

# 2023 University Research Symposium



Illinois State University

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**ILLINOIS STATE  
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Welcome to the 2023 University Research Symposium

Research is fueled by curiosity, the desire to innovate, and the need to find solutions to the world's pressing problems. Illinois State University recognizes that research encompasses diverse forms of inquiry, creativity, and innovation and we invite all students to participate in our community of scholars. Student research occurs across the campus in the context of specific courses, independent studies, summer research experiences, and thesis and dissertation projects. Faculty and staff mentors work with our students to make valuable intellectual or creative contributions to their disciplines. In fact, many faculty publications, conference papers, and creative works include student co-authors and student contributions.

Our offices and campus partners are proud to support student research with grants and travel funds, workshops, technical resources, research competitions, and exhibitions. We encourage and enable students to take part in off-campus professional and academic conferences at the regional, national, and international level. On campus, the University Research Symposium is the premier showcase for student scholarship, featuring over 294 individual, group, oral or poster presentations. An e-poster option with 27 participants aimed at including students who may not otherwise be able to present on-campus, as well as a showcase of the 2023 Image of Research Competition winners.

Our student researchers and faculty mentors persevered and adapted through unprecedented challenges, and we applaud you. Congratulations on your achievements. We look forward to celebrating with you!

Dr. Gina Hunter, Director, Office of Student Research  
Dr. Craig C. McLauchlan, AVP for Research and Graduate Studies  
Dr. Noelle Selkow, Director, Graduate School

# MORNING SESSION ABSTRACTS

## AGRICULTURE

### ASSESSMENT OF SUSTAINABILITY & DIVERSIFICATION PRACTICES OF PRODUCE AND FOOD RETAIL INDUSTRY

Presenter: Ackah, Randy  
Graduate, Agriculture

Mentor: Prof. Aslihan Spaulding

Authorship: Randy Ackah

The corn and soybean monoculture has dominated Midwestern agriculture for decades and is engrained in our supply chains, infrastructure, and federal and state policies. While this pattern provides benefits for some, it has resulted in decreased economic opportunities, declining rural communities, and degraded environments. To address these challenges, the Diverse Corn Belt (DCB) – a five-year USDA-NIFA funded project – is focused on developing an evidence-based framework and vision of how to enable a more diverse agricultural landscape across the Midwestern Corn Belt (Illinois, Iowa, and Indiana).

We hypothesize that given the right enabling conditions, diversified farms, markets, and landscapes can generate a broader suite of economic, social, and ecosystem services benefits that provide more benefits than the current dominant corn and soybean system. Using an integrated and transdisciplinary approach, the DCB team is conducting a systemic analysis and assessment of viable pathways to enable a more diversified agricultural landscape across the Corn Belt. Contributing to the overall DCB project's objective, this survey seeks to identify the sustainability and diversification efforts of food retailers and marketing groups. To achieve this, data will be collected from members of the International Fresh Produce Association (IFPA) and the National Grocers Association (NGA). From these surveys, we seek to identify the farmer sustainability requirements demanded or preferred by these marketing groups while also investigating the market opportunities and barriers opposing sustainable agricultural products. This will address a crucial gap for producers, handlers, and retailers – identifying the best way to promote and communicate the importance of diversified cropping systems to their customer base.

This research is part of “#DiverseCornBelt (#DCB): Enhancing rural resilience through landscape diversity in the Midwest” and is supported by Agriculture and Food Research Initiative Competitive Grant no. 2021-68012-35896 from the USDA National Institute of Food and Agriculture. Project website: [www.diversecornbelt.org](http://www.diversecornbelt.org).

## **FARMER DISPARITY STUDY, THE EXAMINATION OF ECONOMIC AND OTHER DISPARITIES ASSOCIATED WITH FARM OWNERSHIP AND FARM OPERATIONS IN ILLINOIS**

Presenter: Graybill, Susan  
Graduate, Agriculture

Mentor: Prof. Aslihan Spaulding

Authorship: Susan Graybill

In the United States, there is a deep belief that if people work hard, they will be successful. There is also a deep belief that everyone should have access to the same opportunities. The study aims to assist in determining whether this belief in equal access to opportunities for success is a reality in agriculture and, if not, to identify where and how disparities exist. The farmer disparity study was commissioned through Senate Bill 1792 and passed by the Illinois General Assembly in January 2021.

A survey research methodology is used to collect data from farmers in Illinois. Questions focused on identifying and comparing economic, land ownership, education, and other related differences among farmers with different demographics such as race, ethnicity, gender, and age and determining economic and other disparities associated with farm ownership and farm operations.

This research aims to help policymakers understand whether any groups in the state face barriers to farming and indicate areas where policy, funding, or programs could assist in alleviating difficulties due to differences in opportunities for success.

We received an Institutional Review Board (IRB) approval, which included recruiting scripts, survey questions, and consent forms, on September 7, 2022. Qualtrics was used to collect data. The survey will close at the end of March 2023. We will provide the preliminary results at the symposium.

The project was conducted in partnership with the Illinois Department of Agriculture, and researchers from University of Illinois, Southern Illinois University, and Western Illinois University.

## **EXPLORING AGRICULTURE THROUGH ART**

Presenter: Hudson, Gabi  
Undergraduate, Agriculture

Mentor: Prof. Maria Boerngen

This creative activity focuses on agriculture. This project's objective is to define what agriculture means to me, and express that through art and written words. I will be doing so by creating paintings with a written-up description to show the process by which I created each painting, and how each painting represents my views of agriculture. I will be further developing my art, writing, and communication through various components of the project. The methods I will be using to investigate this issue will be to pick distinct aspects of the agricultural industry and bring them to life in paintings. The importance of this project is to broaden the view of agriculture and break down the stereotype that agriculture is viewed as just farming from most of the population's standpoint. As the population becomes more disconnected from the source of their food, fuel, and fiber, this project provides an opportunity to bridge that gap.



## **EXAMINING THE PERCEPTIONS OF PRECISION AGRICULTURE TECHNOLOGIES AND ON-FARM PRECISION EXPERIMENTATION**

Presenter: Tibbs, Reagen  
Graduate, Agriculture

Mentor: Prof. Maria Boerngen

Authorship: Reagen Tibbs, Maria Boerngen

For nearly 40 years, precision agriculture technologies have revolutionized the agriculture industry. Like many of the advancements in agriculture, these technologies have transformed how farmers produce the food, fuel, and fiber that our modern society demands. Precision agriculture is more than just one technology, but rather a whole suite of technologies such as combine yield monitors, GPS/autosteer, and variable rate application technology for seeding and nutrient application. Farmers can receive many benefits from using these technologies, including more efficient nutrient management that can reduce input costs and improve yields. In addition to these benefits, farmers can utilize these technologies to create experiments to test different production practices. These experiments, known as on-farm precision experimentation (OFPE), are considered the future of agricultural research by university researchers and can help bridge the divide between researchers and farmers.

However, if OFPE is the future of agricultural research, then farmers' views of OFPE and their interest in doing these experiments with researchers is an important step that must be taken. A needs assessment is a logical starting point to understand farmers' views on OFPE and related topics. There are two phases of this needs assessment. First, focus groups and interviews were conducted with a small number of Illinois farmers to gain initial insights into the potential viewpoints of the larger farming community. Once the themes and ideas were identified from these focus groups and interviews, a survey is currently being conducted. This online, anonymous survey has been distributed to farmers in several states to gather more perspectives from a more diverse group of participants to truly understand farmers' views. The results from this needs assessment will greatly contribute to the literature on OFPE and will help guide researchers and farmers in conducting successful experiments.

## BIOLOGICAL SCIENCES

### ROLE OF THE ARABIDOPSIS TRM18 PROTEIN IN CELL DIVISION AND CELL SHAPE

Presenter: Abdullah, Abu Habib Md  
Graduate, Biological Sciences

Mentor: Prof. Viktor Kirik

Authorship: Abu Habib Md Abdullah, Omid Zare-Mehrjerdi, Sam McCoy, Viktor Kirik

Microtubule is a cytoskeletal array that plays a crucial role in cell division and expansion. Although plants don't contain Microtubule Organizing Centers (MTOCs) or centrosomes like humans, one protein called TONNEAU1 (TON1) shares similarities with the human centrosome protein called Fibroblast growth factor receptor 1 Oncogene Partner (FOP). TONNEAU1 (TON1) is necessary for microtubule organization in the cell cortex. One recruiter of TONNEAU1 is called TRM (TONNEAU1-like Recruiter Motif), and almost 34 TRM proteins have been identified by Drevensek et al. 2012, but most of their functions are remains unknown. Our goal is to reveal the functions of the TRM proteins in the cytoskeletal arrays, cell shape, and cell division plane of Arabidopsis. By using confocal microscopy, we found TRM18 protein localizes in the nuclear membrane. Furthermore, overexpression of the TRM18 protein changes cell shape and reduces the branching of trichomes. It suggests that the TRM18 protein plays a significant role in cell division and expansion of Arabidopsis. We are highly enthusiastic to investigate the contribution of TRM18 protein in microtubule nucleation and how its different motifs participate in nuclear envelope localization, branching of trichome, and preprophase band formation.

## **DETERMINING MOLECULAR TARGETS OF CORTICOSTEROID MEDIATED IMPROVEMENT OF DYSTROPHIC MUSCLES**

Presenter: Aidoo, Erinda  
Undergraduate, Biological Sciences

Mentor: Prof. Andrés Vidal-Gadea

Authorship: Erinda Aidoo, Kiley Hughes-Wiles, Annamarie Hyer, Andrés Vidal-Gadea

Duchenne muscular dystrophy (DMD) is a degenerative neuromuscular disorder that affects 1 in 3,500 males and is characterized by progressive muscle weakness, loss of ambulation, and premature death. DMD is caused by an absence of the dystrophin protein. There is currently no cure for DMD. Current treatments target the secondary inflammatory damage during the disease with the use of corticosteroids (i.e., Deflazacort and Prednisone). However, steroids have limited usefulness, and involve several severe side effects. Notably, the molecular mechanism of action for steroids in DMD remains elusive. *Caenorhabditis elegans* genetically and phenotypically model DMD through loss-of-function mutations in dystrophin homolog (*dys-1*). Like DMD patients, treatment of dystrophic *C. elegans* with Deflazacort and Prednisone improves their dystrophic musculature. To understand how these corticosteroids affect dystrophic muscle function we are conducting an RNA interference screen on potential steroid targets in nematode muscles. This strategy will help us identify potential molecular targets for therapeutics able to treat the muscles of DMD patients without the significant side effects of current treatments.

## **INVESTIGATION OF THE MECHANISM OF MAGNETIC TRANSDUCTION BY C. ELEGANS**

Presenter: Akinosho, Aalimah  
Graduate, Biological Sciences

Mentor: Prof. Andrés Vidal-Gadea

Authorship: Aalimah Akinpsho, Andrés Vidal-Gadea, Temitope Awe

Magneto-sensation, the ability to sense and use the magnetic field, is a phenomenon that is now established in many animals of various kingdoms. Although the mechanisms that magneto-sensitive animals use to sense magnetic field is still an area of debate, electromagnetic induction, chemical magnetoreception, and biogenic magnetite transduction are the three major hypothetical mechanisms proposed for magnetic field detection. Our lab recently described that the nematode *C. elegans* orient to magnetic fields in a light-independent manner. *C. elegans* use a pair of poly-sensory neurons (the AFDs) associated with temperature sensation to sense magnetic forces within magnetic fields. The main aim of my thesis is to establish the mechanism by which *C. elegans* detects magnetic fields. To this end, I am investigating and testing two of the hypothetical mechanisms for magneto-sensation previously proposed-magnetocaloric and magneto-mechanic mechanism. The former involving the heating or cooling of the magnetic material when the applied magnetic field changes while the latter involves magnetic particle orientation change caused by a force produced by the presence of a magnetic field. I present evidence that different temperatures elicit different magneto-taxis responses in *C. elegans*. Understanding how *C. elegans* orients to magnetic fields will help us understand how many other species interact with the earth magnetic field. This is particularly relevant in the context of an ever-increasing list of known magneto-tacting species, and in the context of the ongoing reversal of the earth's magnetic field.

## PARENTAGE ASSIGNMENT AND PEDIGREE CONSTRUCTION IN HOUSE WRENS

Presenter: Burnett, Hailey  
Undergraduate, Biological Sciences

Mentor: Prof. Pirmin Nietlisbach

Authorship: Hailey Burnett, Pirmin Nietlisbach

An important overarching goal of evolutionary biology is to understand trait evolution and how organisms develop and adapt to cope with changing environmental conditions. As climate change impacts are increasing with time, this is becoming more important than ever. Pedigree and parentage data are useful tools that can be used to answer such questions and are useful for studying the consequences of inbreeding (i.e., reproduction among related individuals), and reproductive behaviors. Extra-pair mating is such a behavior in which members of a socially monogamous species mate with individuals that are not their social mate. There have been many studies done and debates surrounding the costs and benefits of this behavior. Here, a population of House Wrens (*Troglodytes aedon*) that have been studied since 1980 has been used to create pedigree data. Detailed pedigree (i.e., family tree) information across generations reveals relationships among family members and allows for the identification of extra-pair reproduction. To acquire this information, I tested fourteen repeated segments of DNA, known as microsatellites, that have been published in previous literature. I then tested microsatellite variability in our study population. This is important for distinguishing between potential parents based on their genetic alleles. The variable microsatellites will be used to identify parents of the juvenile birds for a family of House Wrens that I collected other data on during the Summer 2022 field season. By knowing the paternity assignments, I will be able to identify extra-pair mating behavior and construct a pedigree using software in R. Upon completion, I have determined which microsatellites are successful in our lab and can be used in future research and have constructed parentage information for use in pedigrees of our bird population. With this research, further questions can be studied in work about extra-pair reproduction, inbreeding, and adaptation to changing environments. Pedigree data and research like this are an important start for understanding the implications that growing issues, such as climate change will have on species across the globe.

## **ARE THEY READY? IMMUNE PRIMING AGAINST EMERGING INFECTIOUS DISEASES IN BUMBLE BEES**

Presenter: Calhoun, Austin  
Graduate, Biological Sciences

Mentor: Prof. Ben Sadd

Authorship: Austin Calhoun, Ben Sadd

Selective pressures from fitness losses associated with pathogen infection have led to the evolution of diverse mechanisms that alleviate pathogen harm. Invertebrates have evolved a memory-like innate immune response, called immune priming, which increases individual protection upon secondary pathogen exposure. This phenomenon can offer general or specific immune protection and can also occur across generations. Investigating the natural relevance of such protective phenomena is important for species of economic and ecological concern, like bumble bees, where novel pathogen exposure represent a threat to health. Here we explore the specificity of immune priming against emerging infectious diseases (EIDs), specifically the honeybee virus Israeli Acute Paralysis Virus (IAPV). We hypothesize that prior pathogenic experience boosts infection resistance and tolerance to secondary pathogen exposure, however, differential exposures will precipitate mismatch costs. We subjected worker bumble bees to different priming treatments, including injected low dose or heat-killed virus of IAPV, or non-infective double-stranded RNA constructs mimicking IAPV or Deformed Wing Virus (DWV). Subsequently, we quantified measures of infection tolerance (via survival assays) and resistance (via absolute pathogen loads by RT-qPCR) following a higher dose of IAPV either 2, 7 or 14 days after the priming treatment. We find no evidence for beneficial immune priming in this system. A follow up showed that this holds true independent of the secondary exposure dose. These results are concerning for native bumble bee health as they suggest evolved immune strategies shown to be effective against bacterial pathogens are not effective in the face of viral EID threats.

## **EFFECTS OF EXTRA-PAIR PATERNITY ON MALE HOUSE WREN (*TROGLODYTES AEDON*) PROVISIONING EFFORT AND NEST DEFENSE**

Presenter: Dart, Avery  
Graduate, Biological Sciences

Mentor: Prof. Pirmin Nietlisbach

Authorship: Avery Dart, Scott K. Sakaluk, Charles F. Thompson, Pirmin Nietlisbach

Some animals form socially monogamous pair bonds in which a male and female mate and raise young together. However, individuals within a socially monogamous pair bond may still mate with other individuals; this mating is defined as extra-pair mating (EPM). Extra-pair paternity (EPP) occurs when offspring arise from EPM. In wild birds, EPM is approximated by EPP. Males benefit from EPP by siring additional offspring without any investment aside from sperm, but the benefits of EPM for females are less clear. Females may gain fertility assurance, access to better foraging grounds, and nest protection from males, as males are incentivized to defend nests that may contain their young. There are also potential costs to EPM for females, including a decrease in paternal effort by their social mates if they suspect paternity threats. I will investigate how male provisioning and nest defense are affected by EPP. I will study these questions in a well-established house wren system. I will record provisioning behaviors with cameras and then determine paternity using genetic markers. Individuals will be visually identified by the colored bands on their legs. I will test if males with more extra-pair young in their nests reduced provisioning rates. I will also test if males are more likely to help defend a neighbor's nest against a great-horned owl model if they had sired offspring in that nest. Taken together, my research seeks to understand how EPP may benefit or cost females and how it changes male behavior.

## **TOWARD A CATALOG OF SYNTHETIC GENE DRIVERS BASED ON EXAMPLES FROM NEUROSPORA FUNGI**

Group Leader: Draper, Katelyn Olivia  
Undergraduate, Biological Sciences

Group Members: Melissa Abraham, Undergraduate, Biological Sciences; Shadiyat Batula, Undergraduate, Biological Sciences; Thera Bowen, Undergraduate, Biological Sciences; Pedro Galvan, Undergraduate, Biological Sciences; Sophie Krivograd, Undergraduate, Biological Sciences; Jalen Lee, Undergraduate, Biological Sciences; Michael Marcheschi, Undergraduate, Biological Sciences; John Munn, Undergraduate, Biological Sciences; Carolina Okleiteris, Undergraduate, Biological Sciences; Princy Patel, Undergraduate, Biological Sciences; Cole Rich, Undergraduate, Music; Balikisu Saliu, Undergraduate, Biological Sciences; Elizabeth Sponagle, Undergraduate, Biological Sciences; Bethany Wilder, Undergraduate, Biological Sciences

Mentor: Prof. Tom Hammond

Authorship: Melissa Abraham, Shadiyat Batula, Thera Bowen, Katelyn Olivia Draper, Pedro Galvan, Sophie Krivograd, Jalen Lee, Michael Marcheschi, John Munn, Carolina Okleiteris, Princy Patel, Cole Rich, Balikisu Saliu, Elizabeth Sponagle, Bethany Wilder, Tom Hammond

Gene drivers are genetic elements that transmit themselves to offspring in a biased manner. It may be possible to use this characteristic of gene drivers to control organisms that are harmful to human health. We aim to develop a catalog of synthetic gene drivers based on natural examples. Two examples are *rsk* and *rfk-1*, which exist in the genomes of *Neurospora* fungi. The *rsk* and *rfk-1* gene drivers work together to increase their transmission rate to offspring. While *rsk* has a simple genetic structure, *rfk-1* contains three complex DNA sequences called introns. We hypothesize that none of the *rfk-1* introns contribute to its function. Here, we present results from experiments designed to test this hypothesis. Our results will aid future studies toward developing *rsk* and *rfk-1*-inspired synthetic gene drivers.



## **MUSCLE AND SENSORY EFFECTS OF P38KB AND GARS IN CHARCOT MARIE TOOTH DISEASE**

Presenter: Duncan, Mackenna  
Undergraduate, Biological Sciences

Mentor: Prof. Pirmin Nietlisbach

Authorship: Mackenna Duncan, Piotr Klos, Megan Cross, Lauren Naeger, Julia Martin, Alysia Vrailas-Mortimer

Charcot-Marie-Tooth Disease (CMT) is a progressive neuropathology caused by the deterioration of neuronal function in the peripheral motor and sensory nervous systems. Motor symptoms include tripping, ankle twisting, and clumsiness, and sensory symptoms include sensations such as pins and needles and burning pain. There are no preventive therapeutics, but mutations in several tRNA-synthetase genes have been implicated in causing CMT. Though mutations in a variety of genes can give rise to CMT, several of the genes are tRNA-synthetases. We have recently found that the p38 MAPK (p38Kb), a kinase involved in aging and age-dependent locomotor deficits, regulates the levels of several tRNA-synthetase proteins during aging. p38Kb interacts with the Chaperone-Assisted Selective Autophagy (CASA) complex to mediate the degradation of misfolded or nonfunctional proteins, a process that contributes to clearing tRNA-synthetase proteins that are damaged from aging. Failure to clear damaged proteins may result in disease symptoms or worsening of symptoms. We hypothesize that p38Kb-mediated regulation of tRNA synthetase degradation is crucial for maintaining proper neuromuscular function. Utilizing *D. melanogaster*, we tested to see how GARS mutants affect locomotor function via muscle and sensory pathways. Muscle and sensory expression of GARS mutants induced locomotor dysfunction in both males and females. Next, we plan to combine knockout of p38Kb and GARS mutants in the muscles of *D. melanogaster* and test for the effects on locomotor function. Knockout of p38Kb has been previously shown to worsen locomotor function. Therefore, we predict that knockout of p38Kb and expression of GARS mutants will induce severe locomotor dysfunction due to the failure of mutant GARS clearance from muscle cells. Overall, GARS mutants induce locomotor dysfunction in *D. melanogaster* by both muscle and sensory channels and future studies will help us better understand the relationship between GARS and p38Kb in CMT2D.

## TURTLE B CELLS FOUND TO HAVE TWO MAIN FUNCTIONS

Presenter: Fairow, Christen  
Graduate, Biological Sciences

Mentor: Prof. Laura Vogel

Co-Mentor: Prof. Rachel Bowden

Authorship: Christen Fairow, Rachel Bowden, Laura Vogel

B cells, a type of white blood cell, are crucial components of the immune system during an infection that produce soluble molecules known as antibodies. Subsets of B cells exist in mammals that differ in function; however, it is not known how B cells function or if different cell subsets exist in reptiles. Understanding how B cells function in reptiles can help protect endangered species by clarifying how their immune system may be different from other vertebrates but may also allow for the development of new human medicines. We have previously found that reptile B cells had a special function that most human B cells do not – they could engulf and destroy invaders using a process called phagocytosis. We hypothesized that reptilian B cells differentiate during infection to either phagocytosis or antibody secretion depending on the size of the target particle. Particles that were too large to be engulfed would prompt the B cell to secrete antibodies while smaller invaders would be destroyed by phagocytosis. To test this hypothesis, we collected blood samples from wild red-eared slider turtles. Blood samples were processed in the lab and lymphocytes were incubated with fluorescent polystyrene beads (1 cytometry to determine if a B cell had captured any beads (or how many). We added an additional fluorescent dye to identify B cells from other white blood cell types. The results of our phagocytic assay showed that turtle B cells were able to engulf multiple 1 also were able to engulf one or two 6 examine antibody secretion. Turtle leukocytes were incubated in the lab for several days, with some samples receiving an additional infection signal, lipopolysaccharide (LPS). We found that turtle B cells could be detected with this method and that the cells incubated with LPS created more spots, indicating that they secreted more antibodies. These results further our understanding of how B cells function in reptiles.

## **IMPACTS OF DROUGHT AND COMPETITION ON A NATIVE PRAIRIE PLANT, *LOBELIA SPICATA***

Presenter: Fedorchak, Micah  
Undergraduate, Biological Sciences

Mentor: Prof. Diane Byers

Authorship: Micah Fedorchak, Diane Byers

North American Tallgrass Prairies are highly diverse and productive ecosystems, which have suffered many adverse effects of habitat fragmentation in the past and are now faced with climate change. One perennial prairie plant, *Lobelia spicata*, is commonly found in these prairies and must compete with other plants (its own and other species) to obtain enough sunlight, water, and soil nutrients. With increasingly unpredictable changing conditions due to climate change, plants must tolerate the frequent lack of water due to longer seasonal droughts. This is accomplished in different ways, including changing root-to-shoot mass partitioning and drought avoidance or tolerance. To test how *L. spicata* reacts to these changing conditions, we decided to run a greenhouse experiment where we would subject the plants to contrasting types of competition (typically a strong effect among prairie plants) and differing intensities of drought. To assess the impacts on plants, we quantified biomass produced and relative allocation of their resources to roots vs. shoots. We proposed that increasing drought would decrease the overall size (biomass and an estimate of fitness) and shift the plants' relative allocation of resources to the roots (increasing foraging ability). We also proposed that competition will decrease the overall size of the plants, particularly for intraspecific competition where the greater similarity in leaves and roots could make the acquisition of light, water, and minerals difficult. Furthermore, we propose the combined effects of drought and competition would have a strong joint impact on the growth of the plants. We used a factorial design with 3 drought treatments and 2 competition treatments (intraspecific--a second *Lobelia* plant, and interspecific--another native prairie plant, *Lespedeza capitata*), as well as a reference treatment (no drought and no competition). The biomass of above- and below- ground matter of all plants was harvested and weighed. Analysis of total biomass found that there was only a significant effect of competition, with the intraspecific competition having a slightly greater impact. The root to shoot ratios shifted with the different competition treatments, so that the greatest allocation to the roots was with intraspecific competition. Increasing drought decreased plant size, but there was much variation within the treatments so we could not detect a particular impact. The variation in plant size and shifts in resource allocation illustrate the flexibility of plants in different competitive conditions.

## **THE EFFECT OF HABITAT ALTERATIONS ON EASTERN FOX SQUIRRELS' (SCIRIUS NIGER) FORAGING AND VIGILANCE BEHAVIORS**

Group Leader: Freko, Justin  
Undergraduate, Biological Sciences

Group Member: Jonathan Leppert, Undergraduate, Biological Sciences

Mentor: Prof. Rebekka Darner

Authorship: Justin Freko, Jonathan Leppert

The purpose of this research project is to investigate foraging behavior of behavior among Eastern fox squirrels (*Scirius niger*). We sought to address four research questions. First, is there a relationship between alert foraging in fox squirrels and the number of conspecifics, or members of the same species, present? Second, do fox squirrels forage less when there are humans present? Third, do fox squirrels show less vigilance in overcast conditions? Finally, in the presence of other conspecifics, do fox squirrels show an increase in foraging behavior? This study is important due to its implications for understanding habitat alterations, such as urbanization and weather conditions, on fox squirrel foraging and vigilance behavior.

## **SOCIAL, VIGILANCE, AND FORAGING BEHAVIOR WITHIN EASTERN GRAY SQUIRRELS AND EASTERN FOX SQUIRRELS**

Group Leader: Green, Toni  
Undergraduate, Biological Sciences

Group Member: Mackenzie Hunter Laney, Undergraduate, Biological Sciences

Mentor: Prof. Rebekka Darner

The purpose of this research project is to explore social, vigilance, and foraging behaviors among Eastern fox squirrels (*Sciurus niger*) and Eastern gray squirrels (*Sciurus carolinensis*). We sought to address four research questions. First, are fox squirrels less social during times of precipitation? Next, are Eastern gray squirrels more vigilant when humans are nearby? Third, are Eastern gray squirrels more active to forage depending on the time of the day? Finally, do Eastern fox squirrels spend more time foraging in sunny conditions in comparison to other cloud cover conditions? This study is important due to its implications for understanding how environmental conditions and human behavior impact squirrel behavior. Examining squirrel behavior allows better understanding of how they function and ecological roles they fulfill. It also allows us to make more educated predictions about their behavioral patterns and impacts on their surroundings.

## **VIGILANCE AND SOCIAL BEHAVIOR AMONG EASTERN GRAY SQUIRRELS IN THE PRESENCE OF HUMANS AND CONSPECIFICS**

Group Leader: Greer, Jessica  
Undergraduate, Biological Sciences

Group Member: Erik Kubiatoicz, Undergraduate, Biological Sciences

Mentor: Prof. Rebekka Darner

Authorship: Jessica Greer, Erik Kubiatoicz, Rebekka Darner

The purpose of this research project is to explore social and vigilance behaviors among Eastern gray squirrels (*Sciurus carolinensis*). We sought to address four research questions. First, are social behaviors more common among gray squirrels when there are no humans present, compared to when humans are present? Second, are social behaviors more common among gray squirrels when they are near conspecifics (i.e., members of the same species), compared to when they are alone? Third, are gray squirrels less vigilant when around conspecifics as opposed to when they are alone? Finally, does the presence of humans' influence squirrels' vigilance? This study is important due to its implications for understanding how conspecific and human presence influence social behavior and vigilance, which in turn may influence a squirrel's ability to detect predators.

## FORAGING TENDENCIES OF THE EASTERN FOX SQUIRREL IN THE PRESENCE OF OTHER SPECIES

Presenter: Halvorsen, Boden  
Undergraduate, Biological Sciences

Mentor: Prof. Rebekka Darner

The purpose of this research project is to explore foraging behavior among Eastern Fox Squirrels (*Sciurus niger*). I sought to address two research questions. First, is foraging among fox squirrels more common when there are fewer people around? Second, is foraging among fox squirrels more common when there are fewer dogs around due to the potential predator of the dog? To better understand the behaviors of the fox squirrel, it is important to know its foraging tendencies and influences on its adaptive behavior. By looking into foraging behaviors and how they are influenced by dogs and humans, further predictions can be made about fox squirrel foraging behaviors, such as how they might be impacted by predator introductions and urban sprawl. My first question is addressed by performing a linear regression, using number of humans present as the predictor variable and total foraging as the response variable. For my second question, I will be using the number of dogs present to predict total foraging. I predict that in both cases, there will be a positive correlation between the number of humans or dogs present and foraging observed.

## VIGILANCE BEHAVIOR OF EASTERN GRAY SQUIRRELS

Group Leader: Long, Gavin  
Undergraduate, Geography, Geology, and the Environment

Group Member: Brennan Shaver, Undergraduate, Biological Sciences

Mentor: Prof. Rebekka Darner

Authorship: Gavin Long, Brennan Shaver

The purpose of this research project is to explore vigilance behavior among Eastern gray squirrels (*Sciurus carolinensis*). We sought to address four research questions. First, are gray squirrels on core college campuses less vigilant compared to those who live in other habitats (core college campus, riparian, coniferous forest, desert, and grassland)? Second, do gray squirrels who are on core college campuses spend more time foraging rather than alert foraging? Third, will gray squirrels express more vigilance behavior when there are humans within 15 m of them, compared to when there are no humans nearby? Finally, will gray squirrels exhibit less vigilance behavior with conspecifics within 15 m of them, compared to when there are no conspecifics nearby? This study is important due to its implications for understanding the effect of habitat alterations and human interactions on vigilance behaviors of squirrels. The habitat of a college campus is one that is full of humans most of the day for about nine months of the year. College campuses are potentially dangerous because squirrels that have been habituated to this urban environment could be at higher risk of predation, incidents with motor vehicles, and other deadly scenarios due to a decreased situational awareness from a lack of vigilance. As deforestation occurs and brings wildlife into closer contact with human society, it is important to understand the interspecific interactions of humans and squirrels. Understanding the effects that human presence has on the behavior of squirrels can help direct conservation efforts.



## **EASTERN FOX SQUIRREL VIGILANCE BEHAVIOR**

Group Leader: Manisco, Mia  
Undergraduate, Kinesiology and Recreation

Group Member: Kristin Koehn, Undergraduate, Biological  
Sciences

Mentor: Prof. Rebekka Darner

Authorship: Mia Manisco, Kristin Koehn

The purpose of this research project is to investigate vigilance and social behaviors among the Eastern Fox Squirrel (*Sciurus niger*). We sought to address four research questions. First, are fox squirrels less vigilant on a college campus/suburban environment than in forest (coniferous and deciduous), and agricultural areas? Second, are fox squirrels more or less vigilant around humans, compared to when humans are not nearby? Third, is there a correlated relationship between Fox Squirrels' vigilance and their proximity/distance to humans? Finally, are Eastern Fox Squirrels more social than Eastern Gray Squirrels (*Sciurus carolinensis*)? This study is important due to its implications for understanding how habitat, nearby related species, and humans impact behavior of the Eastern Fox Squirrel, a common resident of most habitats east of the Mississippi River.

