedlings were found and surrounded by one of two types of wire cages to prevent browsing. The seedlings were monitored from June to November in 2018, 2019, and 2020 for health, height, and survival to understand whether caging is a possible strategy to protect seedlings from browsers, and still allow them to stay healthy. Overall health of the seedlings steadily declined throughout 2018 and 2019, yet only a small portion, ~6.2% of them, died of natural causes. This study shows that despite the reduction in seedling health, survival is still high. This suggests that caging is effective at preventing deer browsing and offers a fairly low labor way to promote seedling regeneration. This study also reveals some opportunities to improve future data collection and analysis, thus providing a path to greater understanding of seedling regeneration in the Gordon Natural Area.

**Robert Ruark**
**Research Advisor: Dr. Erin Hill, Department of Psychology**

**The role of social norms and social comparison orientation in predicting drunkorexia**
Drunkorexia refers to the behavior of combining consumption of alcohol with limited food intake or calorie compensation behaviors (e.g., vomiting, exercise). Motives for this behavior can be to get intoxicated faster or to compensate for the calories consumed with alcohol. This behavior is associated with adverse consequences and is reported by at least one third of college students. Given the prevalence of this behavior in the college student population, it is important to

understand potential risk factors. Social factors represent one category of risk factors associated with alcohol consumption, which is consistent with the fact that drinking among college students has a strong social element. Among these social factors are social norms (i.e., descriptive, injunctive) and social comparison orientation (SCO) - defined as the degree to which an individual compares themselves to others. The purpose of this study is to examine the relationship between these two social factors and drunkorexia engagement. College students (n = 501) completed various questions and questionnaires via Qualtrics for this study. Correlations and linear regression analyses were used to look for correlational and predictive relationships between these variables - including social norms, social comparison orientation, and their interaction in terms of predicting drunkorexia. Results indicate both social comparison orientation and social norms are correlated with overall drunkorexia engagement. In the regression models, eating disorder-related social comparison and descriptive norms were significant predictors of drunkorexia engagement. The implication of these results is that descriptive norms and eating disorder-related social comparison should be highlighted in future research and practice.

**Nathan Scully**
**Research Advisor: Dr. Heather Wholey, Department of Anthropology & Sociology**

**The Huey House: Ground Penetrating Radar on an 18th Century Domestic Site in South East Pennsylvania**
In 1730, William and Genet Huey bought a 125-acre tract in the northwest corner of Westtown, which is now just off West Chester University's South Campus. The Huey family continued to own and occupy the property until they sold it at public auction in 1823. Stone ruins at the site appear to be the remains of their two-story spring house, but the house remains indicated on historic maps have not yet been located. Archaeology faculty and students from the WCU Anthropology program have undertaken a community archaeology project in collaboration with the Westtown Township Historical Society to locate subsurface features associated with the Huey's occupation and develop a narrative of 18th century rural life in the area. "The Huey Site" has been used for teaching purposes, both for students enrolled at West Chester but also for public archaeology. This multi-faceted project uses archival research, and fieldwork with students and community partners entailing a metal detector survey, a geophysical survey using ground penetrating radar (GPR), archaeological excavation, and 3-D laser scanning. This presentation describes results and outputs to date and proposed future work, as well as the use of this site for public and community outreach and education.

**Jacob Sullivan**
**Research Advisor: Dr. Heather Wholey, Department of Anthropology & Sociology**

**Surveying, Scanning, and Storytelling: Pigeon Run Presbyterian Cemetery**
Around the year 1728, William Rhodes, a white farmer in southern New Castle County, Delaware, granted one half acre of his property, alongside a small stream known as Pigeon Run,