## **CHARACTERIZING THE ROLE OF LIVER RECEPTOR HOMOLOG IN REGULATING CORTICOSTERONE METABOLISM**

Presenter: Montalbano, Caitlin  
Undergraduate, Biological Sciences

Mentor: Prof. Ryan Paitz

Authorship: Caitlin Montalbano, Ryan Paitz

During times of pregnancy embryos are extremely vulnerable and sensitive to changes in their environment, such as stress. Corticosterone is a hormone that is released during times of stress, and we have shown that embryonic exposure to maternal corticosterone can elicit a variety of effects in developing chicken embryos, including embryonic mortality. However embryonic metabolism of corticosterone can prevent lethal effects. Liver receptor homolog (LRH) is a receptor that may be involved in regulating the metabolism of corticosterone by controlling levels of the enzyme that metabolizes corticosterone. In this study, the hypothesis is that early embryonic exposure to an LRH blocker will cause low embryo weight and early mortality. By reducing the production of metabolic enzymes, the LRH blocker works by blocking the metabolic processes that are believed to be responsible for converting the lethal hormone corticosterone into an inactive version. We also tested the hypothesis that corticosterone plus the LRH blocker will result in lower survivability and lower embryo mass compared to the lethal steroid corticosterone by itself. The objective of this project is to support the statement that exposure to the LRH blocker, as well as corticosterone plus the LRH blocker, will result in low embryo weight and early embryo death. To test this hypothesis, chicken eggs were injected with the steroid corticosterone as well as corticosterone plus LRH, an inhibitor. Chicken eggs were also injected with oil to serve as the control group. Once the incubation process was done, embryos of each treatment were extracted and removed from the egg remains and then weighed on day 14. Injections of the LRH blocker resulted in a similar mass and survivability to the oil control group. Injections of corticosterone plus the LRH blocker resulted in a slightly lower embryo mass and survivability compared to corticosterone but the difference is not significant. Thus, our results do not support the hypothesis that injecting the eggs with an LRH blocker will result in low mass and low survivability. The results also do not support the additional hypothesis that the corticosterone plus LRH blocker treatment will result in lower survivability and mass compared to the corticosterone treatment.

## **SEX-SPECIFIC EXPRESSION OF TWO MAJOR ANTIOXIDANTS IN THE EXTRAEMBRYONIC MEMBRANES OF DEVELOPING CHICKENS**

Presenter: Naugle-Gross, Eric  
Undergraduate, Biological Sciences

Mentor: Prof. Ryan Paitz

Authorship: Eric Naugle-Gross, Ryan Paitz

Experiencing stress during embryonic development is associated with adult-onset diseases and conditions such as diabetes, hypertension, and other cardiovascular events. During stress, there can be a buildup of reactive oxygen species (ROS) resulting in irreversible oxidative damage to critical biomolecules. To protect against oxidative damage, embryos employ endogenous antioxidants to catalyze the reduction of ROS. Two families of antioxidants, thioredoxin and peroxidoxin, may play a significant role in redox regulation during development. In chickens, sex is determined by inheritance of sex chromosomes where an embryo with two Z (ZZ) chromosomes develops into a male while an embryo with a Z and a W (ZW) develops into a female. The gene for thioredoxin is located on the Z chromosome, while the gene for peroxidoxin is on chromosome 8. This led to the question: Do levels of thioredoxin and peroxidoxin differ between sexes? We hypothesized that there would be sex differences in thioredoxin expression because males have two copies of the gene, while females have a single copy. To address this, the membranes of 30 chicken eggs at day 4 were collected for the quantification of thioredoxin and peroxidoxin expression. Results show that there were sex differences in both antioxidant levels, with thioredoxin expression being higher in males and peroxidoxin higher in females. These findings support the hypothesis that thioredoxin and peroxidoxin expression in embryo development differ among sexes. Future studies will investigate functional consequences as a result of these differing levels.

## DECREASING SEED GLUCOSINOLATE CONTENT IN THE OILSEED PLANT PENNYCRESS

Presenter: O'Flaherty, Spencer  
Undergraduate, Biological Sciences

Mentor: Prof. John Sedbrook

Co-Mentor: Liza Gautam

Authorship: Spencer O'Flaherty, Liza Gautam, Ryan Bayliss, Autumn Salmon,  
Amanda Darcy, John Sedbrook

Pennycress (*Thlaspi arvense*) is a Brassica species related to rapeseed and canola that is being domesticated into an oilseed-producing winter cover crop called CoverCress to be grown between corn and soybeans in the U.S. Midwest. Pennycress seeds, like in other Brassicaceae, accumulate high levels of glucosinolates - over 100  $\mu\text{mol}$  glucosinolate per gram seed weight. Glucosinolates act as deterrents to herbivory due to their bitter taste and conversion to toxic isothiocyanates by the enzyme, myrosinase. As with the domestication of rapeseed to canola, we aim to decrease pennycress seed glucosinolate content to less than 30  $\mu\text{mol/gm}$  to make the seed oil and meal suitable for animal and human feed and food uses. We have targeted loss-of-function mutations in the pennycress MYC3 transcription factor gene using CRISPR-Cas9 genome editing, identifying a decrease in seed glucosinolate content to about 75  $\mu\text{mol/gm}$  without affecting plant growth. We also generated MYC3 mutations in combination with mutations in the HAG1 and /or HAG3 transcription factor genes, through cross pollinations and/or CRISPR multi-plexing, identifying previously undescribed changes in seed glucosinolate content. We will present these findings and discuss our efforts combining these genetic changes with other mutations that improve agronomic traits and together constitute domesticated pennycress.

## **ALERT FORAGING AND VIGILANCE IN EASTERN GRAY AND EASTERN FOX SQUIRRELS**

Group Leader: Ruem, Eric  
Undergraduate, Biological Sciences

Group Member: Cory Moran, Undergraduate, Biological Sciences

Mentor: Prof. Rebekka Darner

Authorship: Eric Reum, Cory Moran

Purpose of this project is to explore alert foraging behavior among the Eastern Gray Squirrel (*Sciurus carolinensis*) and Eastern Fox Squirrels (*Sciurus niger*). We sought to address these four questions. First, is there an increase of alert foraging behavior while these species are in the presence of dogs? Second, does the time-of-day influence alert foraging behaviors in these species? Third, does cloud coverage influence vigilance? Finally, does proximity to safety influence alert foraging in these species? This study is important to understand the behavior of squirrels under specific conditions. From here predictions can be made about which factors influence squirrel behavior and their responses to environmental conditions.

## **VIGILANCE AND FORAGING BEHAVIOR OBSERVED IN THE EASTERN FOX SQUIRREL (*SCIURUS NIGER*) DUE TO ENVIRONMENTAL AND SOCIAL FACTORS**

Group Leader:       Simpkins, Tyler  
                          Undergraduate, Biological Sciences

Group Member:     Jack Kremer, Undergraduate, Biological Sciences

Mentor:             Prof. Rebekka Darner

Authorship:        Tyler Simpkins, Jack Kremer

The purpose of this research project is to examine vigilance behavior among the eastern fox squirrel (*Sciurus niger*). We sought to address four research questions. First, are squirrels near a human structure more vigilant? Second, are squirrels more vigilant in windy conditions? Third, does the number of conspecifics in the area affect foraging behavior? Finally, is there a relationship between the number of conspecifics in the vicinity and time spent showing social behavior? This study is important due to its implications for understanding how habitat alterations such as human-made structures, impact squirrel behavior. Also, this study helps us to understand how the number of conspecifics in the vicinity affect how squirrels' behavior changes depending on the number of conspecifics in the area.

## **DECIPHERING UROPATHOGENIC ESCHERICHIA COLI'S INCREASED RESISTANCE TO NEUTROPHILIC ANTIMICROBIAL HYPOCHLOROUS ACID**

Presenter: Sultana, Sadia  
Graduate, Biological Sciences

Mentor: Prof. Jan-Ulrik Dahl

Authorship: Sadia Sultana, Mary Crompton, Jan-Ulrik Dahl

Activated neutrophils generate reactive oxygen and chlorine species (RO/CS) to eliminate invading pathogens in a process named phagocytosis. Hypochlorous acid (HOCl) is the most potent neutrophilic RO/CS and kills pathogens mainly through widespread oxidative damage of cellular macromolecules. We discovered that uropathogenic *Escherichia coli* (UPEC), the common etiological agent of urinary tract infections, are substantially more resistant to HOCl exposure and neutrophil-mediated killing compared to intestinal *E. coli* pathotypes. We identified the molecular mechanism behind UPEC's increased HOCl resistance: upon exposure to HOCl, UPEC cells upregulate the expression of an operon consisting of three uncharacterized genes, *rcrA*, *rcrR*, and *rcrB*. We identified RcrB as a HOCl-sensing transcriptional repressor that represses the operon during non-stress conditions and that becomes inactivated during HOCl-stress, resulting in the expression of all three genes. Expression of *rcrB* is particularly crucial for UPEC's increased HOCl resistance as *rcrB*-deficient UPECs are as sensitive to HOCl as intestinal *E. coli* pathotypes. Alternatively, recombinant expression of RcrB in HOCl-sensitive intestinal *E. coli* renders the strains highly resistant to HOCl. Given that *rcrB* encodes an uncharacterized putative membrane protein, we hypothesized that its expression may control the HOCl uptake into the cell. We examined the extent of intracellular damage in *rcrB*-deficient UPEC as a proxy to quantify the intracellular HOCl level and found indeed substantially increased protein, lipid, and DNA damage in UPEC cells that lack RcrB. Our goal is now to decipher the precise mechanism of how RcrB controls the cellular HOCl influx, which will help us to better understand how UPEC survives in HOCl-rich environments such as the urinary tract.

## **IMPACTS ON VIGILANCE AND ALERT FORAGING BEHAVIORS IN THE EASTERN FOX SQUIRREL AND THE EASTERN GRAY SQUIRREL**

Group Leader: Yatteau, Emma  
Undergraduate, Biological Sciences

Group Member: Ashley Rodriguez, Undergraduate, Biological Sciences

Mentor: Prof. Rebekka Darner

Authorship: Ashley Rodriguez, Emma Yatteau

The purpose of this research project is to examine vigilance behavior among the Eastern Fox Squirrel (*Sciurus niger*) and alert foraging behavior among the Eastern Gray Squirrel (*Sciurus carolinensis*). We sought to address four research questions. First, does the number of conspecifics within 15 meters of the focal animal affect vigilance behaviors in Eastern Fox Squirrels? Second, does the habitat of the Eastern Fox Squirrel affect vigilance behavior? We will be focusing on the urban, grassland, deciduous forest, riparian, and agricultural biomes, in particular. Third, is alert foraging more common in Eastern Gray Squirrels when humans are present or absent? Finally, does the number of conspecifics within 15 meters of the focal animal influence alert foraging in Eastern Gray Squirrels? This study is important due to its implications for understanding how conspecific density, human presence, and habitat type impacts behavior in these common but ecologically important squirrel species.



## CHEMISTRY

### **ENHANCED DETECTION OF ILLICIT DRUGS FROM PLASMONIC PAPERS VIA SURFACE ENHANCED RAMAN SPECTROSCOPY COMBINED WITH PAPER SPRAY IONIZATION-MASS SPECTROMETRY**

Presenter: Adehinmoye, Adewale  
Graduate, Chemistry

Mentor: Prof. Jun-Hyun Kim

Co-Mentor: Prof. Christopher Mulligan

Authorship: Adewale Adehinmoye, John Harms, Jeremy Driskell, Christopher Mulligan, Jun-Hyun Kim

Surface-enhanced Raman spectroscopy (SERS) is an analytical technique in which the vibrational signal of samples can be amplified by utilizing nanoscale plasmonic materials. Our previous work demonstrated the possibility of improving the detection limits of illicit drugs (i.e., cocaine, fentanyl, 2C-B, hydrocodone and JWH-018) on a plasmonic paper by designing a dual-instrument system consisting of paper spray ionization mass spectrometry (PSI-MS) and SERS. In this study, we attempted to induce the arrangement of the drugs and gold nanoparticles (AuNPs) onto a plasmonic paper to further improve SERS-based sensing capability without sacrificing the PSI-MS performance. This approach involves the generation of highly intense plasmonic environments for these drugs (e.g., vertically and laterally sandwiching drugs between plasmonic materials) where the SERS signals can be maximized by increasing the probability of plasmonic couplings. The optimized system can be served as a promising tool for the sensitive and selective detection of various analytes at low concentrations.

## APPLICATIONS OF [5+2] CYCLOADDITIONS TOWARDS CLEAVABLE TETHERS

Presenter: Angles, Susanna  
Undergraduate, Chemistry

Mentor: Prof. Andy Mitchell

Authorship: Susanna Angles, Andy Mitchell

Oxidopyrylium-alkene based [5+2] cycloadditions are a convenient intramolecular method of synthesizing complex seven-membered ring systems which are present in various biologically relevant molecules. Moreover, these molecules can serve as key intermediates, providing a framework upon which additional functionality can be added. Amide-tethered substrates were employed in this important reaction to produce polycyclic lactam systems. We hypothesized that when an electronically activated amide is utilized, the resulting product would be capable of undergoing various ring-opening reactions, allowing for the appendage of increased functionality. Additionally, this reaction would lead to the development of a net intermolecular [5+2] cycloaddition. Several nucleophiles were used in an attempt to cleave the N-tosyl lactam, with varying degrees of success. The ring-opened product was obtained in low yields, so a more robust substrate was synthesized for testing of future conditions.

## LEAVING GROUP EFFECTS BASED UPON THE STRUCTURAL VARIATION OF THE ALKYL GROUP ON THE AQUEOUS REACTIVITY OF O-ALKYL CARBINOLAMIDES

Presenter: Arndt, Tom  
Graduate, Chemistry

Mentor: Prof. Richard Nagorski

Carbinolamides are a class of compounds that have been shown to be vital in many biological processes. As interest in this functionality has continued to grow, a new class of O-alkylated derivatives of carbinolamides have been discovered that have interesting biological and pharmaceutical properties. The mechanism of the aqueous reaction of these carbinolamide derivatives is difficult to predict as alkylation of the hydroxyl group of the carbinolamide effectively blocks the primary routes by which carbinolamides are known to react. The acid and hydroxide-dependent mechanisms for the breakdown of carbinolamides both require the loss of the proton on the hydroxyl group as some point during their aqueous reaction and the O-alkylated compounds lack this proton. The understanding of the reaction of O-alkylated carbinolamides is further complicated by the fact that the mechanisms of their reactions have never been investigated. Studies from our group have shown that, under acidic conditions, the O-alkylated carbinolamides (1) react at the same rate as the related carbinolamide derivatives (2). It was concluded that loss of the O-alkylated group was very fast as compared to the reaction of the carbinolamides themselves. However, under basic conditions, the O-alkylated carbinolamides reacted much slower than their related carbinolamides but yielded the same reaction products. What is reported here is the reaction of a series of structurally similar O-alkylated carbinolamides where the structure of the alkyl group attached to the oxygen has been varied. It has been discovered that, in the hydroxide dependent reaction, the structure of the alkyl group has a significant effect on the rate of the reaction of the compound. This is the first evidence that has pointed to the rate determining step of the O-alkylated carbinolamides involving the loss of the O-alkyl group itself. The kinetic studies and their implications towards the understanding hydroxide-dependent O-alkylated carbinolamide breakdown will be discussed.

## **AMBIENT TEMPERATURE TANDEM REDUCTIVE AMINATION - [5 + 2] CYCLOADDITION**

Presenter: Barnes, Andy  
Graduate, Chemistry

Mentor: Prof. Andy Mitchell

Authorship: John Goodell

Cycloaddition reactions are of high interest for the synthesis of natural products due to their inherent ability to form multiple bonds in a single reaction. Noting the prevalence of the classic Diels-Alder reaction in the field of total synthesis, further study and optimization of similar cycloadditions should offer elegant new tools for the construction of the complex polycyclic structures often found in nature. Research in the Mitchell group focuses on intramolecular oxidopyrylium-alkene [5 + 2] cycloadditions to form ether-bridged seven-membered carbocycles within fused ring systems. Recent advances have led to room temperature cycloaddition, inspiring the development of an ambient temperature tandem reductive amination - [5 + 2] cycloaddition.

## **THE DEVELOPMENT OF AN ASYMMETRIC GLYCOLATE ALDOL ADDITION SYNTHETIC PATHWAY FOR THE PREPARATION OF POTENTIAL THERAPEUTIC AGENTS THAT TARGET INHIBITION OF THE MAIN PROTEASE (3CLPRO) OF THE NOVEL CORONAVIRUS (COVID-19)**

Presenter: Carter, Austin  
Undergraduate, Chemistry

Mentor: Prof. Shawn Hitchcock

Authorship: Austin Carter, Moses Martinez, Emmanuel Ayim, Jordan Witte, Bader Semakieh, Shawn Hitchcock

The worldwide pandemic started by the spreading of the novel coronavirus (SARS-CoV-2) led to many research groups pursuing medicinal agents to help manage the symptoms associated with this severe respiratory disease. It is known that the Covid-19 virus has many interconnected steps in its propagation life cycle. One of the key steps is conducted by an enzyme known as a protease. It is responsible for the propagation of the virus by cleaving key amide bonds in special proteins. Rathi and coworkers (1) pursued a computation study that revealed that there was a potential candidate that could act as a protease inhibitor. Working with X-ray crystal structure of one of the active protease enzymes (3Clpro), Rathi and his associates were able to carry out molecular dynamics simulation studies that demonstrated that a series of known HIV-1 protease inhibitors interacted well within the hydrophilic and hydrophobic regions of the protease. They also found a unique newly proposed structure was more efficient in fitting into this domain. This structure is a chiral molecule containing an p-fluoroaniline, and chiral amine and a secondary alcohol.

There are a number of physical properties of Rathi's proposed protease inhibitor that make it an ideal candidate for inhibition of the 3Clpro inhibitor. There are hydrogen bonding contacts with alpha-amino acid residue components involving histidine, serine, and cysteine. There are a series of hydrophobic interactions with phenylalanine, leucine, tyrosine, and proline components. Finally, there is a pi-stacking aromatic ring interaction between the proposed protease inhibitor and a secondary histidine component. The molecule proposed by Rathi and coworkers as a potential therapeutic candidate for the novel coronavirus was interesting to our research group as we have been developing chemistry suited to the synthetic preparation of HIV protease inhibitors. In this regard, this research poster will present the research that has been undertaken in our research group to synthesize the Rathi proposed protease inhibitor as well derivatives. The poster will cover the work that we have done in developing the asymmetric glycolate aldol addition reaction to suit its stereoselectivity towards the needed stereochemical elements in the proposed inhibitor. The poster will also cover the synthetic steps undertaken with the aldol addition product to achieve the synthesis of the key target.

## VARYING THE TERMINAL PHOSPHINE LIGANDS IN THE PREPARATION OF HEXARHENIUM CLUSTERS

Presenter: Coil, TJ  
Graduate, Chemistry

Mentor: Prof. Lisa Szczepura

Authorship: TJ Coil, L.F. Szczepura

Hexarhenium chalcogenide clusters, with the format of  $[\text{Re}_6\text{Q}_8\text{L}_6]_n$  (Q = S, Se or Te) are known for their useful electrochemical and photophysical properties. Phosphine ligands are strong donors where the R substituent is known to impact the electronic and steric properties of single metal centers. However, in terms of discrete  $[\text{Re}_6\text{Q}_8]^{2+}$  based cluster complexes, triethylphosphine is the most common terminal phosphine ligand incorporated, with only a few reports exploring other trialkyl- and triaryl- phosphine ligands. Progress towards functionalization of rhenium selenide cluster core with other  $\text{PR}_3$  ligands is realized through various solution-phase synthetic methods. This presentation will focus on the coordination of tribenzylphosphine to the  $[\text{Re}_6\text{Q}_8]^{2+}$  cluster core. The synthesis, purification and characterization of all new cluster complexes will also be discussed, with a focus on ESI-HRMS and  $^1\text{H}$  NMR and  $^{31}\text{P}$  NMR spectroscopy.

## **BORON MEDIATED [5+2] CYCLOADDITIONS**

Presenter: Corrie, Seth  
Graduate, Chemistry

Mentor: Prof. Andrew Mitchell

Authorship: Seth Corrie, Andrew Mitchell

The Mitchell group's recent research has centered on the production and optimization of [5+2] cycloadditions utilizing maltol as a substrate. This is often achieved through the use of a tethered olefin which is attached to the maltol ring. The use of a tether reduces the entropic requirements necessary for a [5+2] cycloaddition. Unfortunately, a tether could limit the utility of [5+2] cycloadditions. One option to overcome this downside is to employ the use of a temporary tether that can be severed after the [5+2] reaction is completed. Preliminary reactions have shown the DABO ligand tether used by the group to generate cycloadditions in the past, is far more sturdy than initially believed. The current approach is to capture the boronic acid portion of the DABO ligand to produce potassium trifluoroborates that can be further utilized by coupling reactions. While the DABO ligand is an example of three points of binding in a tether, attempts have been made to create a tether with a single point of binding that is sturdy enough to undergo cycloaddition and labile enough to be cleaved under particular conditions. One potential route of cycloaddition is utilizing a silyloxyprone with an atom of fluorine in its tether that can complex to an empty p-orbital in an electron deficient vinyl boron, which is particularly fluorophilic. This would ideally promote cycloaddition by bringing the vinyl boron olefin into position to cyclize, and then the boron-fluorine bond can be cleaved through multiple routes.

## DEAROMATIC OXIDOPYRYLIUM-BASED [5+2] CYCLOADDITION REACTION

Presenter: Erzuah, Marymoud  
Graduate, Chemistry

Mentor: Prof. Andy Mitchell

Over the last decade, several developments and advancements have been made towards the oxidopyrylium-based [5+2] cycloaddition reaction which is geared towards the production of natural products. Given its worth, focus on reaction limitations and development of new reaction pathways continue to be of interest to synthetic organic chemists, providing avenues to a wide range of new heterocyclic seven-membered rings embedded within biologically active natural products. Due to the underlying application of oxidopyrylium-based cycloadditions, the Mitchell group has actively explored this area of research. Dearomatic Oxidopyrylium-based [5+2] cycloaddition allows the formation of complex polycyclic compounds from readily available aromatic rings in a single step. Dearomatization of electron rich aromatic systems directly adds functional groups to aromatic cores to result in complex compounds with increased levels of saturation, stereogenic centers, chemical space, and new retrosynthetic disconnections. A synthetic approach involving the construction of fused seven-membered compounds via dearomatic [5+2] cycloadditions between the  $2\pi$  component derived from the C2=C3 bond of an aromatic compound and the pyrone is employed.



## **EFFECTS OF FUNCTIONAL POLYMER PARTICLES ON THE FORMATION OF GOLD NANOPARTICLES AND THEIR CATALYTIC PROPERTIES**

Presenter: Eyimegwu, Faith  
Graduate, Chemistry

Mentor: Prof. Jun-Hyun Kim

Authorship: Franklin Egemole, Pascal Eyimegwu, Jun-Hyun Kim

Composite particles consisting of gold nanoparticles (AuNPs) surrounded by a thermally responsive polymer derived from the copolymerization of N-isopropyl acrylamide (NIPAM) and acrylamide (AAm) were designed and tested as recyclable catalysts in various chemical reactions. The systematic incorporation of AuNPs into the PNIPAM-AAm copolymer particles was achieved by an in-situ method under light irradiation. The structural features (e.g., size, shape, and distribution) and overall loading efficiency of the integrated AuNPs were strongly influenced by the copolymer particle network and functional groups. The resulting composite particles were then tested as a catalyst in the C-C bond-forming reaction under various conditions including reaction time, temperature, base type, and catalyst amount to optimize their reactivity and selectivity, and recyclability. Understanding the influence of host polymer networks on the in-situ formation of guest metal nanoparticles, as well as their structural and catalytic properties, is essential for the development of novel and practical catalysts that can be utilized in various chemical transformation reactions.

## THE REACTION OF N-(HYDROXYBENZYL)BENZAMIDES AND THE EFFECT OF METAL-DICATIONSON THE RATE OF THEIR AQUEOUS REACTION

Presenter: Gentry, Ashten  
Undergraduate, Chemistry

Mentor: Prof. Richard Nagorski

Authorship: Paul Siena, Tak Koyanagi

Carbinolamides are intermediates in the formation of C-terminal alpha-amide peptide hormones where the alpha-amide is critical for hormone activity. The carbinolamide functionality has also been shown to be necessary for the bioactivity of the commercially available antibiotic, Bicyclomycin, in addition to carbinolamides having other roles which have both positive and negative impacts on the organism involved. While studies performed in the group have expanded our understanding of the mechanism by which these compounds react under aqueous conditions, many questions remain. One significant puzzle is the mechanism by which peptidylglycine alpha-amidating monooxygenase (PAM) catalyzes the breakdown of the carbinolamide intermediate generated during the synthesis of the peptide hormones from glycine-extended peptide precursors. The lyase portion of the bifunctional enzyme PAM contains a  $Zn^{2+}$  ion, whose role in catalysis is not well understood. It is known that if the  $Zn^{2+}$  is not present, the activity of the enzyme drops off. Proposed roles for the metal-ion include structural, zinc-bound hydroxide and a direct catalytic role where the substrate and metal interact with one another. The study described here will provide rate data for the acid and hydroxide dependent breakdown of N-(hydroxybenzyl)benzamide derivatives, and the proposed mechanisms for the acid and hydroxide reactions based upon the kinetic data provided and other results reported in the literature. The results of kinetic studies where the  $[Zn^{2+}]$  was varied for both the acid-catalyzed reaction and the hydroxide-dependent reaction will be presented. Lastly the effect of increasing  $[Cd^{2+}]$  on the hydroxide-dependent reaction will be presented and these results will be compared to the effect of added  $Zn^{2+}$ . Based upon the metal-catalysis studies, a role for the metal-ion in the enzyme catalyzed reaction will be proposed.

## INVESTIGATIONS INTO A NEW SYNTHETIC ROUTE TO CARBAPORPHYRINOID SYSTEMS

Presenter: Harris, Emily  
Undergraduate, Health Sciences

Mentor: Prof. Timothy Lash

Porphyrins, aromatic pigments constructed from four smaller pyrrole rings, play a variety of biological roles and have medicinal applications. However, while porphyrins have been extensively studied, the properties of many porphyrin analogues are less well understood. Core modified porphyrins are known where one or more of the internal nitrogen atoms have been replaced by C, O, S, Se, Te or P. A useful synthetic method for preparing structures of this type is the so-called '3 + 1' version of the MacDonald condensation where aromatic dialdehydes are condensed with tripyrrolic intermediates known as tripyrranes. This strategy has been very successful but is limited in part by the accessibility of suitable dialdehydes. This difficulty has made access to porphyrinoid structures with cyclohexene or cycloheptene subunits problematic. In addition, attempts to prepare carbaporphyrin-type systems with phenalene subunits have been unsuccessful. In an attempt to overcome these difficulties, a synthetic route that uses cyclopropane dialdehydes as intermediates is being investigated. Cyclopropane dialdehydes with fused carbocyclic rings are required to construct new carbaporphyrinoid systems. Access to new porphyrin-like macrocycles will allow an assessment of how structural modification affects their reactivity, aromatic properties, and UV-visible absorption spectra. The new porphyrin analogues may find biological applications in areas such as photodynamic therapy and will help guide the direction of future research in carbaporphyrin chemistry.

## **A HIGHLY STEREOSELECTIVE SYNTHESIS OF A KEY INTERMEDIATE OF THE HIV PROTEASE INHIBITOR DARUNAVIR VIA AN ASYMMETRIC GLYCOLATE ALDOL ADDITION REACTION AND TRANS-AMIDATION**

Presenter: Kant, Caitlyn  
Undergraduate, Chemistry

Mentor: Prof. Shawn Hitchcock

Authorship: Caitlyn Kant, Shawn Hitchcock

Darunavir is an anti-viral medication used for the treatment of Human Immunodeficiency Virus Type 1 (HIV-1). The catalytic dyad, formed from 2 aspartate molecules, is responsible for breaking peptide bonds so that the peptide fragments can be used to propagate the virus. Darunavir is a protease inhibitor; it interacts with the aspartate molecules in the catalytic dyad to prevent further protease activity. Darunavir was first synthesized by Arun Ghosh, with a synthetic route of 11 steps. The current industrial route for Darunavir is rigid and does not allow for good flexibility in the synthesis of derivatives due to reliance on phenylalanine as the source for molecular stereochemistry. Our proposed synthetic pathway, only 8 steps, is more efficient and flexible in terms of synthesizing new derivatives on certain key regions. We are seeking to develop a more efficient stereoselective method for the synthesis of Darunavir and new Darunavir derivatives that may have improved efficacy in terms of inhibitory concentrations, using an asymmetric glycolate aldol addition approach.

## AMIDE ASSISTED OXIDOPYRYLIUM [5+2] CYCLOADDITIONS

Presenter: Promise, Ifeanyichukwu  
Graduate, Chemistry

Mentor: Prof. Andy Mitchell

The ability to synthesize cycloadducts from simple molecules is continually being developed by organic chemists and it is considered as one of the most useful tools in organic synthesis. This is because there are many naturally occurring biomolecules containing larger ring sizes (such as the seven membered ring), which synthetic chemists seek to make with readily available starting materials. The Mitchell research group is focused on understanding various factors, limitations and mechanisms related to the silyloxypyrone-alkene [5+2] cycloaddition reaction. In general, intermolecular cycloadditions are difficult to come by, however, we successfully synthesized different cycloadducts with various amide tethers via an intramolecular [5+2] cycloaddition mechanism at moderate temperatures. Amide tethers with bulky groups, tend to lock the alkene / Indole moiety, underneath the pyrone towards an achievable cycloaddition. In due course, we propose the ability to cleave the amide bond of these cycloadducts to assist additional promising synthetic routes.

## **EVALUATION OF RUTHENIUM (III) METAL-BASED COMPLEXES ON AMYLOID- $\beta$ AGGREGATIONS USING GLIOMA CELLS AS A MODEL SYSTEM**

Presenter: Saleh, Eaman  
Undergraduate, Biological Sciences

Mentor: Prof. Marjorie Jones

Authorship: Michael Webb, Marjorie Jones, Eaman Saleh

Approximately 55 million people worldwide struggle with dementia and around 60-70 % of those cases can be attributed to Alzheimer's Disease (AD) 1. Alzheimer's is a devastating neurological disorder characterized by Amyloid-  $\beta$  peptide aggregations in the brain. These aggregations typically express high levels of metal ions, which can be exploited as potential drug therapeutics<sup>2</sup>. Previous hypotheses regarding synthesis and classification of Ruthenium (III) complexes with pyridine-based ligands as modulating agents for Amyloid-  $\beta$  aggregations have implicated the successful coordination between the two<sup>3</sup>. They have also concluded a series of characteristics such as amino-substituted pyridine ligands that show inhibitory effects on peptide aggregations whilst maintaining minimal cell cytotoxicity<sup>3</sup>. Following the results of the study, we proposed a new unique set of compounds to further investigate the characteristics of Ruthenium (III) complexes that pose inhibitory effects on Amyloid-  $\beta$  peptide as well as assess their inherent cell cytotoxicity. To be viable therapeutics, the compounds must not be harmful to cells impacted by Amyloid-  $\beta$  aggregations. Using glial cells as a model system, the potency of the Ruthenium metal complexes against peptide plaques can be assessed. Upon conducting a cell viability MTT assay, we found that of the 15 proposed compounds, none had apparent cytotoxic effects deeming them worthwhile for continual investigation. A second MTT will be run to gauge the effectiveness against breaking down the peptide previously administered to the glial cells. Our results indicate that more sophisticated in vitro studies are necessary for a better understanding of the interaction between A $\beta$  and amino-substituted pyridine ligands. For example, testing the cytotoxicity and the effectiveness of compounds against A $\beta$  in a co-culture of glial cells and neurons to more accurately convey the cellular makeup of the brain; thus, instigating a solid foundation for future in vivo studies and development of treatments for Alzheimer's disease.

## **SYNTHESIS, CHARACTERIZATION AND AQUEOUS KINETICS, AS A FUNCTION OF PH, FOR N-(HYDROXYMETHYL)PHTHALAMIDINES**

Presenter: Shukla, Richa  
Undergraduate, Chemistry

Mentor: Prof. Richard Nagorski

Authorship: Richa Shukla, Michael Burke, Richard Nagorski

The formation of carbinolamides occurs via the reaction of an amide with an aldehyde followed by a proton shift. While the functionality is not well understood and has roles in several biological venue, its intermediacy in the pathway leading to alpha-amidated peptide hormones has brought greater attention to determining how these molecules react. More recently a variety of compounds, having interesting biological function, have been discovered that have carbinolamides with broad structural variation. The role of the carbinolamide in the function of these compounds is not understood but the carbinolamide does represent a more reactive species in the structure of the molecule. Previous studies of carbinolamides have focused on structural variation on both the amide and aldehyde portions of the carbinolamide structure, with no compounds having N-substitution. The purpose of the study presented here was to synthesize a N-alkylated carbinolamide from phthalimide and formaldehyde. The spectroscopic characteristics of N-(hydroxymethyl)phthalamidine will be presented and their aqueous kinetics as a function of pH. The kinetic results will be compared to similar carbinolamides with no substitution on the nitrogen.

## PORPHYRINOID SYSTEMS INCORPORATING HETEROAROMATIC SUBUNITS

Presenter: Ujah, Victoria  
Graduate, Chemistry

Mentor: Prof. Timothy Lash

Authorship: Victoria Ujah, Timothy Lash

Porphyrins and related macrocycles with fused aromatic rings have attracted attention due to their extended chromophores. Also, the altered coordination chemistry and varying degrees of the aromatic character of carbaporphyrins and heteroporphyrins in which one of the nitrogen atoms of the porphyrin macrocycle is replaced by carbon, oxygen, sulfur, selenium, tellurium, or phosphorous, have been the subject of numerous investigations. However, little work has been carried out on porphyrinoid systems incorporating fused heteroaromatic rings.

Extensive research has been done on the 9,10-phenanthroline system due to its fascinating reactivity as an inorganic ligand. Although porphyrins with fused phenanthroline units (1) have been synthesized using the MacDonald 3+1 methodology, this strategy has not been applied to related porphyrinoid systems. A phenanthroline-fused tripyrrane was prepared in three steps from a nitrophenanthroline. Following the preparation of a ring fused pyrrole ethyl ester, reaction with KOH and ethylene glycol at 180 °C gave an  $\alpha$ -unsubstituted phenanthrolinepyrrole, and subsequent condensation with 2 equivalents of acetoxymethyl pyrroles in acetic acid-isopropyl alcohol gave the required tripyrranes. These were condensed with a series of dialdehydes to give ring fused carbaporphyrins, heteroporphyrins and related systems (structures 2-6). It is anticipated that the presence of external coordination sites will enable coordination of metal cations both within the macrocycle and at the external nitrogens.



## COMMUNICATION

### ROLE OF SOCIAL MEDIA IN MEANINGFUL INTERCULTURAL RELATIONSHIPS

Presenter: Agbasiere, Chinyere  
Graduate, Communication

Mentor: Prof. John Baldwin

It is impossible to separate social media from intercultural relationships in today's increasingly digitalized society. Social media now provides individuals from various cultural backgrounds an environment to foster and maintain relationships. This research aims to assess social media's role in meaningful intercultural relationships. The survey was done using a qualitative method, and 50 students from four continents filled out the online survey. The analysis of this study shows the different roles that social media has played in intercultural relationships.

## **BEING IN A FOREIGN LAND: AFRICAN INTERNATIONAL STUDENTS' PERCEPTIONS OF COMMUNICATION STRATEGIES USED BY AND WITH HEALTH PROFESSIONALS**

Presenter: Amoakwa, Agnes  
Graduate, Communication

Mentor: Prof. John Baldwin

African international students often face difficulties in adapting to a new healthcare system. Understanding their perceived barriers and perception of communication strategies that health professionals employ in utilizing campus healthcare services is crucial for implementing new approaches so that these communities of students can benefit from the available resources. In this paper, I interviewed 7 African international students attending a large Midwestern U.S. university who had visited the campus healthcare service, had first-hand positive and negative experiences, and could provide rich and well-detailed information. According to the findings, various barriers hinder African international students' access to healthcare: knowledge regarding health insurance coverage, language barrier, and the high cost of healthcare. The study also showed that African international students perceived communication strategies employed by health professionals as friendly and welcoming. Participants expressed that health professionals communicate with them on a personal level.

## **TEACHERS' PERCEPTION OF FACTORS THAT MOTIVATE STUDENT LEARNING IN AN ONLINE CLASS**

Presenter: Lasisi, Omolola  
Graduate, Communication

Mentor: Prof. John Baldwin

The purpose of this paper is to explore teachers' perceptions of what motivates students to learn in an online class. The COVID-19 pandemic has further established online teaching in higher education. This change in the teaching mode also involves changing how students are motivated to learn. Through open-ended questionnaires and thematic analysis, the study reveals the strategies that teachers have effectively used to motivate students to learn in their online classrooms. The results also show the challenges teachers experience and the ways they can improve motivation in the online classroom, leading to practical implications for the classroom.

## **USE OF SOCIAL MEDIA BY THE INTERNATIONAL STUDENTS TO MANAGE STRESS IN THEIR INITIAL DAYS AT UNIVERSITY**

Presenter: Rahman, Eshrat  
Graduate, Communication

Mentor: Prof. John Baldwin

This study explores how international students use social media to manage their stress during the initial days in the university. The study employed in-depth interviews of seven participants to attain research data. The findings of the study show that the international students primarily use social media to connect with their family members and friends back in their countries, to make new friends in new cultural environment, and to find relaxation and entertainment. Thus, they efficiently manage their stress through their social media usage. However, the participants do not solely depend on social media for stress management as these media sometimes increase stress levels. This suggests that the international students need to socialize in real time which can help them managing stress and better cope with new academic and cultural environments.

Keywords: International students, social media, stress management, university

## **UNDERGRADUATE STUDENTS' SOCIOECONOMIC STATUS, EMOTIONAL STATE, AND DAILY TASKS WITH SMARTPHONE USAGE**

Presenter: Sugimoto, Kaylee  
Undergraduate, Communication

Mentor: Prof. Nathan Carpenter

With the ever-growing rise of social media and the evolution of smartphones, the new normal of using and relying on one affects our lives in many ways. From finding new friends to organizing schoolwork, the integration of a smartphone has completely changed the way people think, even compared to ten years ago. Being in college is one of the most transformative and changing times in a person's life. In fact, during the time that a student spends attending college, a study found that about half of the participants displayed profile changes, as well as changes in their ingrained traits, values, and overall personality (Nguyen et al., 2022). Smartphone usage in a college or university environment may correlate with students' socioeconomic status, students' emotional state, and ability to accomplish daily tasks. The study asks the following questions: RQ1: Does a participant's socioeconomic status correlate with different types of smartphone-related activities? RQ2: Does the amount of time a participant spends using their smartphone correlate with their emotional state after using certain types of apps? RQ3: Does the age that a participant reports first using a smartphone affect their ability to do everyday tasks without one? Participants in this study include undergraduate students attending Illinois State University. The study is non-experimental and qualitative and uses results from a participant survey generated from an Honors Contract.

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## COMMUNICATION SCIENCES AND DISORDERS

### STRONG WOMEN LIVE LONGER

Presenter: Barth, Nicolette  
Undergraduate, Communication Sciences and Disorders

Mentor: Prof. Jamie Mahurin-Smith

Authorship: Nicolette Barth

Introduction: The generational and societal pressure for women to become smaller exacerbates the negative-menopausal effects of declining muscle mass and bone density in mid-life women. Sarcopenia, or the gradual loss of muscle mass, strength, and function is associated with an increased risk of disability, frailty, and injurious falls; these risks, in turn, greatly increase the odds of premature death. The purpose of this project is to investigate how low muscle mass and strength in mid-life women affect their morbidity, mortality, and quality of life in the future, as well as to search for evidence-based interventions to prevent and treat sarcopenia and sarcopenic dysphagia. Results: Research shows that in mid-life and menopausal groups, consistent resistance training, a high protein diet, and an adequate intake of vitamin D are seen to effectively treat and prevent the consequences related to low muscle mass and strength. Additionally, the effort to increase overall strength may see to be effective in sarcopenic dysphagia prevention. Discussion: With all the information presented, there needs to be more effort from healthcare professionals to encourage females to incorporate strength training, to live stronger, longer, more fulfilling lives.

## **SWALLOWING IN A CHILD WITH ZELLWEGER SYNDROME; A CASE STUDY**

Presenter: Mutholam, Anjali  
Undergraduate, Communication Sciences and Disorders

Mentor: Prof. Taeok Park

**Introduction** Zellweger Syndrome (ZS) is a genetic disorder found in newborn babies and causes complications with nerves and metabolism soon after birth. Some symptoms of Zellweger syndrome include difficulty feeding, underdeveloped muscles, and movement problems. The purpose of the study was to investigate clinical features of swallowing in a child diagnosed with Zellweger syndrome. **Method** The subject was a male child of 8 months with Zellweger syndrome born at full term. Videofluoroscopic swallowing exams (VFSE) of thin liquid, thick liquid, and puree were used to analyze the subject. The thin and thick liquid was fed by bottle and puree was fed by spoon. Swallowing was observed including sucking performance, residue, and occurrence of aspiration. **Results** child performed to suck several times before the swallow. For the thin and thick liquid, there was residue in the vallecula, base of the tongue, and pyriform sinus. The delayed pharyngeal swallow and silent aspiration were observed. Puree swallow resulted in residue at the base of the tongue and vallecula. but the aspiration was not seen. **Conclusion** We found that puree was safer in terms of airway protection since there was no aspiration involved. Overall, the child has poor sucking performance in oral preparatory and oral stages. This may be related to underdeveloped muscles and movement problems, specifically in the tongue muscles. The child needs swallowing management and treatment to help his development and to maintain his nutrition.

## CREATIVE TECHNOLOGIES

### SPATIALIZING DIGITAL DRUGS IN VIRTUAL REALITY FOR MENTAL HEALTH

Presenter: Pereira Gloor, Rochele  
Graduate, Creative Technologies

Mentor: Prof. Greg Corness

Co-Mentor: Prof. Rose Marshack

Authorship: Rochele Gloor, Greg Corness, Rose Marshack

Virtual reality (VR) is an immersive technology that implies the perception of being physically surrounded by a non-physical world. VR-based therapies for neurological disorders have been in use for nearly two decades and constantly improved with advances in computer graphics technologies. Data from the Global Drug Survey 2021 shows the wide use of digital wellness apps, such as mindfulness meditation in VR and binaural beats, as coping tools for mood disorders during the 2020 pandemic. Listening to “digital drugs” is found to entrain the brain by synchronizing low frequencies to different cognitive states, thus producing a similar effect as psychedelic drug use. Can we use the illusory capacity of high-quality audiovisual experiences in virtual reality, to guide us to self-perception and expansion of consciousness without drugs? Evidence shows the positive impact of VR applications with 3D and binaural audio specially designed for immersiveness and wellness purposes. For this research, I developed an aesthetic mindfulness VR application with 6Hz theta waves drone-inspired soundscape utilizing a state-of-the-art spatialization plugin. The artistic approach to qualitative method is based Francisco Varela’s process for studying the conscious human experience, both phenomenological and meditative. I used first-person method in the spatial audio development. For the second-person method, thirteen acquaintances aged 23 to 57 years old participated in a 10-minute audio relaxation experience wearing high dynamics headphones followed by a 5-minute VR experience in the Oculus Quest 2 headset. The research outcome was positive where 35% of the participants were deeply “moved” by it. Updates on interactions will be considered as will the use of EEG device. Moreover, larger studies with on the use of binaural beats with overlay soundscape for support of mental health treatment are necessary to provide standardized methods and procedures.



## CRIMINAL JUSTICE SCIENCES

### ATTACHMENT EFFECTS ON BEHAVIOR AND VIOLENCE

Presenter: Vargas, Stephanie  
Undergraduate, Criminal justice Sciences

Mentor: Prof. Joanne Savage

Authorship: Stephanie Vargas

Some argue that the most critical period of time for a human being is childhood. Children are extremely dependent on their caregivers. Some developmentalists emphasize the importance of the attachment bond. When a child lacks an attachment to his or her caregiver, it can cause developmental disruptions. It has been argued that when a child lacks to feel an attachment or feels like they're abandoned by to their caregiver it can lead to feelings of chronic stress and fear, as well as mental and behavioral disorders. Research also shows that young children with insecure attachments are at a higher risk of developing behavior problems. In this paper I will examine the literature on the effects of different attachment bonds on child behavior problems. I will also analyze these associations using data from the National Longitudinal Survey of Adolescent Health.

## FAMILY AND CONSUMER SCIENCES

### ARE ROBOTS THE FUTURE OF THE FASHION INDUSTRY? A CONCEPTUAL FRAMEWORK OF ADOPTION OF APPAREL MANUFACTURING ROBOTS

Presenter: Fisher, Carly  
Undergraduate, Family and Consumer Sciences

Mentor: Prof. Christina Soyoung Song

Authorship: Carly Fisher, Christina Soyoung Song

#### Introduction

While the world is adapting with new technology, apparel manufacturing is continuing with new innovations. Sewbo, announcing the World's First Robotically Sewn Garment, is an early startup in developing automation industrial tools for clothing factories (Staff, R. B. R., & Staff, R. B. R., 2018) Jon Zornow, who is the founder of Sewbo, had built the first robot to sew a t-shirt with using no human intervention. Four factors that are affected by the adoption of apparel production are the following, cost efficiency, lead time efficiency, accuracy, and process automation. Apparel manufacturing is defined as the process that clothing and other textiles products are created, this is a global industry, and the production involves multiple steps. (Alibaba Cloud, 2022)

#### Conceptual Framework

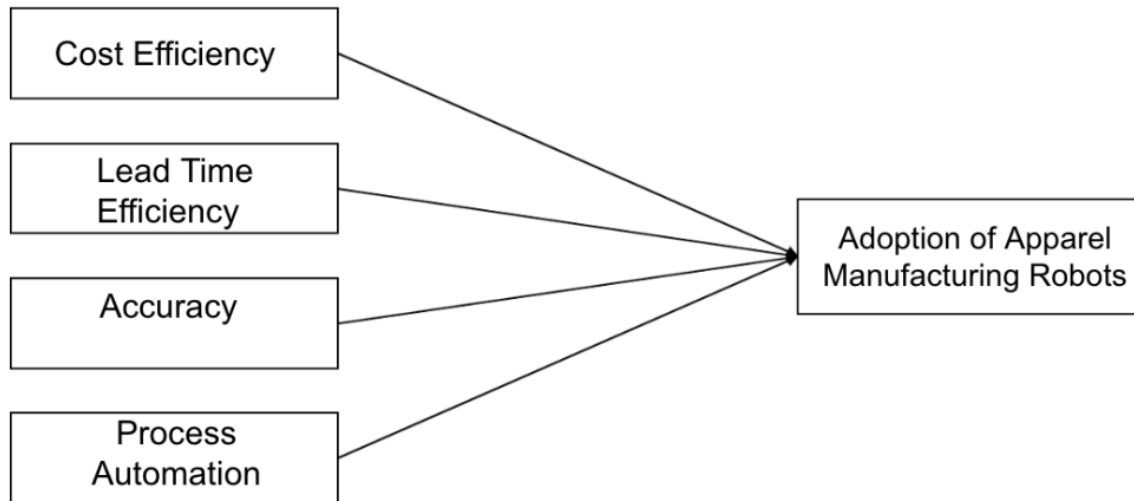
The theoretical foundation for the conceptual model derives from the conceptual framework of the adoption of apparel manufacturing robots. Based on the above analysis, a model integrating cost efficiency, lead time efficiency, accuracy and process automation is proposed to investigate how the adoption of apparel manufacturing robots effects these factors (Figure 1). The model below shows the direct correlation between the adoption of apparel manufacturing robots on cost efficiency lead time efficiency, accuracy, and process automation.

**Proposition 1:** Cost efficiency positively influences manufacturers' adoption of apparel robots

**Proposition 2:** Lead time efficiency positively influences manufacturers' adoption of apparel robots

**Proposition 3:** Accuracy positively influences manufacturers' adoption of apparel robots

**Proposition 4:** Process automation positively influences manufacturers' adoption of apparel robots



**Figure 1.** Proposed Framework

### **Conclusion/Discussion**

This study proposes the concept of the adoption of apparel manufacturing robots. The four factors that are affected are cost efficiency, lead time efficiency, accuracy, and process automation. Due to the lack of knowledge and popularization of the concept, not many manufactures have introduced automation into their manufacturing processes. The creation of Sewbo has proved to the industry that garments are able to be produced by a robot and done successfully.

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## **A CONCEPTUAL FRAMEWORK OF AI SUBSCRIPTION SERVICES: ARE CONSUMERS SATISFIED WITH FASHION SUBSCRIPTION SERVICES?**

Presenter: Guzman, Melanie  
Undergraduate, Family and Consumer Sciences

Mentor: Prof. Christina Soyoung Song

Authorship: Melanie Guzman, Christina Soyoung song

### **Introduction:**

“Powered by innovative algorithms and curated with expert care, the Wantable experience combines the best of technology and experienced hands-on styling. It’s an art and a science” (Watable, 2022). Artificial intelligence (AI) has been changing the fashion industry tremendously by performing human tasks to a whole other level of automation. It does so with the use of machines and computers to mirror a human mind's ability to problem-solve and make decisions (Akram et al., 2022). Online fashion subscription services like Stitch Fix, Wantable, and Trunk Club have combined AI with stylists to offer clients customized style recommendations at ease. The combination of technology and human fashion stylist “entails gathering information like preferences, size and budget via style quizzes, as well as from purchases and returns...” (Howland, 2022). This study will focus on the functionality of AI within subscription services and the promotion of consumer satisfaction through AI.

### **Conceptual Framework:**

Based on this information, we proposed our conceptual framework which includes optimized recommendation, enjoyment, personalization, and convenience to conduct an investigation on how they influence consumer satisfaction toward AI subscription services (Figure 1).

**Proposition 1.** Optimized recommendation positively influences consumers' satisfaction toward AI subscription services.

**Proposition 2.** Enjoyment positively influences consumer satisfaction toward AI subscription services.

**Proposition 3.** Personalization positively influences consumer satisfaction.

**Proposition 4.** Convenience positively satisfies consumers toward AI subscription services.

### **Conclusion/Discussion:**

The fashion industry is rapidly evolving due to the advancement of technology, many brands have incorporated high-tech fashion innovations like Artificial Intelligence to understand the industry and consumers better. This study demonstrates how subscription services have incorporated AI in their business strategy to further business success and promote consumer satisfaction. As the study mentions, businesses have been successful with the combination of AI and humans working together to promote client satisfaction. The study is helpful for online fashion brands wanting to enhance client satisfaction and intensify overall business. This analysis can also influence consumers to consider AI styling subscription services based on the propositions discussed.

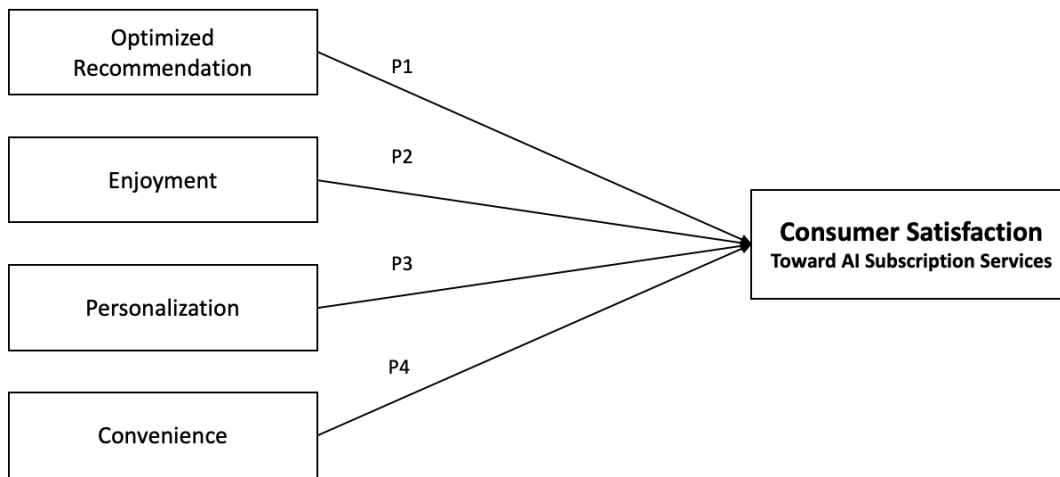


Figure 1. Proposed Framework

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# THE FUTURE OF 4D PRINTING TECHNOLOGY IN SHOES: WILL IT BECOME THE MAINSTREAM?

Group Leader: Henning, James  
Undergraduate, Family and Consumer Sciences

Group Members: Mira Pedone, Undergraduate, Family and Consumer Sciences; Maddie Castino, Undergraduate, Family and Consumer Sciences

Mentor: Prof. Christina Soyoung Song

Authorship: James Henning, Mira Pedone, Maddie Castino, Christina Soyoung Song

**Introduction:** 4D printing is a preservative manufacturing process that can reshape and self-assemble with respect to time, money, and materials. A few benefits of 4D printed shoes are that they are formed to the user's foot, and the material is designed to support and flex with the movement of each foot. 4D printing is not only used in the fashion industry, but it is also used by doctors, the aerospace industry, the automobile industry, and biomedical engineers. 4D printing, a part of additive manufacturing technology, shows the capability of fabricating intelligent components through the active design of smart materials and structures, as well as the shapes, properties, or functionalities which can controllably vary with time and space dimensions. This study uncovers the 'how' and 'why' of 4D printing shoes in the fashion industry by developing more research on how it can be more economical and sustainable worldwide.

**Conceptual Framework:** Based on the above literature, we created our conceptual model of what we believe are the most important reasons for consumers to purchase 4D printed shoes (Figure 1).

Figure 1: Proposed Framework - (Please see attached file)

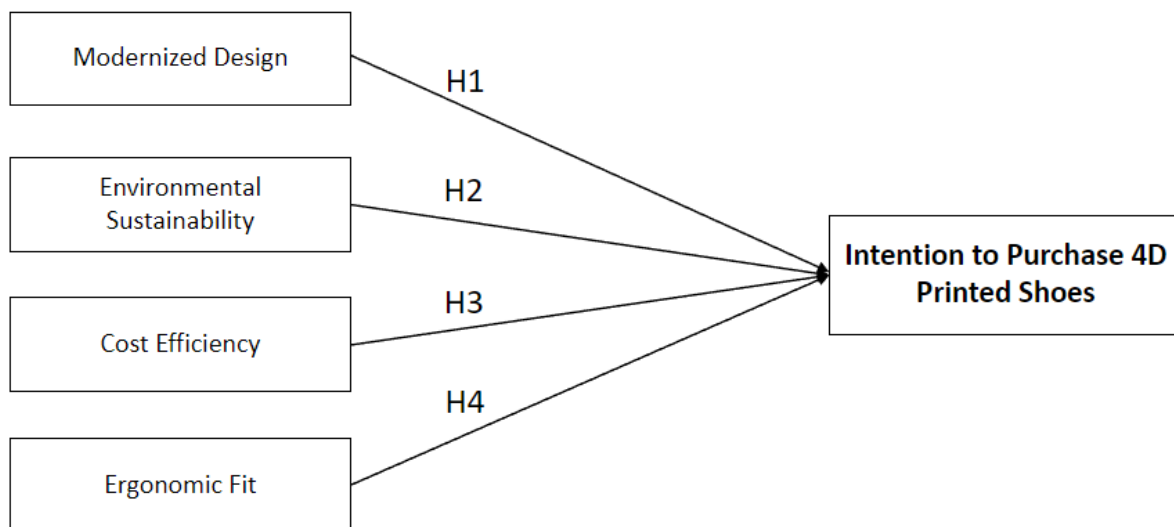


Figure 1: Proposed Framework

## **Conclusion/Discussion:**

After doing the research, this study shows the shoes being not only innovative but environmentally sustainable. There are high hopes for it being seen in fashion in the near future. As complicated as it can be Adidas showed us just how easy it is, it takes two hours to create 4D midsoles. With all the upcoming technology this process can be sped up even quicker. Fashion can have a huge breakthrough with finding a great way of being environmentally friendly. In time it can be used all across the world, changing the way we live and use things. Other companies will start to develop marketing strategies like making them more stylish and finding a way to be sustainable. These findings of the study are going to offer beneficial insights to understanding how and why the fashion industry can change from this.

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## INVESTIGATING WRINKLE RESISTANCE OF COTTON AND COTTON BLENDED FABRICS IN RELATION TO A NON-FORMALDEHYDE DURABLE PRESS FINISH

Presenter: Johnson, Miranda  
Graduate, Family and Consumer Sciences

Mentor: Prof. Ui-Jeen Yu

Authorship: Miranda Johnson, Ui-Jeen Yu

This study investigated PUREPRESS™-treated cotton fabric's wrinkle resistance, compared to 100% cotton and cotton blended fabrics with/without wrinkle resistance finishes. Wrinkle resistance of cotton fabrics can be achieved by using chemical resin finishes or blending with polyester, nylon, or spandex. Most wrinkle resistant finishes contain harmful chemicals, such as formaldehyde. The PUREPRESS™ technology is a durable press finish through pad, dry, and cure fabric application processes treated with crosslinking resins. These improve wrinkle resistance, formaldehyde-free, making PUREPRESS™ technology a prime alternative to the wrinkle resistance finishes with formaldehyde. Eight different cotton fabric samples were tested in this study—cotton and cotton blended fabrics with PUREPRESS™ technology, wrinkle resistant finish, and no wrinkle resistant finish. The fabric samples were tested using AATCC 128 Wrinkle Recovery of Fabrics: Appearance Method. One-way between groups ANOVAs were conducted to examine how wrinkle resistance differs among fabric samples, depending on fiber type, wrinkle resistant finishes, and PUREPRESS™ technology. *Post-hoc* comparisons using the *Bonferroni* test were also conducted. Results indicated significant differences on wrinkle resistance by the different fiber contents and wrinkle resistance finishes. The 100% cotton fabric with PUREPRESS™ technology showed greater wrinkle resistance than the other fabrics. According to prior research, PUREPRESS™ technology also has other properties, such as abrasion resistance, shape retention, pilling resistance, etc. Further research on these properties is needed to explore characteristics of the PUREPRESS™ technology, compared to other wrinkle resistant fabrics.



## **CUSTOMER JOURNEY MANAGEMENT IN INDIAN APPAREL MARKETS**

Presenter: Kaur, Mankirat  
Graduate, Family and Consumer Sciences

Mentor: Prof. Christina Soyoung Song

Authorship: Mankirat Kaur, Christina Soyoung Song

Customer journey management (CJM) starts with understanding customers' experiences throughout their shopping journey (Grewal & Roggeveen, 2020). Small native markets in India can provide memorable experiences for their customers, showing a unique shopping environment with different kinds of noise and fragrances scattered from early morning to late night. The study conducted personal interviews, asking their opinions on price, products, satisfaction level, and apparel shopping experiences among Indian customers. This study found that typical Indian consumers tend to focus on purchasing things they need for daily life, influenced by their cultural factors and frequently bargain the prices of goods actively in the markets. Furthermore, as in other parts of the world, many Indian customers tend to purchase goods online using WhatsApp and Facebook for better prices. Therefore, it has been necessary for Indian retailers and manufacturers to alter shopping processes to leverage the benefits of online businesses. In addition, because foreign brands such as H&M and Zara have entered Indian markets, the sales of local apparel markets have been significantly reduced, and the market has become very comparative (Ho et al., 2019). Therefore, this study recommends that fashion retailers focus on determining and creating a better customer experience by mapping today's changed customer journey in Indian apparel markets.

## **CASE STUDY OF WRINKLE RESISTANCE WITH PUREPRESS™ COTTON TECHNOLOGY**

Group Leader: Loth, Megan  
Undergraduate, Family and Consumer Sciences

Group Members: Jess Buhr, Undergraduate, Family and Consumer Sciences; Anna Vonachen, Undergraduate, Family and Consumer Sciences

Mentor: Prof. Ui-Jeen Yu

Authorship: Megan Loth, Jess Buhr, Anna Vonachen, Sofia Orbegozo

The purpose of this study was to examine wrinkle resistance of PUREPRESS™ technology, developed by Cotton Incorporated, in comparison with 100% cotton and cotton blended fabrics with and without wrinkle resistance finishes. PUREPRESS™ technology has a durable press finish, using crosslinking resins to keep fabric wrinkle-free, and reduce loss of strength and abrasion resistance. Different from existing wrinkle resistant finishes, PUREPRESS™ technology does not use formaldehyde. Few studies have investigated PUREPRESS™ technology's wrinkle resistance; hence, this study will fill the gap of literature about wrinkle resistance with PUREPRESS™ technology that uses crosslinking resins through a standard pad, dry, and cure fabric application processes. Researchers conducted AATCC 128 Wrinkle Recovery of Fabrics: Appearance Method and evaluated wrinkle resistance of a 100% cotton fabric with PUREPRESS™ technology in comparison with a 55% cotton 45% polyester blended fabric with wrinkle resistance finish, a 65% polyester 35% cotton blended fabric, and a 100% cotton fabric. Results indicated 100% cotton fabric with PUREPRESS™ technology showed greater wrinkle resistance than the other cotton and cotton blended fabrics with and without wrinkle resistance finish. PUREPRESS™ technology is formaldehyde-free, creating a better alternative to other fabrics with wrinkle-resistant finishes. This study provides an understanding of formaldehyde-free PUREPRESS™ technology and easy-care performance with wrinkle resistance. More extensive research on PUREPRESS™ technology, which improves tensile strength, tear strength, and abrasion resistance is suggested, compared to a conventional durable press finish.

## **IT'S HAPPENING IN YOUR HOMETOWN: THE WRONGFUL CONVICTIONS OF EVERYDAY PEOPLE**

Presenter:           Lowe, Megan  
                          Undergraduate, Sociology/ Anthropology

Mentor:             Prof. Cristina Prestin-Beard

Authorship:        Megan Lowe

The United States hosts a criminal justice system not immune to flaws which victimize everyday people. What factors determine one's path from arrest to incarceration? How can innocent, everyday people be caught up in this process, and how can that ultimately result in imprisonment?