to be used as a cemetery, which locals did until the early 20th century. In 2019, the Friends of Pigeon Run Cemetery, a non-profit organization, decided to revive the overgrown and vandalized cemetery. In the fall of 2021, a team of WCU faculty and student archaeologists conducted a geophysical survey using ground penetrating radar (GPR) to help locate suspected unmarked graves. Along with the GPR outputs, documentary evidence suggests that at least five and up to thirty-five additional African American burials are grouped together, distinctively separated from the cemetery's boundary. A solitary tombstone, slightly north of the designated property full of white burials, memorializes Private James Smith of the 6th United States Colored Infantry Regiment, which fought in Virginia and the Carolinas during the US Civil War. As David Orr (2017: p176) wrote in his history of the African Union Church Cemetery (AUCC) of Polktown, DE, "African American cemeteries like the AUCC must be understood as distinct cultural expressions of a group that experienced life differently from that of the majority of contemporary white inhabitants.

This presentation will describe the geophysics done on site and the efforts to preserve the cemetery, as well as begin the process of recovering the forgotten stories of the African American Delawareans buried there.

**Cecilia Verrillo**
**Research Advisor: Dr. Sarah Stamis, Department of Biology**

**Comparing Structures of Nucleosomes and Tetrasomes Using DNase I Footprinting**

In the eukaryotic genome, DNA is organized into compact units called nucleosomes, these chromatin subunits consist of a histone octamer wrapped with DNA. These nucleosomal structures are dynamic and become less compact during replication and transcription to allow DNA to be more accessible to replication machinery; histone chaperones play an important role in these events. The histone chaperone hFACT works to facilitate transcription and plays a role in nucleosomal recovery after transcription. The function of hFACT is upregulated in cancer cells and can be used as a target for cancer treatment. During DNA transcription, intermediate states of nucleosomes are formed as the DNA is unraveled. The intermediate complex investigated in this study is the tetrasome which consists of DNA wrapped around the histone H3-H4 tetramer. While the interactions of hFACT with histone H2A/H2B dimers are known, its interactions with the H3-H4 components of the nucleosome are not fully understood. The H3-H4 tetrasome structure was studied using a DNase I footprinting approach. Deoxyribonuclease (DNase) I degrades DNA that is not protected by proteins via binding. This protein footprinting allows for visualization of where such DNA exists in different conformational states via gel electrophoresis. Nucleosomal DNA was almost completely protected while the H3-H4 tetrasomes were left much less protected and more vulnerable to DNase I, suggesting that intrinsic structures of tetrasomes and nucleosomes are considerably different. The results of this project will be used to determine the mechanism of interaction of hFACT with tetrasomes and nucleosomes.

**Austin Wildauer**
**Research Advisor: Dr. Erin Gestl, Department of Biology**

**Opportunities to Enhance Education at the Intersection of Emerging Technologies**
As our ability to read, write and, edit DNA increases, the need for qualified people to fill positions in Bio-manufacturing is increasing. It is more important than ever to encourage students to thoughtfully consider S.T.E.M careers, especially in the biological sciences and yet, for many, classroom science offers boring memorization and little exposure to harnessing the power of biology to solve world problems.

As we experience exponential growth and innovation around emerging technologies, there are endless opportunities to explore ways to inspire students. Often, core concepts lack relevance to students and highlighting applications at the intersections of different disciplines can encourage more in depth study. For example, a company using CT scans to print a 3D model of a patient's heart to allow surgeons practice and improve surgical results or combining labs on plastics with entrepreneurship modules can teach the concepts needed to bring a new discovery to market.

Modules created during this program included 3-D modeling of DNA structure, case studies and simulations using DNA, molding of bio-plastics and assessment of financial models for commercialization and were combined with traditional hands-on experiments such as DNA extraction and coding to be presented to middle school students in both a virtual and in-person setting. The modules were well received and the students were actively engaged in the programs. With the proper funding and time, it would be interesting to follow a large cohort through high school to determine if experiencing these modules causes an increase in interest in S.T.E.M careers.