The causes of wrongful conviction are widely agreed to fit into distinct categories. These include official misconduct, eyewitness misidentification, false and coerced confessions, false or misleading evidence, inadequate legal defense, and incentivized witnesses (The Center on Wrongful Convictions, The National Registry of Exonerations, and The Innocence Project). While Illinois law is beginning to address some of these issues, wrongful conviction continues to loom as a danger inseparable from the criminal justice system at present.

Dozens of court cases have secured Illinois residents' exoneration after proving that they suffered incarceration after a wrongful conviction. These wrongful convictions can be mapped across northern, central, and southern Illinois in recent years, providing a great degree of relatability to Illinois State University personnel.

# A CONCEPTUAL FRAMEWORK OF CONSUMERS' INTENTION TO PURCHASE 3D KNITTED SHOES

Presenter: Shabani, Nahid  
Graduate, Family and Consumer Sciences

Mentor: Prof. Christina Soyoung Song

Authorship: Nahid Shabani, Christina Soyoung Song

**Introduction:** 3D knitting technology (3DKT) is a relatively new seamless technology that provides inherent stretch and compression properties, reduces nearly 60% of material waste in the production processes, and provides an advantage of personalized shoe fitting (Mahbub et al., 2014). As one of the most advanced innovations in sustainability, 3DKT has been increasingly adopted in the shoe industry (West, 2019; Blaga et al., 2020). However, there is a lack of literature explaining why consumers may want to purchase 3D knitted shoes. Therefore, this study investigates the critical factors influencing consumers' intention to buy 3D knitted shoes and proposes a conceptual framework for 3D knitted shoes.

**Conceptual Framework:** Based on the above information, we develop the following prepositions and conceptual framework (Figure 1):

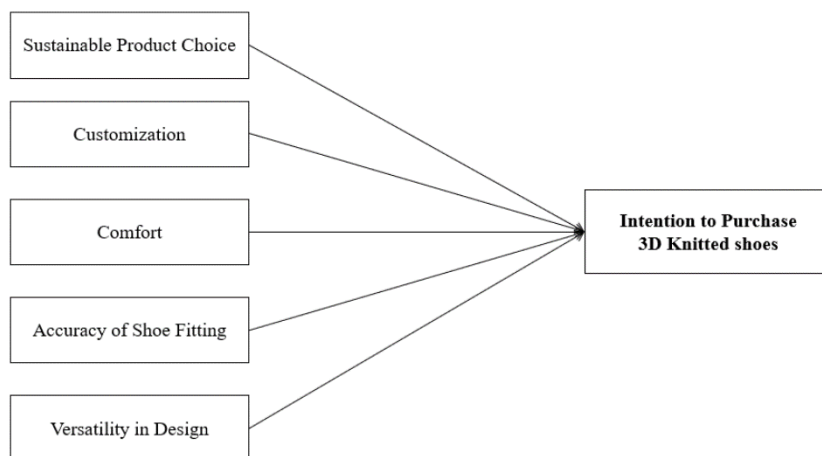
**Proposition 1:** Sustainable product choice will influence consumer intention to purchase 3D knitted shoes.

**Proposition 2:** Customization of shoe design will influence consumer intention to purchase 3D knitted shoes.

**Proposition 3:** Shoe comfort will influence consumer intention to purchase 3D knitted shoes.

**Proposition 4:** Accuracy of shoe fitting will influence consumer intention to purchase 3D knitted shoes.

**Proposition 5:** Versatility in shoe design will influence consumer intention to purchase 3D knitted shoes.



**Figure 1.** Proposed Conceptual Framework

**Conclusion:** While seamless knitting technology continues to improve, there are still many technical limitations in 3DKT to achieve functionality and sustainability simultaneously. We hope that our conceptual framework will help 3D knitted shoe companies and manufacturers increase consumers' awareness of sustainable products and be able to promote 3DKT effectively.

## References

*Mahbub, R., Wang, L., & Arnold, L. (2014). Design of knitted three-dimensional seamless female body armour vests. International Journal of Fashion Design, Technology and Education, 7(3), 198-207.*

*West, A. J. (2019). Innovations in knitting at ITMA 2019 Barcelona, Spain. Journal of Textile and Apparel, Technology and Management, 11(1) Special Issue, 1-15. Please open the attached file to see the figure.*

## FINANCE, INSURANCE, AND LAW

### DETERMINANTS OF LOAN FORGIVENESS IN THE PAYCHECK PROTECTION PROGRAM

Group Leader: Morr, Rudy  
Undergraduate, Finance, Insurance, and Law

Group Member: Wyatt Frere, Undergraduate, Economics

Mentor: Prof. Vladimir Kotomin

Authorship: Wyatt Frere, Vladimir Kotomin, Rudy Morr

The Paycheck Protection Program (PPP) extended forgivable loans to small- and medium-sized businesses at the height of the COVID-19 pandemic in the U.S. Certain conditions had to be met and paperwork completed by applicants to ensure loan forgiveness. Using the data set of 11.5 million PPP loans, we analyze how lender and borrower characteristics affect the probability and the speed of loan forgiveness. The loans were risk-free for the lending institutions through which they were extended because they are backed by the federal government. Among the four different types of lenders – community banks, large banks, credit unions, and fintechs – community banks and credit unions are associated with higher forgiveness probabilities and speeds. Among banks, institutions with lower relative costs (a measure of management quality) are associated with the same results. Borrower and loan characteristics associated with higher forgiveness possibilities and speeds include sole proprietorship, White, and female borrowers, as well as small loans.

## **GEOGRAPHY, GEOLOGY, AND THE ENVIRONMENT**

### **WATER COLOR OF MINNESOTA'S SENTINEL LAKES (SLICE) BY SATELLITE REMOTE SENSING**

Presenter: Dooley, Andrew  
Graduate, Geography, Geology, and the Environment

Mentor: Prof. Wondy Seyoum

Authorship: Andrew Dooley

Surface waters are preciously vital resources requiring expensive and time intensive labor to effectively monitor for adequate water quality management. New applications of water color analysis by satellite remote sensing are a promising holistic approach to water quality monitoring for scientific, industrial, recreational, and cultural benefit. This research expands previous applications of lake water color analysis and pioneers water color patterns of midcontinent lakes in Minnesota, USA. In documenting lake water color, the first observations of water color homogeneity within ecoregions and color consistency through historical satellite mission data may begin. NASA's Landsat 8 OLI satellite provides an active historical record of visible light reflectance of the Earth's surface. Chromaticity analysis concludes unbiased interpretation of dominant visible wavelength as water color from tristimulus reflectance samples. The Sustaining Lakes In a Changing Environment (SLICE) program, predefines "Sentinel Lakes" representative of the population of lakes within major ecoregions of Minnesota. Visible light reflectance records will be extracted at randomly generated points within Sentinel Lakes at late summer when peak insolation bolsters trophic activity. The expected results of this work will provide groundwork of lake water color distribution and variability across the State of Minnesota. Cartographic representation of Sentinel Lake modal water color will aid in interpretation of water color variability within ecoregions. Graphical displays of modal dominant visible wavelength from each ecoregion will yield quantifiable comparison of water color as wavelength. All Sentinel Lakes within an ecoregion are expected to share consistent water color. Ecoregions are anticipated to possess distinguishable water colors from each other. Chromaticity diagrams of historical water color will display what trends of water color exist and compile ecoregion water color trends since Landsat 8's launch. Individual Sentinel Lake water color trends are hypothesized to not remain a consistent color through time. The results of this project further develops the possibilities of water color analysis for water quality monitoring and surface water management at unprecedented scales. Cost reduction, historical backlogs, and recurrent sampling are few of the major benefits for further scientific investigations with water color methodology for water quality monitoring.

## JACKRABBITS OR DESERT COTTON-TAILS?

Presenter: Robinson, Indira  
Undergraduate, Geography, Geology, and the Environment

Mentor: Prof. Jonathan Thayn

Authorship: Jonathan Thayn

Early in the Summer of 2022, my faculty mentor traveled to Canyonlands National Park and was surprised to see that the black-tailed jackrabbits (*Lepus californicus*) of his youth have been replaced with desert cotton-tails (*Sylvilagus audubonii*). How is it, that as global temperatures rise, the rabbit species most adapted to arid, dry conditions are being replaced by a seemingly less-fit competitor? To begin to understand the answer to that question, we compared the differences between their preferred habitat using data provided by the Global Biodiversity Information Facility and satellite data provided by the US Geological Survey. Over 12,200 jackrabbit locations and over 22,000 cotton-tail locations were incorporated into a geographically-weighted logistic regression model. The model allows the coefficients associated with each habitat characteristic to vary across space, highlighting the interactions between the characteristics and location. The volume of data, and the complexity of the model, required that we use ISU's High Performance Computing (HPC) facility. The results of this initial model illustrate the differences in the species' preferred habitats and point us in the right direction for future research.



## HEALTH SCIENCES

### MIXED METHODS STUDY EXPLORING VACCINE SAFETY PERCEPTIONS AMONG COLLEGE STUDENTS

Group Leader: Lemp, Haley  
Undergraduate, Health Sciences

Group Member: Josie Trainor, Undergraduate, Health Sciences

Mentor: Prof. Alicia Wodika

Authorship: Haley Lemp, Alicia Wodika, Josie Trainor

Vaccines are considered one of the greatest modern accomplishments of the public health field due to positive health outcomes, such as the decrease in vaccine-preventable morbidity and mortality rates. Vaccine hesitancy can be defined as the refusal to receive, or the delay in the acceptance of, one or more available vaccines. While many factors contribute to this phenomenon, vaccine hesitancy is often related to one's concerns regarding the safety of vaccines. The purpose of this study was to ascertain college students' vaccine safety perceptions and to investigate the subsequent implications for vaccine hesitancy intervention among college students. In Fall 2023, student participants (n=562) completed a mixed-methods Qualtrics survey that contained questions regarding their personal vaccine safety perceptions focused on the COVID-19 Vaccine, the Human Papillomavirus (HPV) Vaccine, the Influenza (Flu) Vaccine, the Tetanus, Diphtheria and Pertussis (Tdap) Vaccine, and the Meningitis Vaccine. Qualitative data analysis included coding the open-ended student responses to detect common themes. Quantitative data analysis utilized descriptive statistics to summarize the results of the closed-ended survey questions. Participants' hesitancy towards the safety of vaccines was highest among the COVID-19 Vaccine, followed by the Influenza Vaccine, and then the Human Papillomavirus Vaccine. Students were less hesitant towards the safety of the Tetanus, Diphtheria and Pertussis (Tdap) Vaccine and the Meningitis Vaccine. Students reported their desire for transparent vaccine safety communication and their distaste for the politicization of vaccines. Additionally, students who were identified as vaccine-hesitant towards one or more of the studied vaccines emphasized the impact of the length of time spent researching a vaccine on their vaccine safety perceptions.

## **YOU GO, I GO: ASSESSING STUDENT LONELINESS ON CAMPUS**

Presenter: Richter, Aubrey  
Undergraduate, Health Sciences

Mentor: Prof. Alicia Wodika

Authorship: Aubrey Richter, Alicia Wodika

While on campus and especially during the COVID-19 pandemic, students are susceptible to mental health challenges and prolonged loneliness. Many first year and transfer students struggle to adjust to the lifestyle and environment of college and find their community. During the pandemic, students had access to fewer mental health support resources and due to online classes, were not able to form relationships. Loneliness is one of the largest predictors of depression and suicide and can have negative impacts on a student's health. We aimed to look at the biggest predicting factors of students' loneliness on campus to identify what programs might be most beneficial to enhance student belongingness. We sent out a survey to Illinois State University and Heartland Community College students (N= 632) containing open-ended and multiple-choice questions to assess their level of loneliness and determine their knowledge and suggestions of on-campus programs and interventions. At both ISU and HCC, first year students had higher levels of loneliness as well as students who utilized social media for over 5+ hours per day. Regarding feelings of isolation, 21.6% of the ISU sample and 34.2% of the HCC sample stated they always feel isolated from others. Students reported being aware of student counseling services and registered student organizations but had low familiarity with other resources. Students also reported feeling more motivated to go to events if they had a peer/friend also attending and expressed needing more information about events. Additionally, students stated that their professors could foster community by encouraging group work and getting to know students. Many students indicated that they have moderate levels of loneliness when it comes to feeling in tune with others and forming friendships.

## KINESIOLOGY AND RECREATION

### THE RELATIONSHIP BETWEEN COMBINE PERFORMANCE AND INJURIES IN NBA ROOKIES

Presenter: Driskell, Nicklaus  
Graduate, Kinesiology and Recreation

Mentor: Prof. Kelly Laurson

Injury rates in the National Basketball Association have been steadily climbing over the last 20 years. This has occurred in spite of the number of health and performance staff on each team increasing over this time period. There are more doctors, athletic trainers, performance coaches, and strength and conditioning staff than ever before. It has been hypothesized that a higher amount of specialization in youth sport, heavier and taller athletes, and style of play are all contributing factors to this increasing rate of injury. However, no data currently exists examining the potential link between injuries and performance traits. During the NBA combine, anthropometric and athletic characteristics are measured. These include height, weight, wingspan, vertical jump, body fat percentage, hand size, bench press, agility, and sprint time. Playing time is expected to be the biggest factor correlating with injuries. The purpose of this research was to determine if there is a link between injuries and combine statistics from NBA players' rookie year. We hope to determine if there is any relationship between combine measurements and injuries which could be used to guide training methodologies moving forward.

## **THE USE OF PHYSICAL ACTIVITY AND STRESS MANAGEMENT EDUCATION FOR IMPACTING HEART RATE VARIABILITY AND STRESS INDEX SCORES**

Group Leader: Kuehn, Kelsey  
Undergraduate, Kinesiology and Recreation

Group Member: Madison Solomon, Undergraduate, Kinesiology and Recreation

Mentor: Prof. Karen Dennis

Authorship: Kelsey Kuehn, Madison Solomon

**PURPOSE:** Investigate the relationship between physical activity, stress management education, and other biometric (BM) variables on heart rate variability (HRV) through a course that focuses on teaching healthy lifestyles and stress management education over 16 weeks.

**METHODS:** Students who were enrolled in KNR 113 Personal Fitness at Illinois State University during the fall of 2022 were subjects for the study. Throughout the 16-weeks, students participated in physical activities that targeted improving fitness, that were measured through pre- and post-testing. Additionally, KNR 113 students were given university provided pedometers and self-reported their steps weekly. Step counts from week 4 (pre) and 14 (post) were averaged. HRV measurements were gathered at both pre- and post-testing using the HeartMath emWave Pro software measured by a pulse plethysmograph ear sensor along with BM data (ht, wt, body comp., VO<sub>2</sub> (1-mile walk test)) and SI (State-Trait Anxiety Inventory for Adults, Polar Tri-Fit software). Weekly "Release It" assignments were given through the HeartMath Institute website to focus on teaching students how to implement breathing techniques, attitude, and heart-brain connection in their own lives.

### **RESULTS:**

Paired samples T-tests were utilized to assess differences between pre- and post-tests. While there was an increase in HRV, it was not statistically significant ( $t(51)=-1.070$ ,  $p=.290$ ), or for SI scores ( $t(62)=-0.529$ ,  $p=.599$ ). Statistical significance was found in VO<sub>2</sub> ( $t(68)=-12.292$ ,  $p=.001$ ) and steps ( $t(47)=-2.965$ ,  $p=.005$ ). Cohen's effect size values for VO<sub>2</sub> ( $d=-1.480$ ) suggest a "very large" practical significance in VO<sub>2</sub> values.

**CONCLUSION:** The study found a statistically significance improvement in fitness levels (VO<sub>2</sub>) between pre- and post-testing although no statistical significance between HRV and Stress Index measurements. While the HRV and Stress Index measurements did not show any improvements, it is notable that an increase in physical activity and stress management tools can and may be useful to help better manage stress, SI and increase HRV.

## **USER-CENTERED APPROACH TO INTERACTIVE MAPPING: A CASE STUDY OF DISTRICT 87'S COMMUNITY WELLNESS RESOURCES**

Presenter: Mueller, Zachary  
Graduate, Kinesiology and Recreation

Mentor: Prof. Nicky Wu

Co-Mentor: Prof. John Kostelnick, Geography, Geology, and the Environment

Authorship: Zachary Mueller, Nicky Wu, John Kostelnick, Emily Jones

Diversity, equity, inclusion, and belongingness are topics of utmost importance in today's society. In recent years, there has been a push to reach the needs of underserved, marginalized populations who are underfunded and have limited resources. Due to a lack of funding and limited resources, school districts are forced to deal with the impacts of inequities in access and accessibility of community resources that promote physical activity, health, and emotional well-being. School District 87, located in Bloomington, IL, is one of the many school districts facing these challenges. Our current interactive map displays the location of community assets: public/private institutions, physical spaces, businesses, and groups/organizations, as well as the walkability time in five-minute intervals from each school to show access and accessibility to community resources. The interactive map was created in 2019 and includes outdated data and is in need of an update. This project aims to create a more functional interactive map that enables staff members to be more effective at promoting physical activity, health, and emotional well-being. Following a user-centered design process, this project utilizes a two-step approach of two rounds of needs assessments to ensure that the map meets the needs of the staff members. The initial needs assessment consists of a survey with both quantitative Likert-type scale answers and qualitative-open ended answers. The second round of needs assessment consists of 25-minute individual zoom interviews. Zoom interview and its screen share tool allow us to understand how participants interact with the map and gather detailed user feedback about the usability and functionality of the map. It is anticipated that we will identify additional map features, functions, and data layers that will increase staff usage of the map. Furthermore, it is anticipated that we will identify barriers that will prevent map usage, such as the potential lack of knowledge, terminology, and experience using interactive maps. Our project goals are to give district staff members a more intuitive and functional asset map that meets their needs, increase map usage, identify new assets within the community, and increase staff member knowledge on how to use our interactive map properly.

## **EQUITY, DIVERSITY, & INCLUSION EXPERIENCES OF FEMALE PROFESSIONALS IN THE SPORTS & RECREATION INDUSTRY**

Presenter: Oloffson, Kayla  
Graduate, Kinesiology and Recreation

Mentor: Prof. Mike Mulvaney

College athletic departments provide opportunities for young adults to participate in competitive sports at a high level. The successful management and operations of collegiate athletics relies heavily on well-trained professionals to support these services. Historically, college athletics has been viewed as a male-dominated field. However, female professionals are slowly breaking through and increasing in numbers during the past 30-50 years. A recognized initiative that has helped support this growth has been the increased focus on diversity, equity, and inclusion (DEI) efforts within college athletics. The purpose of this study was to explore DEI efforts and their impact across college athletic programs of various sizes. More specifically, the similarities and differences between Division I and Division III female administrators and their perceptions of DEI-related efforts were examined. Female administrators from Division I and Division III collegiate athletic programs were recruited for the project. Each of the administrators recruited for the project were recognized as contributors to their athletic department's goal of raising awareness of DEI and how it can be further executed to narrow the gap between males and females in athletics. Qualitative (structured) interviews were conducted with each of the administrators and thematic analyses were employed to identify repeated patterns and themes. The results of these analyses are highlighted and discussed.

## **BARRIERS TO PHYSICAL ACTIVITY IN UNIVERSITY STUDENTS FOLLOWING PARTICIPATION IN EXERCISE IS MEDICINE ON CAMPUS**

Group Leader: Rafael, Julia  
Graduate, Kinesiology and Recreation

Group Member: Sarah Lafayette, Graduate, Kinesiology and Recreation

Mentor: Prof. Kristen Legally

Authorship: Sarah LaFayette, Julia Rafael

**PURPOSE:** The purpose was to examine barriers to being physically active before and after participation in Illinois State University's Exercise is Medicine on Campus (EIMOC) program. **METHODS:** Forty-one participants completed a 20-item questionnaire prior to and after participating in the EIMOC program. The questionnaire included the "Barriers to Being Active" quiz and an assessment of stage of change for physical activity participation. **RESULTS:** Pre- and post-participation stage of change and barrier mean scores are included below. For stage of change, a decrease in the value indicates greater participation in physical activity. For barriers, a score over 5 is considered an important barrier, and a decrease in the value indicates that the barrier has become less significant. Paired t-tests indicated significant differences ( $p < 0.007$ ) between pre- and post-program stage of change and in all barriers except Lack of Time, Fear of Injury and Lack of Resources.

### Stage of Change

n=41) Lack of Time

(n=38) Social Influence

(n=39) Lack of Energy

(n=38) Lack of Willpower

(n=38) Fear of Injury

(n=39) Lack of Skill

(n=39) Lack of Resources (n=38)

Pre 2.9 4.3 4.8 5.3 6.8 1.0 2. Post 2.4 4.1 3.8 4.1 4.6 0.7

**CONCLUSION:** Reductions in barriers to physical activity is positive for promoting participation and adherence to physical activity. The results suggest that following EIMOC program participation, physical activity levels were better (as assessed by stage of change), and participants experienced a reduction in major barriers. Additionally, all barriers were under a score of "5" following the EIMOC program. These results support the EIMOC program as a positive physical activity intervention.

## EFFECTS OF BALL WEIGHT ON ELBOW JOINT KINETICS IN BASEBALL PITCHING

Presenter: Wood, Kyle  
Graduate, Kinesiology and Recreation

Mentor: Prof. Michael Torry

Authorship: Kyle Wood, Hiroshi Sagawa, Michael Torry

**INTRODUCTION:** Weighted baseball throwing programs are often used to increase pitch velocity. However, increased injury risk has been reported and questions regarding possible mechanism of injury at the elbow exist. Analysis of elbow joint reaction force and moments during pitching of multiple ball weights may provide insight on injury potential. **PURPOSE:** To compare the effects of weighted baseballs on elbow joint kinetics during pitching.

**METHODS:** 10 baseball pitchers (Age  $13.3 \pm 2.69$  years) were analyzed in the study. Participants threw 5 pitches with 5oz, 7oz, and 9oz baseballs. Ball weight order were counterbalanced and 3 fastest pitches for strikes were analyzed. Full body, 3D segment position data were collected using a motion capture system (200 Hz). 3D marker trajectories were input into a Visual 3D model to estimate elbow joint moments and reaction forces. Varus elbow joint moment and joint reaction forces were compared with RMANOVA ( $\alpha = .05$ ) and Bonferroni post-hoc tests.

**RESULTS:** Differences were noted between the ball weights on pitch velocity (5oz  $16.7 \pm 3.2$  m/s, 7oz  $15.99 \pm 3.1$  m/s, 9 oz  $15.2 \pm 2.7$  m/s,  $p < 0.017$ ) and elbow extension velocity (5oz  $3905.1 \pm 434.6$  dg/s, 7oz  $3474.4 \pm 419.7$  dg/s, 9oz  $3260.2 \pm 428.7$  dg/s,  $p < 0.05$ ). Throwing heavier balls resulted in a decreased compression force between the 5oz and 7oz, as well as 5oz and 9oz, but not between 7oz and 9oz (5oz  $451.6 \pm 172.1$ N, 7oz  $391.6 \pm 163.2$ N, 9oz  $381.9 \pm 174.2$ N,  $p < 0.017$ ). The Varus moment decreased as ball weight increased and only exhibited significant differences between two of the conditions (5oz  $29.1 \pm 15.3$  Nm, 9oz  $25.1 \pm 8.2$  Nm,  $p < 0.017$ ). Lateral and Medial JRF differences were not significant.

**CONCLUSION:** Increased ball weights caused a decrease in pitch and elbow extension velocity, as well as compressive JRF and varus moment at the elbow. The decrease in elbow joint moment and forces could be caused by the decrease in ball velocity. The results suggest that throwing weighted baseballs do not increase the risk of injury to the elbow in youth pitchers.



## MANAGEMENT AND QUANTITATIVE METHODS

### BARBADOS STUDY ABROAD ANALYTIC REPORT

Presenter: Thomas, Arianna  
Undergraduate, Marketing

Mentor: Prof. Tina Williams

Study Abroad is a transformational learning opportunity that enriches the student learning experience. Unfortunately, some students are unable to take advantage of Study Abroad opportunities for a variety of reasons. We expect that students have the desire to study abroad but cannot do so due to limiting factors affecting individual persons. This research examines students' desire to participate in study abroad as well as the reasons why some students chose to do so, and others did not. Our population of interest for this study is students attending a medium-sized university in the Midwest. We propose that socioeconomic status, lack of resources and information will negatively impact the decision to study abroad.

## MATHEMATICS

### TRAINING A VIRTUAL SPIDER

Group Leader: Beyer, Daniel  
Undergraduate, Mathematics

Group Member: Joseph Wittrock, Undergraduate, Mathematics

Mentor: Prof. Mehdi Karimi

Authorship: Joseph Wittrock, Daniel Beyer

Reinforcement Learning (RL) is a popular branch of machine learning with several modern applications which enables an agent to learn in an interactive environment. Deep RL (combinations of RL and Neural Networks (NN)) has made major breakthroughs in robotics in recent years. In this project, we use deep RL and the Unity platform to program and design a physically simulated spider. We use Unity's Machine Learning Agents package and PyTorch to train the spider to complete certain tasks. The tasks include following an object, navigating difficult terrains, and climbing surfaces. As part of this project, we define the environment, action space, and reward function. Using Unity ML agents lets us define our deep RL agents with the ability to make observations (to collect data), to make decisions based on observations, to take an action mapped to that decision, and to collect a reward from the consequences of that action. The agent's interaction with the environment creates the training data for the deep RL agent to find an optimal policy. Observations include the spider's limb positions and velocities and the position of the target object. Observations can also include ray casts that act as the eyes of the agent. The agent's actions will control the forces on the joints of the spider's legs.

In this project, we also study some of the theoretical aspects of RL such as the Bellman and the Q-learning equations to find the best deep RL agent type. After trying the default agents PPO and SAC available in the Unity package, we investigate other options in the literature that can improve the training process. We optimize hyper-parameters such as batch size, learning rate, and epsilon to train the spider more efficiently and effectively. Our results and techniques can be used for training more complicated robots with advanced abilities.

## **CLASSIFYING FLOWERS USING CONVOLUTIONAL NEURAL NETWORKS ON A TENSOR PROCESSING UNIT**

Group Leader: Soltermann, Christian  
Undergraduate, Mathematics

Group Member: Christiana Beard, Undergraduate, Mathematics

Mentor: Prof. Mehdi Karimi

Authorship: Christian Soltermann, Christiana Beard

Computer vision has tremendously improved in recent years due to advancements in Neural Networks (NN), specifically, a sub-class of them called Convolutional Neural Networks (CNNs). CNNs are designed to automatically learn a hierarchy of two-dimensional filters that operate on visual data, preserving the spatial relationships within the image. Image classification, one of the primary problems in computer vision, utilizes NN and Deep Learning to recognize and categorize visual data into pre-defined classes automatically. Our research primarily explores the application of CNNs to the classification of images of flowers. A flower image dataset was acquired from the Kaggle “Petals to the Metal - Flower Classification on TPU” competition. Our research will also focus on using Tensor Processor Units (TPUs), integrated circuits developed by Google for neural network machine learning, as well as TensorFlow, a deep learning package used with the Python programming language. We explore and study several new techniques in image classification, such as Data Augmentation and Attention, to improve the performance of our models, which will be primarily measured using scores obtained from submissions to the Kaggle competition. Our developed techniques can be used for flower image classification and many other applications.

## MUSIC

### **AN EXAMINATION OF THE RELATIONSHIP BETWEEN COMPOSER DAVID MASLANKA AND THE ILLINOIS STATE UNIVERSITY SCHOOL OF MUSIC**

Presenter: Whitman, Scott  
Graduate, Music

Mentor: Prof. Phillip Hash

Authorship: Scott Whitman

The purpose of this study was to examine the extent of composer David Maslanka's collaboration, engagement, interactions, and connection with the Illinois State University School of Music. Research questions will examine the following: (a) What was the nature of the relationship between Maslanka and the students and faculty at ISU? (b) What outcomes resulted in the relationship between Maslanka and the ISU School of Music? To date, no study has addressed the relationship with this composer and the ISU. Ensembles at ISU continue to perform his pieces to this day, and he remains an influential figure in the School of Music.

Dr. David Maslanka (1943-2017) was a world-renowned composer. He received his doctorate in music theory and composition from Michigan State University in 1971. He taught and lectured at four universities until 1990 when he moved to Missoula, Montana to be a full-time freelance composer. Maslanka's lifetime of composing resulted in more than 150 pieces. Over a third of those are for wind ensemble. He wrote eight symphonies, 17 concertos, a Mass, and many additional pieces for concert ensembles. His body of work also includes many chamber pieces, as well as works for orchestra and choir.

The Illinois State University School of Music Programs archive allowed for an analysis of the performances of Maslanka's pieces by ISU ensembles and faculty. The concert programs show that over 3 decades, in addition to frequently performing his works, the ISU Wind Symphony did five world premier performances of new Maslanka pieces, and an ISU School of Music faculty member premiered another. With a relationship spanning more than 30 years and including over 57 performances of his works at over 50 concerts, 10 visits to ISU's campus, eight different ISU conductors of his work, and six world premier performances of his work, it seems accurate to state that David Maslanka's influence on the Illinois State University School of Music, specifically the Band Department, has been substantial. This study shows that a long-standing collaboration between an educational institution and a composer is possible and can create a lasting impact on the school or university involved.

# PHILOSOPHY

## THE ETHOS OF ABSENCE

Presenter: O'Dowd, Sara  
Undergraduate, Philosophy

Mentor: Prof. Daniel Breyer

Authorship: Sara O'Dowd

Rhetoric is often examined as presence and words, as the art of speaking tends to. That focus often minimizes the role that silence, and absence can play in rhetoric. Silence and physical absence have grown as tools of rhetoric, allowing for movements to gain ground in the political sphere or hold space for new voices at the table in seminars. These tools tend to be most purposefully wielded by those on the margins, as those in power inadvertently pushed them into their hands. This rhetoric has grown to be more powerful and better documented with time, but it often is used by those on the margins and is not recognized for the act that it is. This study explores how silence and absence came to this state and works to understand better how they function when held in light of Aristotle's model of rhetoric.

## PHYSICS

### BIO-INSPIRED RESERVOIR COMPUTING TO PREDICT NEURONAL BEHAVIOR

Presenter: McGinnis, Cassie  
Undergraduate, Physics

Mentor: Prof. Epaminondas Rosa

Co-Mentor: Prof. Rosangela Follmann, Information Technology

Authorship: Cassie McGinnis, Rosangela Follmann, Epaminondas Rosa

Neuronal behavior can be difficult to predict, especially in the case of pathological activity which may exhibit chaotic patterns. Being able to anticipate what a neurological system will do next is of extreme relevance for the treatment of neurological disorders as epilepsy and Parkinson's disease, among others. Recent advances in computational capability offer important opportunities for using reservoir computing in machine learning to make reliable predictions in neuronal activity. Given the complexity of the problem, this remains an elusive target, but new approaches are showing promising results. In this study we show results using three different network topologies in the context of machine learning in order to find an optimal tool for neuronal predictability, in addition to a more realistic model, a network topology base on the known connectome of the nematode *C. elegans*. It consists of a total of 302 neurons with all connections mapped out. Our analysis for optimized prediction incorporates the adjustment of a variety of control parameters including the reservoir size, the probability of forming edges, the number of edges in each node, and the regularization constant. The reservoir performance for different topologies is quantified using training and predictive error analysis.

## **MATHEMATICAL MODELING OF C. ELEGANS' THERMOTAXIS ASSOCIATED WITH CALCIUM DYNAMICS**

Group Leader: Retter, Julia  
Undergraduate, Physics

Group Members: Dylan Chambers, Undergraduate, Physics; Lylia Gomez, Undergraduate, Physics

Mentor: Prof. Epaminondas Rosa

Co-Mentor: Prof. Rosangela Follmann, Information Technology

In this work we present results of numerical computer simulations about the dynamical mechanisms underlying thermoreception in the nematode *C. elegans*. The mathematical equations we use contain Arrhenius temperature factors accounting for the thermotaxis of the animal seeking environments with temperatures more amenable to their survival. Our mathematical model mimics the behavior of the amphid finger-like ciliated (AFD) neurons and replicate, with a good level of accuracy, data output from equivalent experimental settings. These include the AFD's calcium dynamics response when exposed to linearly ramping as well as oscillatory temperature stimuli. Typical behavioral time scales encountered in our mathematical model are consistent with experimental peak times for calcium responses during pulse-like temperature inputs.

## POLITICS AND GOVERNMENT

### **ONE HOMELESS HERO IS TOO MANY: HOPELESS TO HOMELESS TO HIRED TO HOUSING. ELIMINATING HOUSING INSECURITY BY GETTING THE RIGHT JOB AND THE RIGHT JOB TRAINING TO THE RIGHT VETERAN**

Presenter: Walsh, Jeffrey  
Graduate, Politics and Government

Mentor: Prof. Carl Palmer

Co-Mentor: Prof. Kevin Kline, Military Science

On any given day, in the land of the free and the home of the brave and in the world's richest country, 1 in 4 Americans who experience chronic homelessness and housing insecurities are Veterans. Unfortunately, government initiatives from previous administrations have not directly addressed the root causes of veteran homelessness and veteran unemployment, merely throwing money at the problem. However, homelessness in the veteran population is preventable. America's heroes return from combat zones from all corners of the globe trained as tankers, infantrymen, and artillerymen only to find no equivalent job in the civilian labor market leading directly to unemployment and housing insecurity.

With the proper active-duty job/career training and their wealth of knowledge and experience, America's veterans can significantly contribute to the American GDP and workforce. If we can use their skills appropriately in the 21st Century civilian workplace, we would likely see a significant reduction in veteran homelessness. Skillbridge is one program designed to address military skillset insecurities. The Department of Defense program Skillbridge is a military employment initiative started in 2014 open to all military branches that provides 180 internships in a variety of civilian job fields. The soldier, sailor, Airman, Marine or Coast Guard personnel is allowed to participate in this program just before they separate from the service at discretion of their respective unit commanders. I will explore both the qualitative and quantitative aspects of Skillbridge to ascertain how well the program is working overall in helping eliminate job insecurity.

In this study, I examine how the types of transferrable job skills post 9-11 veterans received during training affect their housing insecurity and homelessness once they return stateside. For my research methods, I have chosen a multi-method approach. My dependent variables are veterans' housing insecurity and homelessness. My independent variable is transferrable military job skills. My control variables are Army combat arms veterans, PTSD, income, education, gender, and age. I use surveys and the quantitative method to test my hypothesis. I use deductive reasoning and specific research questions to learn about military job training and military jobs held by post 9-11 soldiers who rank E-1 to E-4 while on active duty. Finally, I rely on qualitative interviews of officials at the Department of Veterans Affairs regarding any trends, patterns, and insights regarding veteran job insecurity and veteran housing insecurity. All of America's displaced veterans deserve the opportunity to go from hopeless to homeless to hired to housing.



## PSYCHOLOGY

### **AWE AND POSITIVE AFFECT: THE ROLE OF SELF-TRANSCENDENCE AND SELF-FOCUSED ATTENTION**

Presenter: Chall, Autumn  
Graduate, Psychology

Mentor: Prof. Jef Kahn

Authorship: Autumn Chall, Jef Kahn

#### Problem or Major Purpose

The experience of awe, such as seeing a sunset from atop a mountain, is associated with positive emotion (Anderson et al., 2018; Nelson-Coffey et al., 2019). Yet the mechanisms through which awe leads to positive emotion are poorly understood. One way to induce awe is through writing about a prior awe-inducing experience (Bai et al., 2017). The purpose of this study was to use a brief writing task to (a) confirm the relationship between writing-induced awe and positive affect and (b) investigate two theory-based mediators of that relationship—a reduction in self-focused attention and greater self-transcendence (e.g., Jiang & Sedikides, 2021).

#### Procedure

College students (N = 241) completed this study online. This between-subjects design had participants complete a measure of positive affect (Watson et al., 1988) and then write (in a text box) about either a personal experience of awe or a neutral experience (i.e., something typical that they did fairly recently). Following this, participants filled out questionnaires assessing post-writing positive affect, subjective feeling of awe (Bai et al., 2017), self-focused attention (Woody, 1996), and self-transcendence (Jiang et al., 2018).

#### Results

The manipulation check indicated that participants instructed to write about awe reported significantly higher subjective feelings of awe than the control condition,  $t(238) = 7.27$ ,  $p < .001$ . Additionally, after controlling for pre-writing positive affect, participants in the awe condition reported higher post-writing positive affect than those in the control condition,  $\Delta R^2 = .01$ ,  $F(1, 238) = 4.00$ ,  $p = .047$ . The relationship between writing condition and post-writing positive affect was not mediated by self-transcendence, indirect effect = .18 (95% C.I. =  $-.06, .49$ ), nor self-focused attention, indirect effect =  $-.02$  (95% C.I. =  $-.16, .06$ ). As Figure 1 illustrates, however, self-transcendence was positively related to post-writing positive affect.

#### Conclusions and Implications

This study provided additional evidence that writing about awe experiences has the potential to induce awe and increase momentary positive affect (see Bai et al., 2017). We did not find evidence that the relationship between awe and positive affect is mediated by self-focused

attention and self-transcendent experiences, however; thus, the mechanism of awe's effect on emotion remains elusive. One implication of this research is increased support of the effectiveness of writing about awe experiences as a method of inducing awe and positive affect. Future research may address the potential of writing about awe in a therapeutic context.

## CAN VIDEO COMPARISON FACILITATE CHILDREN'S STEM LEARNING?

Group Leader: Colwell, Alexis  
Graduate, Psychology

Group Members: Dennis Gromov, Undergraduate, Psychology; Abby Wissler,  
Undergraduate, Psychology

Mentor: Prof. Alycia Hund

Authorship: Alexis Colwell, Dennis Gromov, Abby Wissler

Providing opportunities for STEM engagement throughout childhood is necessary to attract more individuals to STEM careers and meet the U.S. labor demand in STEM fields. The goal of the current study is to examine the effectiveness of a video comparison activity in teaching 6- and 7-year-old children an engineering principle: that a diagonal brace provides stability in structures. This study is a replication and extension of Hoyos and Gentner (2017), and it is completed entirely online. Children were randomly assigned to one of three groups: Comparison, Single Model, or No Training. The children in the Comparison group saw two metal towers in a training video. In the video, a researcher pushed on the towers to demonstrate that one is stable (diagonal brace tower), and one is unstable (horizontal crosspiece tower). Children in the Single Model group saw a video of the one stable tower. Children in the Comparison and Single Model groups were asked to explain why the diagonally braced tower is strong. Children assigned to the No Training group did not see any training videos nor were they asked to explain them. All three groups completed (a) a Relational Reasoning task, (b) a transfer task, and (c) a Mental Transformation task. The Relational Reasoning and Mental Transformation tasks assessed children's spatial skills, and the transfer task assessed whether children could apply the diagonal bracing principle demonstrated in the training videos in a different situation. Parents provided details about children's science, technology, engineering, and mathematics (STEM) interest and spatial language to examine the relation of these constructs with performance on the three child tasks. We expected that children in the Comparison group would produce more brace-based (referencing the diagonal brace) explanations than children in the Single Model group after watching the training videos. On the transfer task, we predicted that children in the Comparison group would perform better than both the Single Model and No Training groups. We expected children's performance on all three tasks to be positively correlated with STEM interest and spatial language. The expected findings would highlight the importance of early STEM exposure by demonstrating associations between children's STEM interest and spatial language use and their performance on the spatial tasks. The results would also provide support for including opportunities for comparison and explanation in online learning activities.

## **EFFECTS OF ATTENTION AND DELAY ON FALSE MEMORIES FOR STEREOTYPES**

Group Leader:     Corea-Dubon, Maria  
                          Graduate, Psychology

Group Member:    Taylor Humphrey, Undergraduate, Psychology

Mentor:            Prof. Dawn McBride

Authorship:        Maria Corea-Dubon, Taylor Humphrey

Previous research has shown that memories get distorted when people are presented with stereotype-consistent information (Macrae et. al, 2002). The purpose of this study was to examine the effect of stereotype exposure on the generation of false memories for Latino and White individuals. In this experiment, a total of 40 faces (half Latino and half White) were paired with one of two job titles: "Construction Worker" or "Software Developer", which represented stereotype-consistent or stereotype-inconsistent pairings for each race. Participants were instructed to study the faces and job pairings for a later recognition test. Participants were randomly assigned to one of two attention conditions. In the undivided attention condition, they were exposed to the pairings with no distractors. In the divided attention condition, participants were exposed to the pairings while listening to an audiobook, and were asked to be attentive to both the stimuli on screen and the audio. In the recognition test, participants were presented with a mixture of studied and unstudied faces. They pressed "Old" if they remembered the face on screen and then indicated the occupation paired with the face. Participants pressed "New" if they did not remember the face on screen. To assess the effect of delay on memory performance, a second recognition test took place seven days later.

We expect a higher rate of false memories for the divided attention condition, because of reliance on stereotype-consistent information when cognitive resources are limited. However, after a delay of seven days, participants will produce higher rates of false memories, regardless of their attention condition, as a result of memory decay. The Fuzzy-Trace theory of memory offers insights on our findings, as gist-based memory processes could explain memory errors after exposure to stereotypes.

## **TRANSFER OF LEARNING IN PERCEPTION WITH HAPTIC SENSORY-SUBSTITUTION DEVICES**

Presenter: Duffrin, Tyler  
Graduate, Psychology

Mentor: Prof. Jeffrey B. Wagman

Authorship: Tyler Duffrin, Jeffrey B. Wagman

Studies have shown that perceiving a given property of a wielded object requires task-specific sensitivity to the patterns of mechanical stimulation that support perceiving that property. The same is true for perceiving properties of the environment by means of a wielded object. Recently, studies using the Enactive Torch—a novel sensory-substitution device—have shown that these mechanical stimulation patterns are invariant across medium (Favela et al., 2018; 2021). The current study used a transfer of recalibration paradigm to investigate the extent to which this is the case. We investigated transfer of recalibration to the invariant patterns of mechanical stimulation that support perceiving surface distance by means of a wooden rod and by means of an Enactive Torch. In a pre-test and post-test, participants used each of these modalities to explore an occluded surface and reported the perceived distance of that surface. In the practice session, we manipulated which modality participants used to perform this task and whether feedback about performance was provided. We found that transfer of recalibration occurred with feedback regardless of practice modality. The results will be discussed in the context of the invariant stimulation patterns that support perceiving and acting.

## **CAN I.D.E.A. MESSAGING BE TRUSTED? EVALUATION OF AN ACADEMIC INTERVENTION**

Presenter: Hicks, Travis  
Graduate, Psychology

Mentor: Prof. Jordan Arellanes

Authorship: Tavis Hicks, Jordan Arellanes, Eric Wesselmann

### Problem

The BDT framework of interpersonal trust (Rotenberg, 2010) conceptualizes and assesses trust as consisting of 3 bases (honesty, emotion, reliability). The 3 bases are defined accordingly: 1) honesty is defined as a person telling the truth and engaging in behaviors that are benign and genuine in intention as opposed to being malicious or manipulative; 2) emotional trust is defined as a person refraining from causing emotional harm, which can take the form of criticism, embarrassment, or breaking confidentiality; 3) reliability refers to a person fulfilling their word and promise. Limited research has utilized this model to analyze the trust relationships between minority university students and university faculty and administration.

### Procedure

From 2020-2022, twelve classes from a multidisciplinary project (N = 65) utilized a SoTL academic intervention focused on inclusion, diversity, equity, and action (IDEA). Focus groups were conducted in each class and BDT was utilized as a conceptual framework to guide the subsequent thematic analysis. Participants were asked questions related to the instructors/administrators' actions, the campus/community climate, and belongingness. Member checks were conducted to support the validity of the study.

### Results

Themes aligned closely with the three bases of trust in the BDT framework. 1) Honesty of IDEA intentions- - Initial recruiting messages focusing on IDEA were revered, but when actions did not match these messages, students interpreted them as performative and tokenistic rather than genuine actions of inclusion; especially when confronted with discrimination and prejudice. 2) Emotional associations with trust- Students expected IDEA classes to be community spaces for sharing their experiences about race and the university. When students felt this sense of community, they were more likely to disclose personal experiences. Unfortunately, not all students had such an experience, within the class or university. 3) Reliability of IDEA messaging- When students disclosed experiences of discrimination or prejudice, they expected faculty and administration to validate their experiences. When this occurred, trust improved. When responses left students feeling invalidated or unfulfilled, they shared that faculty and administration were unreliable. Overwhelmingly, sincerity and follow-through contributed to students' trust of faculty and administration.

## Conclusions

Limited research has applied the BDT framework directly to feelings of trust held by students toward university faculty and administration. We highlight how university faculty and administration can take steps toward fostering trust by demonstrating sincerity (honesty), being open and non-judgmental to students' disclosures (emotional trust) and acting in accordance with students' expectations of support (reliability).

## **IS COPING ENOUGH? EXAMINING COPING ON BURNOUT AMONG EDUCATORS**

Presenter: Jezowitz, Caitlyn  
Graduate, Psychology

Mentor: Prof. Adena Meyers

Authorship: Caitlyn Jezowitz, Adena Meyers

Coronavirus-19 added additional job demands for educators. Research has yet to examine teachers' perceptions of job characteristics in the context of undergoing years of the pandemic and how educators cope and experience workplace demands. This study explored the associations between the impact of COVID-19, job demands and resources, and coping with burnout symptoms and turnover intentions among teachers. The findings are informative for administrators and school districts to support educators during this time.



## **DOES UNIMANUAL HAND-PREFERENCE MEDIATE OR MODERATE THE RELATION BETWEEN ACQUISITION AND ROLE-DIFFERENTIATED BIMANUAL HAND-PREFERENCE?**

Group Leader: Kroehnke, Megan  
Undergraduate, Psychology

Group Member: Ashton Henry, Undergraduate, Psychology

Mentor: Prof. Julie Campbell

Authorship: Megan Kroehnke, Ashton Henry, Julie Campbell, George F. Michel

Hand preference in infancy has been proposed as a developmentally cascading factor which denotes earlier established behaviors having impact on later developed ones (Michel, 2021). Varying factors of hand-preference have shown this pattern from infancy to toddlerhood. Hand-preference for acquisition, for example, in infancy has been shown to impact the behavior of role-differentiated bimanual hand-preference (RDBM) later on in toddlerhood (Nelson et al., 2013). To explore this relation, unimanual hand-preference has been identified as a skill developing in between the aforementioned behaviors. Occurring consistently early in infancy, a hand-preference for this skill has also been observed (Campbell, 2015). Upon further research, a relationship has been discovered between the factors of unimanual hand-preference and acquisition during ages 6-14 months (Campbell et al., 2015). More research on the nature of the mechanism, driving this cascade, is needed. The purpose of this study is to explore further what is occurring between these factors by identifying if unimanual hand-preference mediates or moderates the relation between acquisition and role-differentiated bimanual hand-preference. Ninety infants were assessed (6-14 mo.) for acquisition, unimanual, and RDBM hand preference. Infants were presented with objects to manipulate while seated at a large table. Videos of the sessions were coded for the hand used when manipulating the objects. The next phase of this study will be to conduct a mediation and moderation analysis to determine whether unimanual hand preference mediates or moderate the relation between acquisition and RDBM hand preference. Data is currently all collected and initial data cleaning has been completed. Future results of this study will determine the role of infant unimanual hand preference in mediating or moderating the relationship between acquisition and RDBM hand preference during the toddler stage. Following the analysis and interpretation, results are anticipated to be completed in a couple of months. This study describes the cascade of hand preference for one skill in infancy into a hand preference for RDBM in toddlerhood. While interpretations are yet to be completed, the implications of this study will describe the mechanism that influences how unimanual hand preference cascades into lateralized hand preference for RDBM.

## **MEDIA REPRESENTATION (AND LACK OF) AS SOCIAL INCLUSION AND EXCLUSION**

Group Leader:	Lim, Zhi Quan Graduate, Psychology
Group Member:	Travis Hicks, Graduate, Psychology
Mentor:	Prof. Eric D. Wesselmann
Co-Mentor:	Prof. Jordan A. Arellanes
Authorship:	Zhi Quan Lim, Eric D. Wesselmann, Jordan A. Arellanes, Travis Hicks

There have been increased discussions about the importance of having diverse representation in media (e.g., Film and TV shows). Media research predominantly focuses on the effects of positive versus negative depictions of individuals from different identity groups. The prevailing assumption is that a lack of representation is worse than negative representation, yet this is not conclusive. This assertion converges with research on interpersonal social exclusion, which demonstrates that negative attention, feeling invisible, or unworthy of attention is harmful. We hypothesize that media representation can be experienced similarly to interpersonal forms of social inclusion, and a lack of representation can be experienced similarly to social exclusion/ostracism.

We conducted two online experiments. In both studies, participants first listed an identity category important to their self-concept. Then, participants engaged in an adapted autobiographical recall paradigm. In Study 1, participants were randomly assigned to one of three groups. Group one recalled a time when someone who shared their identity category was represented in media (type of representation purposefully left ambiguous). Group two recalled a time in which a someone who shared their identity category was noticeably absent in media. Group three served as the control condition, writing about an unrelated event. In Study 2, participants were randomly assigned either to the control condition, the absence condition, or to an interpersonal exclusion condition (i.e., someone purposefully excluded you from an event because of your social group). Participants in both studies completed measures of perceived social value, feelings of being ignored/excluded, and basic psychological need satisfaction (e.g., self-esteem).

In Study 1, participants recalled feeling higher perceived value when they saw their identity group represented than the control or absence condition; there was no difference between the absence condition and control. Participants recalled feeling more ignored/excluded and lower basic need satisfaction when their identity group was absent than both the control and representation conditions. Results for Study 2 were mixed. Participants in the exclusion condition felt the most ignored/excluded, followed by participants in the absence condition and then finally the control condition. Participants in the exclusion condition recalled feeling higher value than the absence group, and descriptively (though not significantly) less than the control condition. Participants in the exclusion condition felt less basic need satisfaction when excluded than both the absence and control conditions. There was no difference between the control and absence condition on basic need satisfaction, contrary to Study 1.

## **GUIDED EXAMINATION REVIEWS IN HIGHER EDUCATION: A LOOK AT KAHOOT! AND JEOPARDY**

Presenter: Lomelino, Tori  
Undergraduate, Psychology

Mentor: Prof. Dawn McBride

Authorship: Tori Lomelino

The current study investigates the effectiveness of and perceptions surrounding two common online educational platforms used for examination review sessions in higher education: Kahoot! and Jeopardy. All participants are currently taking a psychology research methods course and will be invited to review sessions before their upcoming exams. The review session for their first exam will be demonstrated using Kahoot! and participants will answer multiple-choice questions related to the material on their first exam independently, like a practice test. The review session for their second exam will be demonstrated using Jeopardy and participants will work in teams to answer questions related to the material on their second exam quickly and correctly, like a trivia game. Participants will answer questions on a survey using a Likert scale regarding their perceptions of the two review sessions (i.e., confidence, feeling prepared, helpfulness). Participants' exam scores will be collected and analyzed to determine the effectiveness of the review sessions. Based on previous findings, it is predicted that students who attend the review sessions will perform better on the exam than students who do not. It is also predicted that students will prefer the Kahoot! review over the Jeopardy review but students are expected to score similarly on the exams after both review sessions.

Keywords: examination reviews, online platforms, educational games

## **OUT-OF-HOME PLACEMENTS, SUBSTANCE USE, AND PARENTAL INCARCERATION. WHAT IT MEANS FOR JUVENILES SUCCESSFULLY COMPLETING PROBATION**

Presenter: Mahoney, Megan  
Undergraduate, Psychology

Mentor: Prof. Adena Meyers

Authorship: Megan Mahoney, Farhia Osman, Kalysa Pampuch, Blake Tennent, Adena Meyers

The purpose of this study is to examine the probability of juvenile offenders successfully completing probation based on out-of-home placements, substance use, and parental incarceration. Minors who grow up in dysfunctional households are more likely to repeat the dysfunctional family patterns when they become adults (Gomis-Pomares et al., 2021). This study is based on an ongoing project involving coding and analyzing probation and court records from the juvenile justice system that derived out of a rural county in Illinois. Variables from these records will be used to analyze the primary research question.

## **ASSESSING EDUCATOR NEEDS TO PROMOTE WELL-BEING**

Presenter: McKinley, Jessica  
Graduate, Psychology

Mentor: Prof. Adena Meyers

Authorship: Jessica McKinley, Adena Meyers, Caitlyn Jezowitz, Derek Goebel, Katie Rokusek, Megan Kroehnke

Educator stress and well-being have become increasingly important areas of research as educator attrition and shortages have affected schools throughout the United States and across the world. The onset of the COVID-19 pandemic added new stressors and exacerbated existing challenges. The purpose of the current study was to hear directly from educators to learn more about their experiences with stress, the challenges they face in education today, and the ways in which their well-being can be improved. This grounded theory qualitative study included three focus groups and two individual interviews with educators in a Midwestern elementary school district. Using the constant comparative method of analysis, three challenges and three recommendations for improvement were generated with the overarching theme focused on the need to promote an autonomy-supportive climate for educators in order to improve well-being.

Keywords: educator stress, well-being, grounded theory, autonomy support

## ORTHOREXIA NERVOSA: THE ROLES OF ATTACHMENT AND PSYCHOLOGICAL NEEDS

Group Leader: McLarty, Allie  
Undergraduate, Psychology

Group Member: Estrella Gomez Hernandez, Graduate, Psychology

Mentor: Prof. Suejung Han

Authorship: Allie McLarty, Estrella Gomez Hernandez, Suejung Han

**Problem:** Orthorexia Nervosa (ON) is defined as an excessive obsession with only eating foods that are deemed healthy (Barrada & Roncero, 2018). Despite recent scholarly efforts, it still remains unclear whether ON may constitute a clinical disturbance and is a separate eating disorder entity distinctive of other eating disorders (e.g., anorexia nervosa). Recent studies have shown that some general psychological risk factors for eating disorders (i.e., anorexia nervosa, bulimia nervosa, binge eating disorder) are also associated with ON, including perfectionism, obsessive-compulsive symptoms, and negative affect (Barrada and Roncero, 2018). Other risk factors for eating disorders, specifically, emotional regulation difficulties, psychological need thwart, and attachment insecurity have yet to be examined in relation to ON. Significant and yet differential association patterns between these factors and ON may clarify the construct validity of ON as a distinctive eating disturbance. It is reasonable to speculate that ON may be a suppressive effort for difficult emotions and compensatory efforts for thwarted psychological needs, similar to restricted eating in anorexia nervosa. However, given more extreme control over not only how much but also ‘what you can eat’ of ON, ON may be more strongly associated with attachment avoidance (i.e., more suppressive controlling effort) than attachment anxiety, unlike restricted eating that is associated with both attachment insecurities (Han & Kahn, 2017). We hypothesized that ON would be associated positively with emotion regulation difficulties, psychological need thwart, and attachment avoidance (vs. anxiety).

**Procedure:** Female-identified college students (N=191, data collection in progress, mean age=19.3, 82% White) in a U.S. Midwestern university participated in an online survey for research participation credits. The survey included the Experiences in Close Relationship-Short Form (Wei et al., 2005), the Difficulties in Emotion Regulation-short form (Kaufman et al., 2015), the Psychological Needs Thwart Scale (Bartholomew et al., 2011), and the Teruel Orthorexia Scale (Barrada & Roncero, 2018).

**Results:** A multiple regression analysis result supported the hypothesis partially,  $R = .46$ ,  $R^2 = .21$ ,  $F(4, 176) = 11.57$ ,  $p < .001$ . As predicted, thwarted psychological needs ( $\beta = .29$ ,  $p < .001$ ) and attachment avoidance ( $\beta = .15$ ,  $p = .05$ ) predicted ON significantly. Attachment anxiety ( $\beta = -.05$ ,  $p = .50$ ) or emotion regulation difficulties ( $\beta = .29$ ,  $p = .09$ ) did not.

**Implications:** ON may serve as distress avoidance/suppression (i.e., attachment avoidance) and compensation for thwarted psychological needs. ON may be an eating disturbance that is distinctive from anorexic restricted eating.

## **LONGITUDINAL ASSOCIATIONS BETWEEN FAMILY SUPPORT AND ADOLESCENTS' SELF-PERCEPTION**

Group Leader: Meister, Rachel  
Undergraduate, Psychology

Group Members: Will Dettmann, Graduate, Psychology; Andie Baker, Graduate, Psychology

Mentor: Prof. Laura Finan

Authorship: Rachel Meister, Andie Baker, Will Dettmann, Laura J. Finan, Christine M Ohannessian

**Purpose:** Adolescents are tasked with figuring out their identity and integrating their sense of self (Dunkel, 2017). Given their salience as developmental contexts, families may play a crucial role in this process. Positive family interactions are associated with a range of developmental and adjustment outcomes, including adolescents' emotional well-being (Xiang, et. al, 2020) and lower externalizing behaviors (Ryan et al., 2010). It is not surprising then that research also indicates that family functioning, cohesion, and support may bolster adolescents' self-concept and clarity (Johnson, Galambos, Krahn, 2021). However, extant examinations of adolescent's self-perceptions are narrow in focus as they do not examine the ways family relationship factors are associated with the diverse range of self-perception domains and are generally limited to cross-sectional samples. Therefore, we examined how family support is associated with how adolescents see themselves across domains, over time.

**Method:** Data were drawn from the Predictors of Anxiety and Depression During Adolescence (PANDA) Project (Ohannessian & Vannucci, 2018), which surveyed adolescents from five Northeastern State middle schools every six months starting fall 2016 (Mage=12.75; SD=.71; 51% female). Data from the current study were drawn from the Spring 2019 (T1) and Fall 2020 (T2) waves, when participants were in middle adolescence. The Self-Perception Profile for Adolescents (Wichstrom, 1995) was used to assess adolescents' self-perception across the following domains: academic, social acceptance, athletic, physical appearance, behavioral conduct, close friendship, global self-worth, and body image dissatisfaction. The Multidimensional Scale of Perceived Social Support (Zimet et al., 1990) scale was used to assess support from families ( $\alpha=.91$ ).

**Results:** Separate linear regression analyses were used to examine longitudinal associations between family support (T1) and each self-perception domain (T2), controlling for previous wave self-perception domain, age, and gender (T1). Family support was positively associated with academic ( $b=.07, p<.01$ ), social acceptance ( $b=.05, p<.01$ ), athletic ( $b=.06, p<.01$ ), behavioral conduct ( $b=.04, p<.05$ ), and close friendship ( $b=.10, p<.001$ ) self-perception domains. However, family support was only marginally associated with body image dissatisfaction ( $b=-.04, p<.06$ ) and physical appearance ( $b=.04, p=.06$ ), and not associated with global self-worth ( $b=.03, p=.18$ ). **Discussion:** These findings highlight the importance of positive family interactions on adolescents' development of their view of self across diverse self-perception domains. Given that self-perception is an important correlate of adolescent adjustment outcome (e.g., depressive symptoms; AlGhamdi et al., 2011), our findings may aid programs aimed at supporting adolescents' self-exploration by working with families to positively impact their well-being.

## CREATING SAFE SPACES: A COMMUNITY-BASED ART MURAL PROJECT

Group Leader: Meister, Rachel  
Undergraduate, Psychology

Group Member: Michaela Hayes, Graduate, Psychology

Mentor: Prof. Laura J. Finan

Authorship: Rachel Meister, Michaela Hayes, Laura J. Finan

Research suggests youths' active engagement in the arts is associated with positive outcomes ranging from enhanced communication skills and opportunities to self-confidence and self-esteem (French, 2018; Gussak & Ploumis-Devick, 2004; Hughes et al., 2005; Phillips, 2012; National Endowment for the Arts, 2020). Some research even suggests that the benefits of engagement with arts during adolescence extend into adulthood (e.g., problem solving; Phillips, 2012). However, outside of some research on older adults (Cohen et al., 2007) there is a dearth of research examining how community youth group-based mural art contributes to social and adjustment outcomes. Therefore, we investigated how participation in a community-based mural art program was associated with how youths think about their future and their impact on the community.

In July 2022, a two-week community-based art mural project was conducted. The project aimed to provide a platform for young artists to reflect on "Creating Safe Spaces" in a small mid-western town. Young artists (N=41) recruited from local schools, community centers, and nonprofits joined police officers and community members in creating a public mural (entitled "Journey of Hope"). Participants worked on the mural for 3-4 hours daily and participated in daily activities and discussions. Quantitative data were collected via pre- and post-mural surveys. Only 26 youth attended the mural project and assented to participate in the research, but two were excluded due to age and consent issues (N = 24 for the pre-test, N = 17 for the post-test). The participants (Mage=12.96, SD=1.43; 54.2% female; 33.3% multi-racial/-ethnic) completed both pre- and post-test surveys which assessed demographic information, their levels of hope (Synder, 1997) and their civic efficacy (Syvertsen, 2015).

Mean values were computed for scales and paired samples t-tests were conducted to examine differences in study variables from before and after participating in the mural. Hope scores were not significantly different from before (M=23.53, SD=5.96) to after (M=23.65, SD=6.43) the mural,  $t(16)=.09$ ,  $p=.93$ . Similarly, civic efficacy scores were not significantly different from before (M=3.61, SD=.47) to after (M=3.12, SD=.25) the mural,  $t(16)=1.87$ ,  $p=.08$ .

We did not find statically significant evidence that engagement in a community group-based mural art program was associated with differences in youths hope for the future or civic efficacy. However, given the small sample size, it may be that the current study was underpowered to observe such effects. Future research is needed to understand the ways in which engagement in these types of programs impact young people.



## **CHOSEN STEPPING-STONE CONFIGURATIONS DEPEND ON TASK CONSTRAINTS**

Presenter: Orthy, Maisha Tahsin  
Graduate, Psychology

Mentor: Prof. Jeffrey B. Wagman

Authorship: Maisha Tahsin Orthy, Jeffrey B. Wagman

Previous research investigating how people choose to arrange stepping stones in a play area has shown that people create non-symmetric patterns that differ from those typically found in playgrounds. In this study, we investigated how people choose to arrange stepping stones when creating a path from one place to another and how these choices between different conditions. Participants used small circular rubber mats to create a walking path to cross a 600 cm space as carefully as possible, as comfortably as possible, and as quickly as possible. After making each path, participants walked on and adjusted the mats if necessary. The result showed that participants used fewer mats, placed them farther apart, and created greater challenge (distance of mats in relations to stepping distance) when crossing the space quickly than in the other two conditions. These results will be discussed in relation to perceiving and creating affordances.