**Corinne Yost**
**Research Advisor: Dr. Eleanor Brown, Department of Psychology**

**Stress Hormone Cortisol Relates to Emotion Expression for Young Children facing Economic Hardship**
Background: Around 40% of children in the US face economic hardship. Related stressors influence physiological functioning and brain development, with implications for cognitive and social-emotional functioning. The hormone cortisol indicates stress levels, yet because cortisol responses to current stressors are imposed on baseline levels, the meaning of cortisol as measured on a particular occasion often is unclear: both elevated and depressed cortisol levels can indicate problematic dysregulation. The present study aims to elucidate how cortisol levels relate to expressed emotion for children attending Head Start preschool.

Participants: Participants included 70 children attending a Head Start preschool in Philadelphia, PA. Mean age was 4 years, 1 month, and 52.3% were female, 54.5% Black/African American, 15.2% Latino/Hispanic American, 10.3% Asian American, and 20.0% Caucasian/European American.

Procedure: Ethical standards were followed, and all procedures were approved by the WCU IRB.

The study included: (1) parent demographic interviews at the start of the school year; (2) measurement of child cortisol levels via salivary assay at four times of day on six different days across the school year; (3) coding of children's emotion expression in their preschool classes directly prior to the measurement of cortisol, using a well validated observational system called AFFEX (Izard, Dougherty, & Hembree, 1989).

Results and implications: Preliminary zero-order correlational analyses indicated that children's expression of sadness was uniquely correlated with elevations in cortisol. No significant relations were indicated for other types of emotion expression. Implications concern understanding how child cortisol levels relate to observed emotions in preschool context.

**Mikayla Zeigler, Ioanna Gerasimidis**
**Research Advisor: Dr. Breit, Department of Psychology**

**Pharmacokinetics and Litter Outcomes following Prenatal Alcohol and THC Exposure via E-cigarettes in a Rat Model**

Abstract: Prenatal drug use is a common public health concern that can cause serious complications surrounding the time of birth, birth defects, and developmental delays. National surveys and reports report that pregnant women believe that drug consumption of through electronic cigarettes (e-cigarettes) is a safer alternative for than traditional routes of consumption. Therefore, the likelihood of prenatal exposure to nicotine and cannabis constituents through e-cigarettes is on the rise; yet, the potential consequences of prenatal e-cigarette exposure are largely unknown, particularly when these two drugs are co-consumed. With literature regarding this topic being relatively recent, the findings are relatively unknown. To address this question using a clinically relevant animal model, Pregnant Sprague-Dawley rats received nicotine (36 mg/mL), THC (100 mg/mL), the combination, or a vapor vehicle (propylene glycol), via e-cigarettes daily from gestational days (GD) 5-20 (mimicking the first and second human trimesters). Maternal blood samples were collected throughout the pregnancy at multiple time points to measure drug and metabolite levels during pregnancy, and litter outcomes were measured to determine possible effects on the pregnancy. Pregnant dams exposed to the combination of nicotine and THC had lower plasma nicotine levels than those exposed to nicotine alone; this effect was consistent through the first 15 days of pregnancy, but by GD 20, the effect was not as prominent. Pregnant dams exposed to the combination of nicotine and THC also had lower nicotine metabolite (cotinine) levels than those exposed to nicotine alone on each recorded day and time throughout the paradigm. Importantly, a similar effect was seen in the plasma THC and THC metabolite (THC-OH and THC-COOH) levels, where the combined exposure group had lower THC and metabolite levels than those exposed to THC alone. Despite the effects on blood levels, prenatal exposure to nicotine, THC, or the combination did not alter basic litter outcomes; no differences were observed among gestation lengths, the number of pups born, the sex ratio of litters, or average pup weights at birth. This data elucidates the possibility that combined exposure to nicotine and THC via e-cigarettes may produce pharmacokinetic effects on maternal drug and metabolite levels, which could indicate confounding outcomes compared to single exposure of

either substance. the findings of the study are important in helping us to understand some of the physiological effects of THC and nicotine as well as their combined effects on pregnant women. Taken together, this knowledge can help improve education for pregnant mothers on the effects and repercussions of prenatal e- cigarette use.