## MESOSYSTEMIC INFLUENCES ON JUVENILE JUSTICE OUTCOMES

Presenter: Osman, Farhia  
Graduate, Psychology

Mentor: Prof. Adena Myers

Authorship: Farhia Osman, Megan Mahoney, Eric Marchand, Kalysa Pampuch, Blake Tennent, Adena Meyers

According to ecological theory research, the microsystem is the direct relationships and immediate surroundings of an individual (e.g., family, school). And the mesosystem is the interactions between the various microsystems of an individual (Newman and Newman, 2020). Applying ecological theory to the juvenile justice system, the interactions between the family, the school system, the court and probation system, etc. are all part of the youth offender's mesosystemic influences. Research and professionals involved within the juvenile justice system universally acknowledge that family and parental involvement is a protective factor for youth offenders (Burke, et al., 2014; Mallett, 2010; Schwalbe, 2012). Probation officers describe positive parental support as a partnership in care for the child, and emphasize uncooperative parents undermine youth participation and success in final outcome (Schwalbe, 2012). However, there is a lack of clarity upon how to quantify and measure family engagement (Schwalbe, 2012). This research operationalizes family engagement through the frequency of contact between the family and juvenile justice professionals. And it will utilize this definition to explore the relationship between family involvement and probation outcomes, and thus, mesosystemic influences upon the youth offender's final disposition.

This research utilizes archival data records of low-risk juvenile offenders from a rural, Midwestern county. The researchers were granted access of court and probation records from the years 2010 to 2015 as part of a larger initiative, and systematically reviewed and coded the information for analysis. The variables of interest were the frequency of contact (i.e., total contacts, family-initiated contacts, and professional-initiated contacts) and the final probation outcome. The researcher also will control for length of time within the system.

A chi-square test of analysis was conducted on a smaller sample of 44 participants to determine the relationship between frequency of contact and the final probation outcome. However, the researcher plans to analyze a larger number of participants using regression models to determine if the number of contacts predicts the outcome. It is hypothesized that frequency of family-initiated contact will significantly predict an outcome of successfully discharged or dismissed.

The results of this study will add to the literature by providing an operationalization of family engagement within the juvenile justice system. It also highlights the communication between the probation system and family through the language of ecological theory, and the mesosystemic influences of the youth offender upon their probation outcome.

## **DIFFERENCES IN EXPOSURE TO RACIAL MICROAGGRESSIONS FOR BLACK PWI AND HBCU COLLEGE STUDENTS**

Presenter: Peterson, Kierra  
Graduate, Psychology

Mentor: Prof. Brea Banks

Authorship: Kierra Peterson, Brea Banks

The purpose of this proposed poster is to present the results of our research examining differences in exposure to racial microaggressions among Black college students enrolled at Predominantly White Institutions (PWI) and those enrolled at Historically Black College and Universities (HBCUs). Microaggression are brief and commonplace daily verbal, behavioral, or environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults toward people of color (Sue et al., 2007). Research suggests that racial microaggressions cause considerable psychological distress among Black Americans and are manifested in nearly all interracial encounters (Sue et al., 2008). Using a quantitative methodology, we are surveying Black students currently enrolled at PWIs and HBCUs. The survey specifically includes items to assess demographic variables (i.e., race, age, sex, year in school), frequency of exposure to microaggressions, and racial centrality. We hypothesize that the prevalence of racial microaggressions experienced by Black PWI students will be higher than those experienced by Black HBCU students, given that PWIs have more white individuals on their campuses who may be more likely to engage in microaggressive behavior. We are also exploring how participants' report of racial centrality impacts their report of exposure to racial microaggressions. Some research suggests that higher reports of centrality are related to greater endorsement of discrimination, but no studies have explored how this may differ for Black students at HBCUs as opposed to PWIs. We hope that the results of our study will provide insight into how students experience higher education, depending on the demographic and culture of their schools, which may help to promote safe and supportive school environments and initiate equitable practices for all students.

## THE DEVELOPMENT OF CARDINAL, ORDINAL, AND SPATIAL LANGUAGE IN YOUNG CHILDREN

- Group Leader: Powell, Autumn  
Undergraduate, Psychology
- Group Members: Mahika Charles, Undergraduate, Psychology; Alexis Colwell, Graduate, Psychology; Kaila Jones, Undergraduate, Psychology; Katie Kastar, Undergraduate, Psychology; Emily Monroe, Undergraduate, Psychology; Hope Mueller, Undergraduate, Psychology; Kimberly Perez, Undergraduate, Psychology; Caitlyn Weber, Undergraduate, Psychology; Abby Wissler, Undergraduate, Psychology; Seungok Yum, Graduate, Psychology
- Mentor: Prof. Alycia Hund
- Authorship: Mahika Charles, Alexis Colwell, Kaila Jones, Katie Kastar, Emily Monroe, Hope Mueller, Kimberly Perez, Autumn Powell, Caitlyn Weber, Abby Wissler, Seungok Yum

Language is an important aspect of child development. Cardinal number words such as one, two, and three emerge before ordinal number words such as first, second, and third, although both increase in early childhood (Colome & Noel, 2012). Similarly, spatial words such as front, middle, and back, improve from 3 years to 5 years and help with problem solving skills (Hund et al., 2017). A recent study compared ordinal and spatial language and found that 3- and 4-year-old children were significantly less successful at a search task using ordinal labels than using color labels, and their performance with spatial labels was intermediate (Hund et al., 2021). Our goal was to investigate the developmental trajectory of cardinal, ordinal, and spatial language comprehension and production from 3 to 5 years. Thus far, 158 3-, 4-, and 5-year-old children have been tested using cardinal (one, two, three), ordinal (first, third, fifth), and spatial (front, middle, back) labels, presented in a counterbalanced order. Children were randomly assigned to the Give Me or Tell Me condition. In the Give Me condition, children were asked to place the appropriate car(s) into a toy garage based on the label provided by the researcher to test language comprehension. In the Tell Me condition, children were asked to produce the correct label specified by the researcher. Analyses revealed significant developmental improvements from ages 3 to 4 years and 4 to 5 years. Children were significantly more accurate in the Give Me condition than the Tell Me condition, suggesting that comprehension outpaces production. Children were significantly more accurate on trials involving cardinal labels than trials with spatial labels, and significantly more accurate with spatial labels than ordinal labels. These findings provide important details about the development of relative language during early childhood, which has implications for academic success in mathematics and beyond.

## **EVALUATING THE GOLD STAR MISSION, PART 2: FOCUS GROUP RESULTS**

Presenter: Ryner, Lilly  
Graduate, Psychology

Mentor: Prof. Eros Desouza

Co-Mentor: Prof. Mark Swerdlik

Authorship: Lilly Ryner, Katie Little, Eros Desouza, Mark Swerdlik

This study was designed to be a part of a broader program evaluation of the Gold Star Mission (GSM). GSM is an organization founded to “honor and support Gold Star Families by preserving the memory of our Fallen Heroes through service to others in need”.

Focus groups were held with participants of the Gold Star 500 an annual endurance cycling event which honors service members who gave their lives while actively serving in the military and raises funds for college scholarships for their dependents. The focus groups were designed as a follow-up to the results of a previous online survey. Focus group questions were centered around an evaluation of the various GSM organizational goals and objectives; assessing the impact of GSM events on participants; and gathering information to plan for future activities to better support Gold Star Families and honor the fallen.

In the current study, researchers conducted two focus groups with a total of 19 participants, all were recruited from the cycling event. The six focus group questions included: (1) In what ways is the Gold Star Mission effective in increasing awareness of the significance of the phrase Gold Star Family? (2) How can Gold Star Mission better facilitate community support for its members? (3) How has your involvement in the Gold Star Mission event helped you be better emotionally, physically, and or spiritually? (4) What effects have the Gold Star Mission activities had on other people that you know? (5) In what ways has participating in Gold Star Mission events made you feel supported? and (6) Share a specific example of when you felt understood, accepted, or experienced camaraderie by participating in Gold Star Mission events. A qualitative analysis was conducted coding participant responses into main themes. The frequency of main themes ranged from 4 to 5 for each question. Themes included outreach to communities, grief and emotional support, and memorialization. Results suggested that the Gold Star Mission was reaching its goals and objectives and held events that were impactful on participants. Themes also centered around the need to reach more Gold Star Families; GSM could do more to involve younger people and focus group participants expressed a strong desire for GSM to sponsor more events.

## **ATTACHMENT STYLE AND STUDENT ACADEMIC SUCCESS**

Presenter: Shaw, Kyler  
Undergraduate, Psychology

Mentor: Prof. Dawn McBride

Authorship: Kyler Shaw

John Bowlby's theory of attachment has targeted the association between infant attachment and future social interactions (Bowlby, 1989). Further expansion of Bowlby's theory has led to predictions of social interactions in adulthood (Fleming, 2008). The present study focused on the relationship between attachment styles and the academic success of college students. It was hypothesized students who reported a secure attachment style had greater academic success compared to students who reported insecure attachment styles. Participants were presented a survey that illustrated descriptions of both secure and insecure attachment styles and asked to rate how likely they identified to them. Results showed securely attached students had higher academic performance compared to insecurely attached students.

## **AFFECT AND OUTCOME EXPECTATIONS AS DETERMINANTS OF ACADEMIC MAJOR SATISFACTION**

Presenter: Strain, Audrey  
Undergraduate, Psychology

Mentor: Prof. Margaret Nauta

Authorship: Margaret Nauta, Kathryn Skoog, Audrey Strain, Karolina Wierzbicka

**Problem or Purpose:** College students' satisfaction with their choice of major predicts their academic performance (McIlveen et al., 2013), persistence (Suhre et al., 2007), and well-being (Pesch et al., 2018). Uncovering major satisfaction's determinants would help with the early identification of students who are at risk for negative outcomes so if a change of majors is warranted, it occurs early enough for a timely graduation. Recent research (Lehman & Nauta, 2022) revealed affect experienced in classes predicts major satisfaction, and the association was strongest among first-year students. Consistent with the Social Cognitive Model of Career Self-Management (Lent & Brown, 2013), we hypothesized that students' beliefs about what will happen in the future if they earn a degree in their major (i.e., academic-major outcome expectations) also determine major satisfaction. We believed outcome expectations may be especially salient for advanced students, whose thoughts may be increasingly about post-college life.

**Procedure:** Students (N = 260; 87% female; 34% racial minority) completed an online survey consisting of the Positive and Negative Affect Scale (Watson et al., 1988) with instructions to respond with respect to how they felt in major-related classes, the Academic Major Satisfaction Scale (Nauta, 2007), and a new outcome expectations measure we developed based on a separate sample's (N = 25) responses to open-ended questions about what will happen in the future if they earn a degree in their major.

**Results:** A regression analysis confirmed outcome expectations are related to major satisfaction. Major satisfaction's bivariate associations with positive affect ( $r = .34$ ) and negative affect ( $r = -.35$ ) were both significant and aligned with Lehman and Nauta's (2022) findings, but the association between positive affect and major satisfaction was not significant when controlling for outcome expectations. Year in school moderated the association between positive outcome expectations and major satisfaction, but contrary to our expectation, the association weakened as year in school increased.

**Conclusions and Implications:** Outcome expectations hold promise as an avenue for identifying and intervening with students who are at risk for negative academic outcomes related to low major satisfaction, particularly early in college. The value of assessing both outcome expectations and affect is less clear, as there appears to be redundancy between outcome expectations and positive affect. There are still unanswered questions about the determinants of major satisfaction among more advanced students.

## **EDUCATIONAL EXCLUSION AND ACHIEVEMENT: WHAT THAT MEANS FOR JUVENILES IN THE JUSTICE SYSTEM**

Presenter: Tennent, Blake  
Undergraduate, Psychology

Mentor: Prof. Adena Meyers

Authorship: Blake Tennent, Megan Mahoney, Farhia Osman, Kalysa Pampuch, Adena Meyers

The aim of this study is to explore and describe the educational outcomes among juveniles within the justice system. This study relied on court and paper probation logs, rather than human participants. A judge in a rural Illinois county, who oversees the juvenile court, allowed us to examine cases of individuals under the age of 18 from 2010 to 2015. Throughout this study, we have worked to code and analyze records into specifically defined variables. The key variables examined in this study include in-school suspensions, out-of-school suspensions, expulsions, the beginning level of academic achievement, and the end level of academic achievement. Analyses will be conducted to explore the relations among these variables. The discussion will focus on how school exclusion shapes one's end level educational achievement within the juvenile justice system.



## **MICROAGGRESSION PERCEPTIONS AMONG BLACK WOMEN AND MEN**

Group Leader: Towner, Jazsmine  
Graduate, Psychology

Group Members: Jessica Akpan, Graduate, Psychology; Arielle Flint, Graduate, Psychology;  
Tyra Jackson, Graduate, Psychology; Farhia Osman, Graduate,  
Psychology; Brittany Bradley, Graduate, Psychology

Mentor: Prof. Brea Banks

Authorship: Brea Banks, Jazsmine Towner, Jessica Akpan, Arielle Flint, Tyra Jackson,  
Brittany Bradley, Farhia Osman

Racial microaggressions are verbal, behavioral, or environmental slights that often communicate hostile and derogatory messages towards People of Color (Sue et al., 2008). Whether intentional or unintentional, racial microaggressions often result in deleterious effects on one's physiological, psychological, and emotional functioning (Smith et al., 2007; Nadal et al., 2014; Keefe et al., 2014). Specifically, chronic exposure to microaggressions has been linked to the presentation of traumatic stress symptoms, reduced-self efficacy, increased headaches, and fatigue in Black individuals (Moody & Lewis, 2019; Smith et al., 2007; Helms et al., 2011). Examples of racial microaggressions as experienced by Black women and men include being perceived as less intelligent, the assumption of criminality, and the act of tokenism (i.e., the assumption that one Black person speaks for all) in predominately white spaces. Additionally, Black women are often perceived as being loud, angry, and hypersexual, while Black men, regardless of physical characteristics, are more likely to be perceived as larger and more threatening than their racial counterparts.

Currently, there exists limited research examining whether there are significant differences in the perceptions of microaggressions for Black women as compared to Black men. Conceivably, Black women may interpret microaggressions as more harmful given that their intersectionality of race and gender may make these transgressions more salient. Using an online survey, we are examining how Black participants' exposure to microaggressions, gender-blindness, color blindness, and acceptability of microaggressions are related and if there exist differences given gender. Data collection is underway and will be completed by the end of October. Upon completion of the survey, participants will be entered into a raffle to receive a gift card. This study may be especially relevant for the field of school psychology as Black professionals are often susceptible to microaggressions in the workplace.

## **REFLECTIONS OF MICROAGGRESSIONS IN HIGH-SCHOOL, SCHOOL ANXIETY, AND SCHOOL CLIMATE**

Presenter: Towner, Jazmine  
Graduate, Psychology

Mentor: Prof. Brea Banks

Authorship: Jazmine Towner, Brea Banks

We examined college students' reflections of racial microaggressions in high school and school anxiety and the role that perceptions of school climate play as a moderator of those reports. Microaggressions are everyday interpersonal slights that are enacted against people holding minoritized identities such as race, gender, sexuality, and religion (Sue et al., 2007). Our focus for the current study was racial microaggressions and particularly those that are experienced in high school. We were interested in exploring the impact of microaggressions on school-based anxiety, given the unique experiences of adolescents in high school. School climate refers to the thoughts and feelings an individual has about their school environment (Cohen et al., 2009). We hypothesized that 1) exposure to microaggressions would predict school anxiety, such that participants who reported more exposure to microaggressions would report higher school anxiety, and 2) the relation between exposure to microaggressions and school anxiety would be moderated by school climate, as the relation between exposure to microaggressions and school anxiety would be weaker for those endorsing positive perceptions of school climate. We recruited 113 college students (ages 15-72) who held racially minoritized identities and via a Qualtrics survey asked them to reflect on their high school experiences. Our hypothesis was partially supported, as exposure to microaggressions significantly predicted generalized anxiety but did not predict social anxiety. We did not find support for our hypotheses that school climate would moderate this relation.

## **PRECRASTINATION AS A FORM OF INTENTION OFFLOADING: A TEST OF THE CLEAR HYPOTHESIS**

Group Leader: Williams, Courtney  
Undergraduate, Psychology

Group Members: Cody Casteel, Undergraduate, Psychology; Connor Al-Ashkar,  
Undergraduate, Psychology

Mentor: Prof. Dawn McBride

Authorship: Ryan Liew, Connor Al-Ashkar, Cody Casteel, Courtney Williams

Cognitive offloading is defined as an act to reduce one's mental processing demands by taking a physical action (e.g., setting a reminder on your phone or writing a note to yourself). The present study looks at how precrastination is related to cognitive offloading. VonderHaar et al. (2019) defines precrastination as the tendency to complete a task early even at the expense of extra effort. Recent research has looked at the CLEAR hypothesis, which states that there is a strong drive to reduce one's cognitive load (VonderHaar et al., 2019). When presented with two tasks, a person tends to cognitively offload by completing the more cognitively demanding task first. Gilbert et al. (2020) found there to be a strong bias in participants' use of external cognitive tools as opposed to internal resources. In the current study, participants will be given a prospective memory task of hitting a specific key in the box moving task when a certain numbered box is due to be moved. We will consider their offloading choices in trials where they get to choose to offload or not (earning more points for remembering without the reminder). They will also do a standard box moving task in a different block of trials to measure their precrastination of the item generation task. Our hypothesis is that participants's precrastination rates should be related to their choices in the offloading task, which would support the CLEAR hypothesis.

## LONGITUDINAL ASSOCIATIONS BETWEEN PEER RELATIONSHIPS AND ADOLESCENT E-CIGARETTE USE

Presenter: Worden, Kara  
Undergraduate, Psychology

Mentor: Prof. Laura Finan

Authorship: Kara Worden, Ali Fay, Kenzie Wiegel, Laura Finan, Christine Ohannessian, Symphany Mitchell

**Purpose:** Given that one in five high school students and one in twenty middle school students currently use e-cigarettes (Wang et al., 2020), it is essential to understand the factors associated with use. One factor that may contribute to this health risk behavior is relationships with peers. Studies suggest that the presence of bullying victimization (negative experience/stimuli) could result in maladaptive coping patterns, such as substance use (Agnew, 1992; Peck et al., 2018). In contrast, research shows that peer social support results in lower rates of adverse adjustment outcomes, including substance abuse (Wills, 2020). However, how these peer factors contribute to e-cigarette use remains understudied. Therefore, we examined the relationships between peer victimization and support and adolescents' e-cigarette use.

**Method:** Data were drawn from the Predictors of Anxiety and Depression During Adolescence (PANDA) Project (Ohannessian & Vannucci, 2018), which surveyed adolescents from five Northeastern State middle schools every six months starting in the fall of 2016 (M<sub>age</sub>=12.75; SD=.71; 51% female). Data from the current study were drawn from the spring 2019 (T1) and fall 2020 (T2) waves, when participants were in middle adolescence. Participants reported whether they had ever “smoked electronic vaporizers or e-cigarettes,” to indicate lifetime use (0=no, 1=yes). The Revised Peer Experiences Questionnaire (Queirós & Vagos, 2016) was used to assess overt ( $\alpha=.86$ ) and relational ( $\alpha=.90$ ) peer aggression. The Multidimensional Scale of Perceived Social Support (Zimet et al., 1990) scale was used to assess peer support ( $\alpha=.93$ ).

**Results:** Separate logistic regression analyses were used to examine longitudinal associations between each peer experience indicator (T1) and later e-cigarette use (T2), controlling for previous wave e-cigarette use, age, and gender (T1). Results indicated that, above and beyond past e-cigarette use, overt (OR=1.50,  $p<.05$ ) but not relational ( $p=.28$ ) peer aggression was associated with a greater likelihood of e-cigarette use six months later. Conversely, support from peers was associated with a lower likelihood of e-cigarette use six months later (OR=.78,  $p<.05$ ).

**Discussion:** Findings indicated that greater support from peers is associated with a lower likelihood of e-cigarette use, whereas overt peer aggression is associated with a higher likelihood of e-cigarette use, six months later. Peer relations are central social forces in adolescents' lives and have been associated with a range of developmental and adjustment outcomes. Results from this study may be particularly impactful for informing programming designed to foster positive peer connections among adolescents to reduce health risk behaviors among young people.

## **ANXIETY DISORDERS IN ADOLESCENTS**

Presenter: Yang, Wan Ju  
Graduate, Psychology

Mentor: Prof. Caitlin Mercier

Authorship: Wan Ju Yang

Adolescents face risks for physical and mental challenges attributable to dramatic physical and psychological changes as well as the development of social relationships. Anxiety disorders are one of the most common mental illnesses in the world, and their age of onset is mostly during adolescence. Through an integrative review, I contribute to the understanding of anxiety disorders by physical, mental, and social risk factors as well as multicultural factors faced by adolescents that could have a distinct impact on them. I offer insights into challenges for research, clinical interventions, and care practice that address anxiety disorder for adolescents. To that end, I propose recommendations for clinicians, researchers, and educators to better work with adolescents with the knowledge of the unique challenges that they face.

## **EFFECTS OF DELAY ON FALSE MEMORIES FOR SEMANTIC AND PHONOLOGICAL LISTS**

Presenter: Yuksel, Ece  
Graduate, Psychology

Mentor: Prof. Dawn McBride

Short-term and long-term memory show different patterns of results based on varying aspects of stimuli. This study analyzes the change in false alarm patterns for phonologically-related lists and semantically-related lists in short-term memory and long-term memory found in past work in the lab. In past studies, lists words related by phonological aspects has produced more false memories than lists related by semantic (meaning) aspects when tested after a very short delay (less than 1 second); yet the reverse is found for longer delays between study and test (about 15-20 minutes). Thus, the research question in this study is when this major difference starts to happen and the two list types show similar levels of false alarms between short- and long-term memory. To answer this question, we are using a modified Deese-Roediger-McDermott (DRM) procedure (Roediger & McDermott, 1995) to test the memory of participants for multiple study-test delays (750 ms, 30 ms, 90 s, 3 min). Comparing the patterns of false alarms across delay times will give us some support for where the major change between these two memories occurs. Our hypothesis is that we expect to see a change in false alarm patterns starting at about 90 seconds with a full reversal of the pattern at 3 minutes. This result will support previous suggestions that long-term memory plays a significant role in retrieval after this time delay

## COLLEGE STUDENT DRINKING: THE ROLE OF AFFECT AND PLANS

Group Leader: Yum, Seungok  
Graduate, Psychology

Group Member: Michelle Duong, Graduate, Psychology

Mentor: Prof. Laura Finan

Authorship: Laura Finan, Seungok Yum, Michelle Duong

Risky alcohol use among US college students is a known public health problem (SAMSHA, 2020). Motivational models suggest emotions play an important role in why individuals use alcohol (Cooper et al., 1995; Cox & Klinger, 1988). Although some research suggests negative moods are related to more drinking and drinking-to-cope among college students (O'Hara et al., 2013), a recent meta-analysis found that people are more likely to drink heavily on days they were high in positive mood (Dora et al., 2022). Furthermore, college students in positive moods were less likely to drink without a plan (Fairlie et al., 2019), and planned drinking has been shown to be driven by diverse contextual characteristics (Stevens et al., 2022). Although extant studies suggest affect and drinking plans can play a role college students' alcohol use, less is known how these two factors work together to influence this health risk behavior. Therefore, we investigated interactive effects of diverse affective states and drinking plans on college students' alcohol use at the daily level.

A daily diary survey was used to collect 945 assessments from undergraduate students (N=113; Mage=20.16; SD=1.38; 79% female; 79% White) from a large Midwestern university. After a baseline survey, students completed daily surveys for 10 days between 6:00-11:59pm. Each day participants reported on their affect, substance use behaviors, and substance use plans. The 10-item short-form of the Positive and Negative Affect Schedule (Mackinnon et al., 1999) was used to assess affect. Participants reported the quantity and frequency of alcohol they drank the night before and how much they planned to drink that night. Analyses controlled for age and gender.

Findings from multilevel logistic regression models indicated planning to use alcohol was associated greater likelihood of actual alcohol use on a given day (OR=14.12,  $p<.000$ ). Students were more likely to plan to use alcohol and were actually more likely to use on days when they were more excited (OR=1.31,  $p<.001$ ; OR=1.24,  $p<.05$ ) and enthusiastic (OR=1.28,  $p<.001$ ; OR=1.20,  $p<.05$ ), and less likely to plan to and actually use on days when more distressed (OR=.79,  $p<.01$ ; OR=.81,  $p<.05$ ). Notably, on days when students planned to use alcohol and were feeling more excited, they were more likely to use alcohol (OR=1.64,  $p<.01$ ). Results from this study may be used to inform prevention efforts aimed at reducing the burden of disease stemming from college alcohol use by addressing the unique and additive roles of cognitive and emotional factors.

## SOCIAL WORK

### CHS PEER SUPPORT GROUP EVALUATION

Presenter: Bosley, Brittany  
Graduate, Social Work

Mentor: Prof. Christopher Gjesfeld

Authorship: Brittany Bosley, Christopher Gjesfeld

The McLean County Center for Human Services (CHS) runs a Recovery program for individuals who have severe and persistent mental health disorders. The program offers peer support groups to give these individuals the opportunity for prosocial interaction and to build social or coping skills. Studies have found that more than half of people with severe mental illness are lonely. Loneliness can impair the ability to make and keep friends, participate in social activities, and create barriers with the communities (Perese & Wolf, 2005). The COVID-19 pandemic left many people feeling alone and socially isolated. Due to the pandemic, CHS had to move group meetings to Zoom and was not open for "drop-in" visits. Following the availability of vaccines in 2021, CHS has reopened for drop-in visits and in-person group sessions, however the staff has noticed participation in group sessions and "drop-in" visits remains lower than in pre-pandemic times.

We designed the current project to be an evaluative survey provided to clients of the CHS currently in the recovery program. Our primary goal was to find what these clients perceive as barriers to attending in the peer support groups offered by the CHS. Our survey also asked clients to describe the benefits of these groups and the ones they enjoyed most. At the end of the survey, the participants were given the opportunity to speak their minds about what improvements to the peer support groups they would like to see.

Results will be forthcoming in March 2023. The results of this project will be used to consider changes in the way services CHS implements and runs their peer support groups. Our goal is to provide these clients with more positive social opportunities by adapting existing groups or creating new ones that meet their specific needs.

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## **MODERATING AFFECT OF RELATIONSHIPS ON BURNOUT AMONG MENTAL HEALTH PROFESSIONALS**

Presenter:           Brower, Sara  
                          Graduate, Social Work

Mentor:             Prof. Christopher Gjesfjeld

Authorship:         Sara Bower, Christopher Gjesfjeld

Burnout rates among mental health providers in recent years have been notably high indicating a concerning trend in the field. For the purpose of this work, burnout is best defined by the World Health Organization (2019) as a syndrome that results from excessive and chronic workplace stress that has not been managed successfully. There are a number of factors that have been found to contribute to burnout among clinicians some of which are workload, relationships with leadership and co-workers, and personal factors such as empathy. Research regarding possible interventions has been undertaken, however many of these interventions have been ineffective. Interventions at the organization level tend to be less effective than those targeted at the personal level, often because burnout has already occurred by the time organizational interventions are implemented. However, there is some evidence that interventions aimed at social cohesion within the workplace can reduce burnout because it helps to foster relationships between individuals thus ameliorating some work stress that leads to burnout (Eliacin et al., 2018). My hypothesis is that positive office culture and social relationships within the organization are associated with less burnout. This leads to the research question, do social supports and office culture impact the rate of burnout in mental health professionals?

A quantitative study will be undertaken that includes both a modified version of the MOS- social support survey (Sherbourne & Stewart, 1991) and a modified version of Maslach's burnout inventory (Maslach et al., 2016). Demographic information regarding age, gender, ethnicity, and years practicing will be collected. Survey data will be coded and analyzed using the Chi-square test. Data from Maslach's burnout inventory (Maslach et al., 2016) will be analyzed using measures of central tendency.

Data forthcoming in March 2023.

Implications: The results of this research may indicate a relationship between social cohesion in the workplace and rates of burnout thus leading to more targeted interventions.

## **BIBLIOTHERAPY AND DECISION-MAKING SKILLS**

Presenter: Burnett, Sophie  
Graduate, Social Work

Mentor: Prof. Christopher Gjesfjeld

Authorship: Sophie Burnett, Christopher Gjesfjeld

Interpersonal conflict is unavoidable and is a major aspect of elementary school students' interactions. The school environment is important to child development and socialization which form the foundation of their peer relationship experiences. (Elledge et al., 2016). Students are involved in issues that could be solved easily using bibliotherapy to improve decision-making techniques to limit conflict. Bibliotherapy is used by reading or telling stories that can teach valuable lessons. Reading stories in the classroom environment can build a strong foundation of social-emotional learning that will positively influence a child's behavior. Bibliotherapy can be used to target social skills, feeling identification, self-confidence, family related issues, bullying, and so on. The aim of this research is to discover if bibliotherapy, with a focus on decision making, can improve students decision-making skills. Ninja Life Hacks is a children's book series that was developed to teach these valuable life skills. These stories will be implemented to see the effectiveness of bibliotherapy on decision-making skills.

Participants in this study include 46 third graders and 55 second graders (101 total) who attend Washington Elementary School in Bloomington, Illinois. Participants include 49 females and 52 males between the ages of 7 and 9. The research that will be conducted is a social work Tier 1 intervention. Additional materials include the Ninja Life Hacks book bundle as well as worksheets and activities that have been created to go along with the lessons. Another material needed will be the pretest and posttest that will be completed before and after the implementation of the intervention. The research design of this study is experimental and uses a quantitative method. It aims to analyze the impact of a decision-making curriculum implemented in the classroom environment. The independent variable is the Ninja Life Hacks decision-making bundle while the dependent variable is decision-making skills.

As of now, only the pre-test has been administered. The post-test results will be completed and analyzed towards the end of February. The pre-tests have been scored and scores were better than an anticipated. A potential implication would be that there was little to no growth on the scores from the pre and posttests.

## **THE EFFECTIVENESS OF SECOND STEP DIGITAL ELEMENTARY PROGRAM AT JEFFERSON ELEMENTARY SCHOOL (#709)**

Presenter: Bush, Morgan  
Graduate, Social Work

Mentor: Prof. Kate Sheridan

This study explored the effectiveness of a Tier 1 social-emotional digital intervention called Second Step. Lessons were implemented in grade levels K-6 at Jefferson Elementary School in Morton School District (#709). All teachers of Jefferson Elementary were invited to complete electronic surveys regarding their opinion of the effectiveness of the Second Step lessons they administer. Students' social-emotional wellness was monitored using school-wide implemented surveys in areas of total behavior, academic, social, and emotional. This data will help determine if other elementary schools within the Morton School District utilize Second Step as a Tier 1 intervention next school year.

## **PROFESSIONAL DEVELOPMENT STAFF NEEDS**

Presenter: Daniels, Kierra  
Graduate, Social Work

Mentor: Prof. Kate Sheridan

This study explored professional development staff needs at Morton school district 709. This study included 70 special education staff and teachers. Participants were invited to complete an electronic survey by the Student Support Services director from district 709. Findings will inform decisions that will help plan professional development events and training for the upcoming 2023 school year.

## **CASE MANAGEMENT TRAINING AT OSF**

Presenter: Faires, Jared  
Graduate, Social Work

Mentor: Prof. Kate Sheridan

This study explores training provided to social work case managers at OSF regarding local resources homeless shelters, drug counseling resources, and local nursing home information.

## TEACHERS ARE LEAVING PUBLIC EDUCATION AT ALARMING RATES

Presenter: Freeman, Rebecca  
Graduate, Social Work

Mentor: Prof. Christopher Gjesfeld

Authorship: Rebecca Freeman, Christopher Gjesfeld

Teachers are leaving the public school system at alarming rates. The United States Bureau of Labor Statistics (2022) reported approximately 10 million current public-school educators. This is a downward trend from 2020 when there were about 10.6 million public-school educators. Teachers are reporting incredibly high levels of stress and are opting to leave the profession. The studies show there are three main reasons teachers are burning out: 1- Behaviors of children, 2- Limited social emotional competence (of the teachers) and 3- concerns about their own mental health. Teacher stress has potentially devastating consequences for the field of public-school education in the United States. Students are negatively impacted when teachers are experiencing such elevated rates of stress. The first step to stopping the high turnover rates is to understand what are the main stressors teachers are facing and what support they need?

This research project will be a qualitative design with public elementary school teachers as participants. I will use the Measures of Stressors and Supports for Teachers created by Dr. Sandilos and Dr. DiPerna with demographic questions to better understand what teachers need. The MOST survey is an assessment tool that looks at ten different areas that can have influence on a teacher. The ten areas are: parents, colleagues, school leadership, belonging, classroom students, students with disabilities, time pressure, professional development, safety and emotional state. I hope to use the information I gather to better support teachers in order for them to be more equipped to support the students in their classrooms.

Data collection is ongoing; as of February 15, 2023, there have been 18 responses to the survey. Reference:

U.S. Bureau of Labor Statistics. (2022). Job opening and Labor turnover survey. U.S. Bureau of Labor Statistics. Retrieved October 20, 2022, from <https://www.bls.gov/jlt/>

## **A PILOT TEST OF A SURVEY INSTRUMENT TO MEASURE SOCIAL PROMOTION GRADING PRACTICES IN CENTRAL ILLINOIS HIGH SCHOOLS**

Presenter: Gary, Zari  
Graduate, Social Work

Mentor: Prof. Kate Sheridan

This study is a pilot test of a survey instrument to explore and describe grading practices utilized by high school teachers in Central Illinois which are based on social promotion. Social promotion grading practices refers to assigning passing grades to students with the intent of keeping them with their age-appropriate school cohort, rather than being based on academic competence. The survey instrument is being field-tested to provide feedback on survey items including recommendations of additional questions or revisions to proposed survey items. The design is participatory research in order to gain the benefit of experience and insight from parents with high school aged children.



## **DIVERSITY AND INCLUSION HIRING PRACTICES RURAL SCHOOL DISTRICTS**

Presenter: Gill, Helena  
Graduate, Social Work

Mentor: Prof. Christopher Gjesfjeld

Authorship: Helena Gill, Christopher Gjesfjeld

Diversity and inclusion have been a push subject in recent years. Corporations, businesses, and schools are interested in expanding their company by hiring individuals with various backgrounds. These efforts are essential; nevertheless, the bases behind hiring diverse candidates are also important. However, how companies implement this training has been mentioned less. The issue arises from the safety of the individual employees seeking to be employed. Creating opportunities for diversity and inclusion in the work environment is needed. Our research is essential because a homogenous population can promote "groupthink," impairing problem-solving. Also, hiring discrimination becomes intergenerational when it is unaddressed. This research looks to gain knowledge on diversity and inclusion hiring practices from employees hired in rural schools.

To obtain information to determine if the hiring process in rural communities is diverse and inclusive, I will create a survey to gather this information. The survey consists of sixteen items in an open-ended format. The survey will be anonymous to protect the staff's identity. However, they will be asked about demographics such as age, gender, race, and the highest level of education. I will conduct a convenience sample by emailing a link to the survey to all staff in the district and neighboring districts. The collected data will be coded and transformed into qualitative data. Data will represent the viewpoint(s) of staff employed regarding their districts' diversity and inclusion hiring practices.

At this point, my results are not in yet. However, results will be used to further knowledge of diversity and inclusion in rural communities. Districts can use the research information to implement or revise their diversity and inclusion hiring practices.

## **INEQUALITIES IN CARE AMONG U.S. VETERANS**

Presenter: Henslick, James  
Graduate, Social Work

Mentor: Prof. Kate Sheridan

This study explores potential inequalities in care among disabled U.S. veterans.

## **RISK OF SECONDARY TRAUMA IN PEER ENGAGEMENT SPECIALIST**

Presenter: Hines, Shannon  
Graduate, Social Work

Mentor: Prof. Kate Sheridan

The purpose of this study is to explore the potential risk of secondary trauma for peer engagement specialist who work in a mobile crisis team. A secondary trauma survey was distributed to all central Illinois engagement specialist who work in a mobile crisis team under the Unity Point/Carle umbrella. The findings will be used to enhance training.

## **A STUDY ON FOSTER PARENT'S KNOWLEDGE OF TRAUMA-INFORMED CARE**

Presenter:           Hudomiet, Emily  
                          Graduate, Social Work

Mentor:             Prof. Christopher Gjesfjeld

Authorship:         Emily Hudomiet, Christopher Gjesfjeld

Many children in the foster care system have experienced multiple traumas in their life, furthermore, the research concludes that these trauma symptoms negatively affect the foster youth and their foster parents. Considering the importance of trauma, it is essential to ensure that foster parents are knowledgeable about trauma and the impact trauma may have on their behavior. Based on my research of current literature, there is a gap in knowledge regarding foster parents and their knowledge as well as their experiences with these foster youth. Before we know the content and methods for providing information regarding trauma, we must fill certain gaps in this area by understanding the specific knowledge of foster parents. My qualitative study attempts to fill the research gap regarding what foster parents know regarding trauma within the foster youth population. Some of the questions we asked the foster parents included: A) How many children have you fostered who did not complete their permanency plan while in your home? B) Was there a reason the placement was unsuccessful? C) Were you given background information on any of your foster children regarding possible behavior/emotional problems? If not, would it have been helpful if you had? D) Were you aware that your foster child may have experienced trauma? With this research, we hope to fill the current knowledge gap within the foster care system to provide foster children with the best trauma-informed care possible.

## **HEARTLAND COMMUNITY COLLEGE COUNSELING SERVICES**

Presenter: Hulett, Joshua  
Graduate, Social Work

Mentor: Prof. Kate Sheridan

The goal of this study was to evaluate the knowledge Heartland Community College students had of the student counseling program. A written survey was provided to students in the psychology program at Heartland Community College to determine their knowledge of the program. Findings will be used to determine how to improve outreach and education of the counseling program to Heartland students.

## **SECONDARY TRAUMATIC STRESS AND THE RELATIONSHIP TO BURNOUT IN CHESTNUT STAFF**

Presenter: LaRocco, Abigail  
Graduate, Social Work

Mentor: Prof. Christopher Gjesfjeld

Authorship: Abigail LaRocco, Christopher Gjesfjeld

Over the last 20 years, there has been concern about the relationship between helping professionals who treat traumatized clients, their potential of developing PTSD-like symptoms, and developing feelings of burnout. The effects of treating traumatized patients can be defined as Secondary Traumatic Stress or STS. Secondary traumatic stress is the emotional duress one experiences after listening to an individual's experience firsthand. Symptoms of STS can include intrusive thoughts, depression, job avoidance, and a lack of motivation. Burnout is when one loses interest or grows tired from the stress of overworking. Although STS and Burnout can negatively impact work experience or performance, understanding triggers may be beneficial to finding potential relief outlets. We attempt to measure STS in a sample of individuals who regularly work with individuals experiencing high levels of trauma. We hypothesize that STS correlates with burnout, depression, and a desire to leave.

We conducted a mixed-method survey of about 20 Chestnut Staff who are in some way exposed to client interaction (e.g., LCPC, LCSW, MSW, or mental health staff). We collected between January 2023 and March 2023 and used items from the Secondary Traumatic Stress Scale and the Burnout Assessment Tool. We specifically took the portions of the two scales focusing on avoidance, exhaustion, and cognitive impairment symptoms. A self-disclosure form will be delivered before any other survey question. Following the disclosure, a survey will be distributed to Chestnut Staff and incorporate a Likert scale and short answer questions regarding secondary stress and burnout. Data will be forthcoming in March 2023. Our results are significant because we hypothesize that there is a direct correlation between Secondary Traumatic Stress and Burnout, causing less motivation or a desire to leave among Chestnut Health systems Staff. If our hypothesis proves correct, we may find solutions to help with symptoms of burnout and secondary stress.

## **MEETING SPACES FOR TRAUMA-RELATED COUNSELING AND ADVOCACY**

Presenter: Markley, Charlotte  
Graduate, Social Work

Mentor: Prof. Kate Sheridan

Limited research exists on the impact of the physical space on mental health treatment. This study explored the impact of the available meeting spaces on clients at a sexual assault crisis center. Staff and clients at the YWCA Stepping Stones program in McLean County were invited to complete surveys on their perceptions and experiences in the available private meeting spaces used for client-staff interactions.

## **EXPLORING A NARCAN AND FENTANYL TEST STRIP DISTRIBUTION PROGRAM AT A MEDICATION ASSISTED RECOVERY CLINIC**

Presenter:           McAuley, Melissa  
                          Graduate, Social Work

Mentor:             Prof. Kate Sheridan

The purpose of this proposed study is to explore client use of Narcan and Fentanyl Test Strips, client perceptions about Narcan and Fentanyl Test Strips, client behavioral changes associated with Narcan and Fentanyl Test Strips, and the efficacy of the Narcan and Fentanyl Test Strips distribution efforts at medication assisted recovery clinics in Illinois.



## THE IMPACT OF SOCIAL MEDIA AND MIDDLE SCHOOLERS MENTAL HEALTH

Presenter: Nottke, Nicole  
Graduate, Social Work

Mentor: Prof. Christopher Gjesfjeld

Authorship: Nicole Nottke, Christopher Gjesfjeld

Adolescents are spending more time on their phones. Social media such as YouTube, Instagram, Snapchat, and TikTok have become some of the most popular platforms for adolescents, with TikTok and YouTube being the most popular social media platforms. Although social media can be a convenient tool for youth to learn skills and make social connections, social media can cause middle schoolers to feel upset, and experience bullying, which could potentially lead to psychological concerns like depression and social isolation.

Given the lack of research on how social media affects adolescents' social-emotional well-being within schools, we are testing to see how social media affects middle school students and if it is essential for educators and professionals who work in middle schools to learn and understand how social media can impact a student's psychological and social-emotional well-being. We conducted a survey sent to 8th-grade students at Parkside Jr. High School. Parental passive

consent was provided for all 8th-grade students to complete this survey. The survey was sent out via email on January 30, 2023, to all 8th-grade students to complete during their advisory class period. 58 students anonymously completed the survey. The survey concluded with 35 questions: basic demographics, social media survey, and the UCLA (University of California, Los Angeles) loneliness scale. The UCLA loneliness scale ranges from a low degree of loneliness to a high degree of loneliness. Results from the survey concluded that 29 participants spend more than 3 hours a day on social media. Of those 29 participants, 12 scored a low degree of loneliness scores, 12 participants scored in a moderate degree of loneliness scores, 4 participants scored a moderately high degree of loneliness, and 1 scored a high degree of loneliness.

Implications include limited research and data on how social media affects middle schoolers' psychological and social-emotional well-being and school curriculum. Schools focus on academic and health courses but have limited technology courses that teach students proper social media safety and awareness of social media. With technology increasing within schools, and social media usage increasing among youth, we believe that social media awareness should be implemented within schools.

## **SECONDARY TRAUMATIC STRESS AMONG HELPING PROFESSIONALS AT THE CENTER FOR YOUTH AND FAMILY SOLUTIONS**

Presenter: Ramirez, Veronica  
Graduate, Social Work

Mentor: Prof. Christopher Gjesfjeld

Authorship: Veronica Ramirez, Christopher Gjesfjeld

Secondary traumatic stress (STS) refers to the emotional and psychological impact of empathetically listening to clients' experiences of trauma. People who are in the helping profession are more likely to find themselves at risk for experiencing STS than other professionals might be due to the nature of their work. Research has found that the experience of STS is similar to that of posttraumatic stress disorder. It has also been found that STS is positively correlated with a decline in job performance and job retention among the helping profession. Our research recruited staff from The Center for Youth and Family Solutions (CYFS) to inquire about their personal experiences with STS. This also included their thoughts on how the agency might be able to provide more support for their employees regarding STS.

We conducted both a qualitative survey and virtual interviews that consisted of 6 open-ended questions that were administered to participants. This survey and virtual interviews were administered in February 2023. All participants were identified as CYFS staff from all of its 11 locations across the state of Illinois and from its 7 departments/programs. All participants identified themselves as being 18 years or older.

Data will be forthcoming in April 2023. With these results, we see potential in bringing awareness to the experiences of STS among CYFS staff and inform initiatives towards continuing the agency's efforts to better support its staff in the future.

## **THE EFFECTIVENESS OF MTSS TIER 1 SEL IMPLEMENTATION AT WOODROW WILSON SCHOOL (K-2)**

Presenter: Reents, Justine  
Graduate, Social Work

Mentor: Prof. Kate Sheridan

The aim of this study was to examine the effectiveness of the implementation/curriculum of SEL Tier 1 instruction, and the impact it has on students at Woodrow Wilson Elementary in East Peoria, IL. All staff members (administrators, teachers, and teacher's aides) were invited to complete an anonymous-online survey to give their input and opinions on the social-emotional learning occurring in their school. The findings from this study will show if the implementation of social-emotional learning is occurring regularly, as well as if the SEL curriculum is having a positive impact in students social-emotional behaviors from the Winter to Spring benchmarking periods.

## **A COLLABORATIVE EXPLORATION OF THE RELATIONSHIP BETWEEN HOME VISITING PROGRAMS, HOME VISITORS & CHILD WELFARE CASEWORKERS**

Presenter:           Reeves, Iyasha  
                          Graduate, Social Work

Mentor:             Prof. Kate Sheridan

This study explores the perception of home visitors and child welfare collaborative efforts through working relationships with mutual clients/families. This study included results from 20 individual participating home visitors from 1 distinct agency within 3 central region sites in Illinois. Of these sites, 3 programs use Healthy Families (HFI) model while 1 uses the Parents as Teachers (PAT) model. All participants were emailed a survey and consent to participate in this study. Findings from this study will be used to see how to best cultivate support and continue to grow the relationships of support for families served by both professionals.

## **IMPACT OF SOCIAL WORKER RIDE-ALONGS ON POLICE OFFICER PERCEIVED STRESS AND MENTAL HEALTH STIGMA IN MOLINE, IL**

Presenter: Steele, Cassandra  
Graduate, Social Work

Mentor: Prof. Christopher Gjesfjeld

Authorship: Cassandra Steele, Christopher Gjesfjeld

The future of policing in the United States is an emotionally charged topic with high stakes outcomes. The role of social workers working with police is one of the most frequently discussed avenues to improve police and community relations, with just as emotionally charged and diverse opinions. It is worth knowing that partnerships between police and social workers are not new. In 1919, August Vollmer, largely considered the “father of American policing,” considered poverty, unemployment, inadequate housing, poor peer relationships, and others as factors of crime. He urged police to collaborate with social service agencies and community organizations in the creation of schools, clinics and hospitals, recreation, and community centers, among others as a way to proactively alleviate the causes of crime (Patterns & Swan, 2019). The exact implementation of social work with policing is in its infancy and current pilot programs will directly impact how policing will change nationwide.

This project takes a quantitative approach to analyze the impact of social workers on the officer’s perceptions of mental health and perceived stress in the Moline, IL Police Department through an existing partnership with the Center for Youth and Family Solutions (CYFS) that includes social-worker ride alongs. The study is cross-sectional and quasi-experimental with a comparison group. I administered a voluntary survey available to all officers of the department that included the Perceived Stress Scale (Cohen, 1994) and the Police Officer Stigma Scale (Stuart, 2017), as well as survey questions specific to the police and social worker partnership.

Preliminary data shows that officers in Moline Police Department look favorably on the partnership with social workers. Data illustrating how the partnership influences perceived stress and mental health stigma is still being submitted. Analysis will be prepared in March.

Implications for findings include possible expansion of the partnership within the Moline PD. Should the study show that social workers have an impact on officer’s stigma about mental health and perceived stress, the study could be repeated following the federal research guidelines and be published as a model for other departments.

## **FATHER'S PERSPECTIVE OF SPECIAL EDUCATION**

Presenter: Strong, Morgan Graduate,  
Social Work

Mentor: Prof. Christopher Gjesfjeld

Authorship: Morgan Strong, Christopher Gjesfjeld

Special education in public schools supports children who have disabilities learn in a least restrictive environment. As special education continues to adapt and improve over the years, researchers look to families to help improve the services children receive. In previous research, the mother of families is often highlighted in research as the most involved parent in special education services and support for their children. The view that mothers are the more active parent, stems from other myths which have negatively impacted how fathers are view and unfortunately impacts how fathers even view themselves. Because of the myths that surround fathers in families and their role, it has led to a decrease in understanding of father's perspectives and their experiences supporting their child in special education. The goal of the current research will seek to better understand the active father and their direct experiences supporting their children in special education. Father involvement is defined as the social and functional involvement in their child's life.

The current study will involve fathers of children ages 3-11 in a rural setting through non-probability convenience sampling. The researcher is relying on available fathers in the rural school district. The data will be collected via an online survey created by the researcher including qualitative and quantitative data, a mixed-methods design. The qualitative section of the current research study focuses on using the phenomenology research design. The current study will seek to understand lived experiences (thoughts, perceptions, and ideas) of father participants who have children in special education. Descriptive data will also be collected.

The open-ended and short response questions in the survey will be analyzed by a speculative inquiry process done by the researcher to collect information on common themes among responses.

The results of this survey will contribute to current research on portraying a more accurate picture of father involvement and perspectives on their child's special education services. In addition to provide thoughtful responses in how special education teams can better support an entire family unit. Implications of the current research will provide a better understanding of father's perspective of special education and supporting their child(ren). By better understanding an entire family unit, educators and service professionals can better support families and children receiving special education services.

Keywords: special education, father's perspective, involvement, rural, survey

## **SELF MANAGEMENT AND SELF EFFICACY SKILLS IN ELEMENTARY SCHOOL STUDENTS**

Presenter: Thompson, Erin  
Graduate, Social Work

Mentor: Prof. Kate Sheridan

This study explored self-efficacy skills and self-management skills of elementary students. This study included data from elementary students and elementary teachers at a local school. Participants were invited to complete an electronic survey about changes in self-efficacy and self-management in students. Findings will inform administration to develop supports to increase self-efficacy and self-management strategies.

## **MEASURING THE QUALITY OF MENTAL HEALTH SERVICES FOR THE UNINSURED AND UNDERINSURED**

Presenter: Tomczewski, Kathleen  
Graduate, Social Work

Mentor: Prof. Kate Sheridan

This study explored client satisfaction in regards to receiving mental health services for the uninsured and underinsured within the community of Bloomington-Normal. The purpose of the study examines whether services provided by Integrity counseling are beneficial to the community and whether clients are satisfied with the services provided. Clients who have had at minimum four or more counseling sessions were invited to complete a survey assessing client satisfaction and perceived progress towards counseling goals. Findings will be used to help Integrity Counseling understand how to better provide services to future clients.



## SOCIOLOGY/ANTHROPOLOGY

### IS THE TEMPORAL STYLOID PROCESS A UNIQUE SPEECH STRUCTURE IN HUMANS?

Presenter: Martin, Sommer  
Graduate, Sociology/Anthropology

Mentor: Prof. Shelby Putt

Authorship: Sommer Martin, Shelby Putt

The elongated temporal styloid process in humans serves as an attachment point for the styloglossus, stylohyoid, and stylopharyngeus, which are involved in tongue movement and deglutition. We hypothesized that an elongated styloid process in humans is the result of selection for increased musculature that would support tongue movements that are involved in speech and aid in the movement of the oropharynx and laryngopharynx during deglutition. This hypothesis assumes that an elongated styloid process is unique to humans. To test this hypothesis, we conducted a comparative analysis of the presence or absence of the temporal styloid process on ten species of Old World primates. We found that this structure is not unique to humans but also exists in baboons. In *Papio*, the styloid ligament, styloglossus, stylohyoid, and stylopharyngeus attach to the styloid process in a similar manner to the human soft tissue articulations. This indicates that the temporal styloid process that is present in humans and baboons is a convergent evolutionary structure and therefore not specially adapted for speech.

## THE GET ACQUAINTED PROCESS: THE EFFECTS OF ATTACHMENT STYLES ON SELF-DISCLOSURE

Group Leader: Munoz, Mariana  
Undergraduate, Sociology/Anthropology

Group Members: Samantha Tate, Undergraduate, Psychology; Sarah Jacobsen, Undergraduate, Psychology; Carlos Morn-Toro, Undergraduate, Politics and Government; Taylor Starr, Undergraduate, Sociology/Anthropology; Sophia Larson, Undergraduate, Sociology/Anthropology; Erin Hennessy, Undergraduate, Sociology/Anthropology

Mentor: Prof. Susan Sprecher

Attachment orientation is a frequently examined individual difference variable in relationship science. Adult attachment orientation refers to people's tendency to feel comfortable forming relationships (a secure style) or to be anxious or avoidant about relationships (insecure styles). Attachment orientation – which develops during childhood based on family experiences and can change with new experiences – can have important influences on adults' relationships (Mikulincer et. al., 1991). A few prior studies consider how patterns of self-disclosure may differ as a function of attachment orientation in different types of relationships. For example, Shechtman and Rybko

(2004) found that in group counseling sessions, participants with a secure attachment style self-disclosed more than the other participants with insecure attachment styles. In this study, we examine how young adults' attachment orientation is related to the degree to which they self-disclose, specifically, in getting-acquainted interactions. We expect to find that those individuals with secure attachment styles will self-disclose more than those with insecure attachment styles. We also look at gender differences in the degree of self-disclosure in first interactions and expect to find women will self-disclose more than men.

We (a research lab group working under Dr. Susan Sprecher) analyzed data that were compiled from several prior social interaction studies conducted over many years in her lab at ISU. In each study, pairs of previously unacquainted students engaged in a getting-acquainted exercise in a lab setting. In a pre-interaction survey, the participants were given Bartholomew and Horowitz's (1991) four-category attachment model which described the types of attachment styles we plan to measure. The participants were then asked to indicate how well each attachment style described them. In a post-interaction survey, the participants describe how much they had self-disclosed and how much their partner had self-disclosed. More specifically, participants answered questions on a 7-point scale rating the interaction they had with the other partner. We will first present descriptive information (e.g., how much they disclosed overall), followed by results examining whether people who have different attachment styles vary in their self-disclosure levels in a first interaction, both as reported by themselves and as indicated by their conversation partner. One preliminary finding is that individuals who described themselves with a secure attachment style reported that they shared more intimate details with their partner than those who described themselves with an insecure attachment style. Our secondary focus on gender differences in self-disclosure levels suggested that females reported self-disclosing more to their interaction partner than males did.

## **AN EXAMINATION OF INDIVIDUAL FACTORS ASSOCIATED WITH THE EXPERIENCE OF COMPASSIONATE LOVE FOR STRANGERS/HUMANKIND**

Group Leader: Odeh, Yasmin  
Graduate, Sociology/Anthropology

Group Members: Fiona Fleming, Graduate, Sociology/Anthropology; Mariana Munoz, Graduate, Sociology/Anthropology; Samantha Tate, Undergraduate, Psychology

Mentor: Prof. Susan Sprecher

Authorship: Fiona Fleming, Yasmin Odeh, Mariana Munoz, Samantha Tate

Compassionate love is one of the major types of love that humans can experience, although it has been overshadowed by the study of romantic love. Sprecher and Fehr (2005) described compassionate love as including "...feelings, cognitions, and behaviors that are focused on caring, concern, tenderness, and an orientation toward supporting, helping, and understanding the other(s)" (p. 630). They developed the Compassionate Love Scale (CLS) with the purpose of measuring an individual's predisposition to feel compassionate love for others. The scale was designed to be used, in different forms, to assess compassionate love for a variety of targets, ranging from romantic partners to strangers and humankind. Considerable evidence has been found for its reliability and validity, including in brief forms (Hwang et al., 2008; Sprecher & Fehr, 2021). Many research questions have been investigated using the CLS, including the examination of factors that promote or are associated with compassionate love. However, prior research has disproportionately investigated factors associated with compassionate love for close others; thus, more research is needed on experiences of compassionate love for non-close others. More specifically, we address the question of who is most likely to experience compassionate love for distant others, strangers, and/or humankind. Because compassionate love is associated with many positive actions, such as volunteering, providing social support, and engaging in helping behavior (Sprecher & Fehr, 2005), it is useful to identify who is most likely to experience it. As part of several laboratory studies, participants (N ~ 700) completed a survey that included a short form of the CLS with

strangers/humankind as a target (e.g., "I tend to feel compassion for people, even though I do not know them"). Several individual difference variables were also measured, including gender, race, and attachment styles. Preliminary results indicated that women had higher scores than men on the CLS ( $t[696] = 4.65, p < .001$ ). No significant race differences were found ( $F[2,666] = 1.07, p = .34$ ). Attachment security was positively associated ( $r = .11, p = .03$ ) and dismissive avoidance was negatively associated ( $r = -.11, p = .03$ ) with compassionate love. Other results will be presented. The study contributes to the understanding of factors and characteristics associated with the propensity to experience compassionate love for strangers/humankind.

## **PERSPECTIVES OF KENYAN WOMEN (ELGEYO-MARAKWET COUNTY) WHO UNDERWENT FEMALE GENITAL MUTILATION/CIRCUMCISION (FGM/C)**

Presenter: Tanui, Melon  
Graduate, Sociology/Anthropology

Mentor: Prof. Jason Whitesel

This qualitative case study focuses on women from Elgeyo-Marakwet county in Kenya, several of whom have undergone what has come to be referred to by the Western world a female genital “mutilation” (FGM). This procedure “involves the partial or total removal of the external female genitalia” or inflicting any other damaging injury on “the female genital organs for non-medical reasons” (WHO 2022: para. 1). The residents of this county are Kalenjin speakers of Keiyo and Marakwet sub-dialects. County residents refer to FGM as *Yatitaet*, which loosely translates to “circumcision.” The process, which lasts from days to a month, is called *Tumdop Tibiik*, meaning the initiation of girls.

During initiation, cultural values, skills, attitudes, and behavior are passed down to young girls to prepare them for adulthood within the Keiyo/Marakwet community. No religion mandates female genital mutilation/circumcision/cutting (FGM/C); rather, patriarchal interpretations / lessons of religion create the cultural backdrop that allows this practice to persist (*Women’s Health News 1998*). FGM/C “has no health benefits”; yet it has been difficult to eradicate, due to patriarchal cultural practices and religious beliefs among practicing communities.

The research method I will use is in-depth interviews with 8 to 10 adult women who have undergone female circumcision. The purpose of the interviews will be to learn the deeply rooted traditional belief in the “purity” of a woman who has been circumcised. My researcher’s position is one of a Kenyan insider who has become a critical outsider through education, i.e., I hold the Western view of (FGM/C) as a human rights violation as condemned by the World Health Organization (WHO 2022), while at the same time I recognize the deeply rooted patriarchal belief behind the practice: to curtail or altogether prevent a woman’s pleasure so that she remains a loyal wife and child-bearer.

Findings of my research will contribute to an understanding of a phenomenon—the practice of female circumcision—and earning me the researcher integrity to evaluate that phenomenon within its own context, by extensively quoting the women who have undergone circumcision. Implications of this research can be far-reaching by elevating the voices of the women themselves to be heard, those who have “bought into” the practice, those who oppose it, as well as those who are on the fence, given their respect for and understanding of their tradition.

## ZOOM ZEN AND BUDDHIST MEDITATION IN DENVER

Presenter: Virklan, Noah  
Undergraduate, Sociology/Anthropology

Mentor: Prof. Nobuko Adachi

For my senior thesis I will argue that American Zen meditation centers, following a trend of increased interest in mindfulness-based stress reduction among a greater virtual audience, transitioned to remote practices because of the quarantine isolation period. Previous scholars claim (Raifman J. et al. 2022) that the COVID-19 isolation period, coupled with loneliness, and economic precarity, greatly increased suicidal stressors for the general population. Many psychologists urged that mindfulness meditation, when combined with cognitive therapy, concluded with around 87% of suicidal patients (n=16) finding “interesting” or “helpful” coping skills for ideation intervention when compared to normal talk therapy (Chesin et al 2018, 454). I will show that many meditation forms brought to America are the result of Buddhist influence. For example, the inclusion of Buddhist loan words like Zen and Mantra into secular MBSR (Mindfulness-Based Stress Reduction) and Yoga practices, and that many yoga postures and breathing techniques are likewise imported from a long history with Sanskrit. I demonstrate this correlation with 6 months of field notes acquired from two Zen Buddhist temples and a Diamond Way Buddhist group. The reason for this larger interest in Zen Buddhist meditation, I believe, was because people were invited to create new spaces over the internet which were associated with Karna’s (2018) description of “psychophysical skills” (that is, the meditative praxes, rituals, and teachings of Zen communities are reflexive of a lineage’s skillful ways in adapting the teaching of meditation skills to their audience, thereby compelling many Zen groups to employ a seamless transition of temple practice for an audience at home). I Support this claim with ethnographic interviews of Zen members and ordained Zen teachers. As internet communities, and their resulting subcultures, migrate to synchronous interactions over virtual telecommunication, this paper offers a useful revision to Grieve’s (2010) understanding of our relation to the so-called cyberspace.

## SPECIAL EDUCATION

### IMPACT OF MODIFIED DIALOGIC READING PLUS ASSISTIVE TECHNOLOGY ON A YOUNG CHILD WITH DEVELOPMENTAL DELAY

Presenter: Hanson, Mary-Kate  
Undergraduate, Special Education

Mentor: Prof. Jeongae Kang

Authorship: Mary-Kate Hanson, Jeongae Kang

Dialogic reading (DR) is a shared interactive reading practice that has been shown to develop oral language skills and comprehension of young children, including children who have specific language impairments. In particular, modified dialogic reading (MDR), a combination of DR, visuals, and systematic instruction is known as a promising intervention to help children with autism spectrum disorders (ASD) improve reading comprehension and engagement. However, its effects on children with developmental delay (DD) are not known. In addition, existing research mainly uses a hard copy of visuals. To fill the gap in research, we examined the effects of special education teachers using MDR with assistive technology (AT) on the reading comprehension and engagement of young children with disabilities during the extended school year (ESY).

Using a case-study design we observed one kindergarten student with developmental delay (DD). We paired DR with the AT platform Boom Cards. Boom Cards enables teachers to customize interactive visual materials to fit the individual needs of their students. Using Boom Cards, one special education teacher implemented MDR four times a week for five weeks during ESY. We observed special education teachers using Boom Cards during student reading activities and collected a teacher survey to determine social validity. Student outcomes were measured by the number of correct responses to reading comprehension questions, the duration of engagement time, and the number of words. The correct number of reading comprehension answers (triad, binary, direct model/incorrect) and the amount of time students spent talking about what they read while using Boom Cards (engagement) were visualized. We compared the changes of the level and trend between the baseline and intervention phases of each student.

Our findings indicate that while we observed the improvements in reading comprehension and engagement, the variability of the data, including the amount and quality of questions during baseline, made it difficult to determine the direct effects of the MDR plus AT package on the participating student. The data demonstrates that following the implementation of the intervention, there was an increase in both the duration of engagement and the quantity of words utilized. In this presentation, we will discuss considerations for the improvement of future research.

## **LANGUAGE & BEHAVIOR**

Presenter: Redfern, Madie  
Undergraduate, Special Education

Mentor: Prof. Stef Gardiner-Walsh

This presentation will summarize eleven academic papers on language deprivation in D/deaf children and its impact. Sensorineural hearing loss is the most common congenital disability in all parts of the world, where two out of every 1000 children have prelingual hearing loss. The primary takeaway of this presentation is that research indicates that early exposure to sign language is the best choice to reduce language deprivation for D/deaf children.

## **THE IMPORTANCE OF EFFECTIVE PARENT COMMUNICATION**

Presenter: Tilford, Mary  
Graduate, Special Education

Mentor: Prof. Jeongae Kang

Authorship: Katie Tilford, Jeongae Kang

Parent involvement and communication decrease as students reach the junior high and high school levels. Many factors can change parental involvement during this time (Bhargava & Witherspoon, 2015). This study was conducted at a local junior high in central Illinois. The purpose of this study was to investigate the communication experience of parents of students during the Individualized Education Plans (IEPs) process and factors that impact parent communication. We used a mixed-method design with parent surveys and interviews. Statistical and thematic analyses were used to determine common themes in parent communication and experiences. Our quantitative findings from the survey indicated parents of students with autism were more likely to want more frequent contact with their child's case manager than families of students with other disabilities. In addition, families of students in the sixth grade wanted to hear from their child's case manager more frequently than families of seventh or eighth grade students. Our qualitative findings from the interview indicated families would like to receive more positive notes about their children. In addition, data shows that parents' relationships with current case managers was affected by the relationship with the past case managers. The overall findings of this study will guide professional development regarding parent communication and allow for reflection on adjustments that would enable parents to have a more positive experience.



## **THE PERCEPTIONS AND EFFECTS OF HIGH SCHOOL LIFE SKILLS PROGRAMS ON DISABLED STUDENTS**

Presenter: Troxell, Zoë  
Undergraduate, Special Education

Mentor: Prof. Melinda Snodgrass

Authorship: Zoë Troxell, Melinda Snodgrass

The purpose of this interview study is to understand how high school participants in special education life skills programs perceived those experiences and how the life skills program affected them. Life skills programs are typically designed to teach students with disabilities the skills they need for post-school employment, activities of daily living (e.g., hygiene, meal preparation), and self-determination and other social skills. We interviewed students who participated in a life skills program at and through their high school as part of their special education services. We asked participants about their experiences, their perceptions of the experiences, and how they perceive the program to have affected them. We describe our findings and discuss the ways in which life skills programming positively and negatively affects disabled students. We offer implications for educators to inform future educational decision making to maximize benefits to all students and minimize harm.

## TEACHING AND LEARNING

### TEACHERS IN THE EDUCATIONAL OVERSEAS: STRESS, BURNOUT, AND RESILIENCE DURING AND AFTER COVID-19

Presenter: Anggriawan, Robby  
Graduate, Teaching and Learning

Mentor: Prof. Do-Yong Park

Authorship: Robby Anggriawan

As expected, teaching abroad is a life-changing experience for teachers (Cross and Dunn, 2016; Celik, 2017). Undoubtedly, it will be a new experience and an eye-opening moment for them, which can also shape their future lives. However, it can also be challenging for them as they are in a place where the culture differs from their home countries. It got even worse when the Covid-19 pandemic occurred and affected many aspects. In this study, eight teachers in overseas educational contexts have been awarded Fulbright scholarships and taught in their host countries (from the US to other countries and from other countries to the US). By using semi-constructed interviews, they have shared their bittersweet experiences, from adaptation to stress and burnout to resilience during and after COVID-19 or “the new normal.” However, this unique condition did not reduce the fundamental values of the exchange program itself, which is still noteworthy for deepening mutual understanding between their homes and host countries.

## **A CONCEPT MAP FOR A WHOLE-SCHOOL APPROACH TO MENTAL HEALTH: TRAUMA, AGENCY, AND THE CLIMATE-CRISIS INFORMING THREE PILLARS WITHIN THIS MODEL OF EDUCATION**

Presenter: Lough, Derek  
Graduate, Teaching and Learning

Mentor: Prof. Lara Handsfield

A post-COVID-19 world requires us to reevaluate how we frame mental health in education. Medical conditions associated with the numerous bodily and mental health issues that arose during a global pandemic are just now being investigated in earnest. Though our actions are grounded in hope, their impacts on our worldwide education system remain unknown. While we study the long-term effects, we must be accountable by adapting to those factors outside our ability to change and reinforce learning mechanisms within our students' control. These institutional changes may also serve our students, teachers, staff, and administration in primary, secondary, and schools of higher education as they encounter the impacts of climate change more often, both as geographically local incidents and psychological patterns of detriment or uncertainty. The concept map below will connect several theories in education and conceptual frameworks to show how three pillars of trauma-informed education, climate-ready actions, and supporting student agency will inform a whole-school approach that can be methodologically constructed to build a foundation for student mental health. While some of the literature points on the concept map will address well-known theories in education, most will have been peer-reviewed over the last five years.

## TECHNOLOGY

### USE OF WASTE GLASS AS AN ALKALINE ACTIVATOR AND FLY ASH AS PRECURSOR IN GEOPOLYMER CONCRETE

Group Leader:	Kayani, Taimoor Graduate, Technology
Group Member:	Lucas Roslewski, Undergraduate, Geography, Geology, and the Environment
Mentor:	Prof. Pranshoo Solanki
Co-Mentor:	Prof. Guang Jin, Health Sciences
Authorship:	Taimoor Kayani, Lucas Roslewski, Pranshoo Solanki, Guang Jin

In order to investigate the viability of employing waste glass as a potential alkaline activator in the synthesis of geopolymer concrete with fly ash as a precursor, an alkaline activator was created in this research by dissolving waste glass in a NaOH solution. There were three different sizes of glasses utilized. ICP-OES (inductively coupled plasma optical emission spectrometry) was used to determine the precise quantity of Na<sub>2</sub>O (Sodium Oxide) and SiO<sub>2</sub> (Silicon Dioxide) in the activator. 38 distinct Geopolymer Concrete combinations were created using three different types of glass and various concentrations of SiO<sub>2</sub> and Na<sub>2</sub>O. Testing of specimens after 24 hours of heat curing (80 °C) and 24 hours of ambient curing at room temperature (23 °C) allowed researchers to determine the compressive strength of geopolymer concrete. It was discovered that the alumina and calcium content of the glass type affected the compressive strength of geopolymer concrete mixtures. Up to a particular content, beyond which a strength loss was seen, the compressive strength rose with Na<sub>2</sub>O Percentage. The peak strength of geopolymer mixtures containing both ACAS and DCF glass was reached at SiO<sub>2</sub> of 3.0%. A significant factor in the activator's capacity to withstand compression was its modulus (SiO<sub>2</sub>/Na<sub>2</sub>O). The compressive strength decreased as a result of the greater liquid-to-solid ratio.

## **USING SMARTPHONE-BASED AUGMENTED REALITY FOR ASYNCHRONOUS LEARNING – A CASE STUDY**

Presenter: Miller, Grant  
Undergraduate, Technology

Mentor: Prof. Isaac Chang

Authorship: Grant Miller, Isaac Chang

Programming an industrial robot is one essential activity for manufacturing automation. The program can be done by either moving the robot arm manually with a teach pendant or designing the robot's tool path and tasks on a computer before sending the commands to the physical robot. The former approach might be straightforward but is slow and somewhat tedious due to the system's protective mechanism. Comparatively, the computer programming environment is broadly adopted by higher education. While capable of quickly verifying the program through low-risk simulation, it demands high-level cognitive activities from the users. Its steep learning curve could be overwhelming for novice learners, and the complexity of the software is unsuitable for asynchronous learning.

This presentation describes a new learning approach that could address this concern. A virtual robotic system can be presented in a smartphone-based augmented reality (AR) viewer to convey the learning objective and the intended outcome. Once the virtual system is anchored on a flat surface such as a tabletop or floor, the user can move around with their phone and zoom in/out to study the detail. A preliminary study determining the effectiveness of this approach will be presented. The following questions will be assessed with a small group of participants: (1) How can the AR models help students comprehend assignments and projects? (2) In what way can the AR viewer enable better project collaboration synchronously and asynchronously? This presentation will conclude with lessons learned and suggest best practices for designing learning activities with AR in mind.

## WOMEN'S, GENDER, AND SEXUALITY STUDIES

### WOMEN IN POLITICAL LEADERSHIP

Presenter: Lindenmeyer, Isabelle  
Undergraduate, Politics and Government

Mentor: Prof. Julie Webber

Raising the question of how women in political power have an effect on college students and their political decision-making. Do the effects of women in power of a certain party change the followings of said party based on the gender of voters, or does this not affect any political party?

# AFTERNOON SESSION ABSTRACTS

## AGRICULTURE

### CROPPING SYSTEMS MANAGEMENT ON PENNYCRESS

Presenter: Dangol, Rashmi  
Graduate, Agriculture

Mentor: Prof. Nicholas Heller

Corn-soybean rotation in the Midwest includes low-diversity cropping systems with high fertilizer inputs that leave the land fallow for around eight months of the year. Integrating an annual winter crop into the summer-annual-dominant cropping system could be an approach to increase diversity and sustainability in farming practices providing both economic benefits and ecosystem services. Pennycress (*Thlaspi arvense*) has been developed as a winter annual cash cover crop oilseed that can be integrated into a traditional corn-soybean rotation.

Despite its potential as feedstock and biodiesel production, limited information is known about the best agronomic management practices for its high production. The objective of the study is to optimize when and how we can grow pennycress between different crop rotation systems to maximize crop productivity and oilseed yields. This study is conducted at Illinois State University Research Farm, Lexington using a randomized block experimental design to compare four treatments systems: Cereal Rye-Pennycress-Soybean, Silage Corn-

Pennycress-Soybean, Grain Corn-Pennycress-Soybean, and Soybean-Pennycress-Corn. The annual summer crops were grown in spring 2022, and pennycress was drilled in fall 2022. Following the pennycress, soybean and maize will be planted as summer cash crops. Cash crops biomass and yield and pennycress spring canopy cover, biomass, yield, and the total net income of each plot will be evaluated to compare these systems.

## **STUDY ABROAD PROGRAMS AND STUDENT STRESS: AN ANIMAL SCIENCE CURRICULUM CASE STUDY**

Presenter: Lawrence, Jayden  
Graduate, Agriculture

Mentor: Prof. Drew Lugar

Authorship: Jayden Lawrence, Michael Barrowclough, Drew Lugar

Study abroad programs increase a student's exposure to different cultures, traditions, and ways of life. This has been referred to by some as 'gaining cultural intelligence'. While the benefits of participating in a study abroad program have been well documented, language, cultural, and/or environmental barriers may present themselves to program participants. These barriers have the potential to introduce additional stress to students, in conjunction with the stress more typically experienced during a 'traditional' college experience.

This study examines the relationship that participating in a study abroad program has on student stress, whether physiological or perceived. Over a 12-day period in December 2022 in Mexico City, Mexico, students participated in an Animal Science focused study abroad program. The program included conventional course lectures as well as agricultural and cultural excursions.

In addition to student demographic information, heart rate variability (via chest strap heart rate monitors) and perceived stress surveys were collected before (PRE), during (ABRD), and after (POST) the nearly two-week program.

Preliminary analysis shows that Caucasian students had higher overall perceived stress compared to non-Caucasian students ( $P = 0.004$ ). Perceived stress scores were higher in the PRE phase compared to the ABRD and POST phases, regardless of ethnicity ( $P = 0.001$  and  $P = 0.025$ , respectively). Heart rate variability levels were higher during the PRE phase for Caucasian students than non-Caucasian students ( $P=0.043$ ).

An abundance of research has sought to individually examine the influence that study abroad programs and stress have on student academic success. To the authors' knowledge however, no research currently exists that analyzes the potential relationship between the two.



## **EXPERIENTIAL LEARNING INFLUENCES STUDENT PERSPECTIVES ON CAREER ASPIRATIONS, INDUSTRY NETWORKING, AND SOFT SKILL DEVELOPMENT**

Presenter: Neuleib, Lauren  
Graduate, Agriculture

Mentor: Prof. Michelle Kibler

Authorship: Lauren Neuleib, Michelle Kibler, Jennie Ivy, Lacey Johnston

Equine industry internship and career options are diverse and can prove difficult for college students to navigate when entering the workforce. An equine industry course, with classroom and experiential learning trip components, was developed to expound educational and networking opportunities provided in traditional animal science curriculum. The objective of this study was to determine how course participation influenced future career aspirations, willingness to relocate for employment, and soft skill development. Students (n=24) from the University of TN (n=20) and IL State University (n=4) participated in an 8 d experiential learning trip which contained 17 individual stops across industry, reproduction, nutrition, agritourism and manufacturing locations in TN, OK and TX. Pre and post trip surveys were conducted (Qualtrics) to assess, prior experience with equids, career aspirations, personal, professional skills and knowledge learned from the trip. Soft skill abilities, willingness to travel, and knowledge gained were assessed on a 5 point Likert scale. Career aspirations, involvement in the equine industry and skills developed post trip were assessed through open ended questions.

Data were assessed for descriptive statistics using StataSE 17. Most students (65%, n=15) were previously involved in the equine industry and/or equids for more than 5 years, were animal science majors (88%, n=22), and were raised in rural/on-farm communities (53%, n=13). Post trip 54% (n=24) of respondents change career aspirations including but not limited to nutritionists, barn manager, reproductive specialist, and equine veterinarian. Post trip students indicated they have gained more knowledge of internships (68%, n=22), awareness of careers (66.67%, n=24), value of equi-tourism (41.67%, n=24) and overall additional knowledge of equine gained (66.67%, n=24). Open ended questions indicated students (n=24) developed professionally, with skills including networking (25%, n=6), importance of connections (20.83%, n=5), and knowledge of new career opportunities (37.5%, n=9). Students gained social skills (12.5%, n=3), communication skills (8.33%, n=2), confidence (41.67%, n=10) and expanded personal comfort zones (29.17, n=7) (n=24). The experiential learning trip enhanced student knowledge, experience, and soft skills that would have otherwise been inaccessible in a traditional course setting. Additional assessment should be conducted to quantify the benefit of experience-based learning in career aspirations and developing marketable skills. experiential learning, equine industry, hybrid instruction, internships, careers

## FARM INPUT AND FARMLAND PRICE CORRELATION

Presenter: Schmid, Julia  
Undergraduate, Agriculture

Mentor: Prof. Michelle Kibler

Co-Mentor: Prof. Justin Rickard

Authorship: Julia Schmid, Michelle Kibler, Justin Rickard

Global supply chain issues, shifts in spending patterns, and the recent surge in U.S. inflation created by Covid-19 caused soaring farm input prices (Jiao, Trends). The recent increase in farmland values is correlated with fluctuant farm input prices in Illinois and the U.S., and this study provides evidence to prove this theory. The average 2022 price of Illinois farmland was \$8,900.00 per acre, a 12.7% increase since 2021 (Jiao, Illinois), while fertilizer prices have experienced the most significant price increases compared to other inputs. In April 2022, anhydrous ammonia prices were up 179.0%, while potash prices increased by 107.5% (Jiao, Trends). Over the past 20 years, agricultural seed prices have significantly increased, as conventional seed prices have risen by 200% while genetically modified seed prices have increased more than 700% (Kovak). On average, it cost approximately 19% more in 2022 to raise a corn crop than in 2021 (Dehlinger). As vital as inputs are to crop production, farmers have recently been forced to significantly decrease the amount of each input they use, which limits production. In the U.S., soybean and corn production are both down due to weather that caused prevent planting this spring (Williams et. al.), while farmland prices increased by about 15% from 2021-2022 (Land). Within this same time frame, anhydrous ammonia and potash prices increased approximately 130% and 100% respectively (Quinn, Potash Leads; Quinn, Potash Retail). Results from this study provide evidence that increased farm input prices are correlated with high farmland values.

The main objective of this research was to identify the correlation of farm input and farmland prices. Secondary objectives include comparing current industry prices to forecast future prices and creating a price index to place current prices in context of the past few decades. Data was collected for input and farmland prices from 1960-2022 for the United States and Illinois. Most data sets used were broken into monthly prices and calculated to find averages and weighted averages of each input to determine average yearly prices. The importance of this study is to provide a connection between input prices and farmland values to provide members of the agricultural industry, specifically farmers, with data to forecast future prices. It is anticipated that this research will educate and prepare farmers to budget and financial plan in the future to avoid non-profit years by learning from past situations.

## BIOLOGICAL SCIENCES

### INTERACTION BETWEEN STARVIN AND P38KB TO TARGET PROTEIN LAMIN AS A NEURODEGENERATIVE DISEASE MODEL

Group Leader: Acquah, Bismark  
Graduate, Biological Sciences

Group Member: Shira Archie, Undergraduate, Biological Sciences

Mentor: Prof. Alysia Vrailas-Mortimer

Co-Mentor: Prof. Tom Hammond, Biological Sciences

Authorship: Bismark Acquah, Shira Archie, Alysia Vrailas- Mortimer

Neurodegenerative diseases are characterized by the progressive loss of neuronal function and cell structure. One potential therapeutic strategy involves targeting Lamin, the major components of the nuclear lamina where they provide a platform for the binding of other proteins to the chromatin and confer mechanical stability (Dittmer *et al.*,2011). Mutations in the human LMNA gene result in at least 15 distinct disorders ranging from muscular dystrophies to neurological disorders to lipodystrophies (Vytopil *et al.*,2003). Interestingly, some mutant forms of Lamin protein aggregate, which may be toxic to the cells. However, it is unknown how specific mutations in Lamin give rise to tissue specific disease. We hypothesize that certain tissues are susceptible to specific Lamin mutations due to the inability of tissue specific quality control mechanisms to degrade those mutant forms, leading to protein aggregation and cellular toxicity. We will be testing if tissue specific disease mutations in Lam Dm0, one of the fly homologues of LMNA, cause the protein to aggregate in muscles and neurons of *Drosophila melanogaster*. We found out that the main forms and the farnesylated forms of the different Lam Dm0 mutant proteins have different expression patterns in the muscles of the flies. In addition, we found that the p38 MAPK (p38KB) interacts with Starvin and the CASA complex to regulate the degradation of Lam Dm0. Future experiments will characterize how these mutant forms of lam Dm0 affect the functionality of the muscles and neurons in flies.

## **CAENORHABDITIS ELEGANS' AMPHID SHEATH GLIA MODULATES TOUCH-INDUCED ESCAPE RESPONSES**

Presenter: Awe, Temitope  
Graduate, Biological Sciences

Mentor: Prof. Andrés Vidal-Gadea

Authorship: 'Tope Awe, Jessica Adams, Laura Kelly, Shifat Niha, Andrés Vidal-Gadea

Glia are non-neuronal cells in the nervous system that provide structural and metabolic support to neurons. They are involved in different aspects of neuronal function such as synaptic transmission and plasticity. In addition, glia are now increasingly appreciated as active regulators of numerous physiological processes initially considered exclusively under neuronal regulation. For instance, the amphid sheath glia (AMsh) of *Caenorhabditis elegans* mediate adaptive response of the ASH neurons to repeated exposure to aversive odorants. This is in addition to their other supportive functions to neurons. Previous studies have also shown that these glia respond to nose touch. However, the molecular mechanism and the behavioral significance of the AMsh response to touch were unknown. Using RNA interference, we identified that *mec-12* is required for the normal response of AMsh glia to nose touch. To understand the behavioral significance of AMsh's response to touch, we measured the activity of the AMsh during touch-induced and spontaneous reversal movements using calcium imaging. Our findings indicate that AMsh activity peaks at the end of touch-induced reversals as well as spontaneous reversals. These findings suggest that AMsh glia play a role in modulating the touch-induced escape response in *C. elegans*.

## **UNDERSTANDING HOW THE NEW OILSEED WINTER COVER CROP, PENNYCRESS, RESPONDS TO DROUGHT**

Presenter: Bayliss, Ryan  
Undergraduate, Biological Sciences

Mentor: Prof. John Sedbrook

Co-Mentor: Liza Gautam

Authorship: Ryan Bayliss, Liza Gautam, Carol Kiam Assato, Spencer O'Flaherty, Arjuman Lima, Autumn Salmon, Amanda Darcy, John Sedbrook

Pennycress (*Thlapsi arvense* L., Field Pennycress) is a winter annual oilseed plant related to Brassica rapa and Brassica napus (rapeseed and canola). It is being rapidly domesticated into a new winter cash cover crop and renewable diesel feedstock for the U.S. Midwest Corn Belt due to its unique combination of agronomic traits. Rapidly changing climate dynamics has led to uneven distribution of rainfall which has resulted in drought as a serious threat to crop growth and yield. Hence, the use of novel technologies including CRISPR-Cas9 gene editing which can improve drought resilience in plants and help plants adapt to climate change is much needed. Little is known about how pennycress responds to drought. To learn more, we have analyzed pennycress seedling and plant responses to different challenges including water withholding as well as chemical treatments that mimic drought. Our initial analyses suggest pennycress naturally has drought tolerance, which may be related to its extreme cold tolerance. We also generated pennycress single, double, and triple mutants using CRISPR-Cas9 mutagenesis targeting 10 genes important for drought responses in other species. Preliminary phenotypic analyses of these mutant lines also support our hypotheses that pennycress may have relatively higher drought tolerance than its close relative, the model plant Arabidopsis thaliana. These data will be presented and discussed.

## THE NEWLY DISCOVERED GENE *rcrB* IS THE MAIN DRIVER BEHIND UROPATHOGENIC *ESCHERICHIA COLI*'S INCREASED RESISTANCE TO HYPOCHLOROUS ACID

Presenter: Bennis, Mehdi  
Undergraduate, Biological Sciences

Mentor: Prof. Jan-Ulrik Dahl

Authorship: Mehdi Bennis, Sadia Sultana, Jan-Ulrik Dahl

Urinary tract infections (UTIs) are among the most prominent bacterial infections that affect about 150 million people worldwide, presenting a burden to healthcare costs. 70-80% of all UTIs are caused by uropathogenic *Escherichia coli* (UPEC), which commonly resides harmlessly in the gut but turns into a serious pathogen upon entry in the urinary tract where they can cause significant morbidity and mortality. To establish a successful infection, UPEC needs to access the urinary tract, ascend to the bladder to colonize, and invade the bladder cells. Prior to colonization, however, UPEC must overcome an onslaught of host's defense mechanisms including attacks by innate immune cells such as neutrophils. Neutrophils sense and eliminate invading pathogens by generating a toxic cocktail of antimicrobial compounds, including hypochlorous acid (HOCl). HOCl is also the active ingredient of household bleach, one of the most potent disinfectants worldwide but can be generated in the human body mainly by the heme-containing enzyme myeloperoxidase. Not surprisingly, HOCl is highly effective in killing microorganisms by causing severe cellular damage. Recently, we discovered that UPEC is significantly more resistant to HOCl and neutrophil-mediated killing compared to other *E. coli* pathotypes, which might explain why only UPEC is able to cause UTIs. In this study, we show that the *rcrB* gene is an essential component for UPEC's HOCl defense, as a deletion of *rcrB* causes UPEC to be significantly more susceptible to HOCl-mediated stress. Our data suggest that *rcrB* is either directly or indirectly responsible for UPEC's ability to counter HOCl stress and protects UPEC during phagocytosis. Consequently, this defense system can serve as a potential antimicrobial therapy to improve the host's own innate immune response and capacity to fight UTIs.

## **GIANT MICE ON SMALL ISLANDS: MECHANISMS OF GIGANTISM IN PEROMYSCUS MANICULATUS GULF ISLAND POPULATIONS**

Presenter: Berg, Rachel  
Graduate, Biological Sciences

Mentor: Prof. Pirmin Nietlisbach

Authorship: Rachel Berg, Pirmin Nietlisbach

Island rodent populations frequently exhibit island gigantism, presenting with larger body sizes in comparison to mainland counterparts. Proposed mechanisms to explain gigantism include benign island habitats and lack of mainland predators and competitors. However, island populations tend to be denser than mainland populations, increasing conspecific competition. With extrinsic sources of pressure largely missing from island habitats, conspecific competition may become a selecting force for larger body sizes in island populations. Here we examine presence of gigantism in North American deermouse (*Peromyscus maniculatus*) populations throughout the Gulf Islands of British Columbia, Canada and assess if population density is an underlying mechanism. Deermouse populations were live trapped on nine of the Gulf Islands as well as on the lower mainland of British Columbia to assess gigantism. We found that deermouse populations on islands have larger body mass than populations inhabiting the mainland. However, no significant relationship was found between population density and body mass. Due to the large variation in ecological composition of islands selected for study, follow-up analyses were conducted on other possible mechanisms. Study sites with reports of higher predator species richness were found to have smaller mice in comparison to islands with few to no predator species reported. Gigantism continues to be a complex phenomenon likely driven by several mechanisms. Furthermore, these mechanisms may vary across metapopulations, requiring further study.

## **CHARACTERIZING THE EFFECTS OF ESTRADIOL AND TWO POTENTIALLY ESTROGENIC CHEMICALS ON THE GROWTH AND SURVIVAL OF CHICKEN EMBRYOS**

Presenter: Bernauer, Alyssa  
Undergraduate, Biological Sciences

Mentor: Prof. Ryan Paitz

Authorship: Alyssa Bernauer, Ryan Paitz

Studying prenatal exposure to chemicals found in our everyday environment allows for prevention of early embryonic mortality. Phthalates and triclosan are two examples of potentially estrogenic chemicals we interact with daily that have been found to reduce fertility and disrupt endocrine functioning. I tested the hypothesis that early embryonic exposure to DEHP would reduce embryo mass and survival. I also tested the hypothesis that early embryonic exposure to triclosan and estradiol would reduce embryo mass and survival. Chicken eggs were injected with oil as a control group, a solution containing low DEHP, or a solution containing high DEHP. The embryos were incubated for 14 days prior to being weighed. The data collected showed no statistically significant differences between the treatments for embryo mass and survival. In a similar study on the effects of estradiol and triclosan, chicken eggs were injected with oil as a control group, estradiol as a control group, triclosan, or a solution of triclosan and estradiol. The embryos were incubated for 14 days prior to being weighed. The data collected showed no statistically significant differences between the treatments for embryo mass and survival rate. Based on the results of this project, DEHP, triclosan, or estradiol had no effect on the survival rate and mass of chicken embryos.



## EXPERIMENTAL MANIPULATIONS OF OFFSPRING FOOD AVAILABILITY SUGGEST BEGGING CONTAINS LITTLE INFORMATION IN A FROG WITH FACULTATIVE PARENTAL CARE

Presenter: Brooks, Olivia  
Graduate, Biological Sciences

Mentor: Prof. Matthew Dugas

Authorship: Olivia Brooks, Evan Talbott-Swain, Matthew Dugas

Offspring solicitation signals (begging) are hypothesized to evolve to communicate information about how an offspring might benefit from parental investment. Much of what is currently known about the information content of begging signals comes from species where offspring are entirely dependent on parents for food. However, early in the evolution from non-begging to begging, the ability of offspring to self-feed may have shaped the benefits of producing begging signals. In Neotropical poison frogs, most tadpoles forage within their nurseries, but in some species, mothers provide unfertilized trophic eggs to their developing young. While egg-feeding is obligate in some lineages, in others, tadpoles both self-feed and beg for food. We tested hypotheses about what information is contained in tadpole begging in the mimic poison frog (*Ranitomeya imitator*), a species in which tadpoles can self-feed and beg for trophic eggs from parents. We reared tadpoles on three different diets shown to affect mass at metamorphosis, a common predictor of fitness in amphibians. We then assayed begging effort and intensity throughout development. Tadpoles reared on different diets did not differ in begging effort or intensity at any point during development. Our data suggests that *R. imitator* begging does not contain information about long-term differences in food intake. However, we also found that tadpoles did not beg often overall and that begging intensity decreased within a trial. Taken together, this suggests that early in the evolution of begging, offspring signals may have served simply to alert parents of their presence.

## CHARACTERIZING AMPHETAMINE-INDUCED DOPAMINE SIGNALING IN THE STRIATUM UTILIZING CARBON-FIBER MICROELECTRODE ARRAYS

Presenter: Chicosky, Rebecca  
Graduate, Biological Sciences

Mentor: Prof. Paul Garris

Authorship: Rebecca Chicosky, Jacob Giles, Paul Garris

Drugs of abuse increase extracellular levels of brain dopamine (DA), a key neurotransmitter modulating motor (i.e., movement) and limbic (i.e., emotional) functions. This elevated DA state is thought to underly the pathological reinforcing behaviors of abused drugs. Amphetamine (AMPH), a psychostimulant with high abuse potential, is historically believed to increase extracellular DA by efflux, an action potential-independent form of DA release. However, recent studies have contradicted this belief and demonstrated that AMPH elicits burst firing of DA neurons, which generates fast DA concentration changes called DA transients. Currently, it is unknown if AMPH-induced DA efflux and transients coexist and if so, whether these signals are segregated functionally or anatomically. Previous techniques using the gold-standard fast-scan cyclic voltammetry at a carbon-fiber microelectrode only afforded single-site recording and therefore, biased DA measurements towards one type of DA signal, fast. This bias may have led to an incomplete understanding of how AMPH alters DA function in the striatum, a forebrain region implicated in reward learning and found to have diverse DA signals. Here, we utilize two newly developed 16-fiber carbon-fiber microelectrode arrays (CF-MEAs) for simultaneous 32-channel DA recording in the dorsal and ventral striatum. This new technique affords us the ability to study DA signaling within the urethane-anesthetized rat striatum without a bias toward fast signals. Measurements, which capture heterogenous DA signals before and after AMPH administration (i.p./i.v.) permit relating observed different effects of AMPH to functional domains of DA signals in vivo.

## MECHANISMS OF INITIATION OF CORTICAL SPREADING DEPRESSION IN MIGRAINE DISORDERS

Presenter: Crowe, Grace  
Undergraduate Biological Sciences

Mentor: Prof. Wolfgang Stein

Co-Mentor: Prof. Allison Harris

Authorship: Grace Crowe, Wolfgang Stein, Allison Harris

An estimated 1 billion people worldwide experience migraines with symptoms including intense headache pain, nausea, and sensitivity to varied stimuli. Some forms of migraine are preceded, and perhaps initiated, by visual auras before pain onset. Auras are caused by a slowly traveling wave of inactivity in the visual cortex, referred to as cortical spreading depression (CSD). Cortical inactivity results from a loss of potassium homeostasis in the space surrounding the cortical neurons that is elicited by a rapid and dramatic increase in cortical neuron activity. A wave of inactivity then slowly propagates through the cortex.

While the consequences of a loss of potassium homeostasis are well-understood, the larger-scale dynamics and mechanisms that initiate the loss, and thus ultimately CSD, remain poorly understood. In patients with familial hemiplegic migraine (FHM-2) it has been hypothesized that mutations in the Na<sup>+</sup>//K<sup>+</sup> pump, an enzyme essential for potassium homeostasis and present in all brain cells, plays a key role in initiating CSD. It is not clear to what extent the severity of the defects caused by the mutation, or how the spatial distribution of defects within the cortical network, affect CSD initiation. Our project aims to address these issues by studying how local inhomogeneities in pump strength can lead to the initiation of CSD. We use a computational model of 25 cortical microcircuits to examine the effects of spatial variations in pump strength. The micro-circuits are coupled through the extracellular space, allowing for the diffusion of ions, such as potassium, across the network.

Introducing a reduced pump strength into a single location of the network was sufficient to elicit inactivity characteristic of CSD. However, inactivity was restricted to the micro-circuit manipulated and did not spread across the whole network. With a further decrease in pump strength, CSD only spread to a few neighboring micro-circuits, demonstrating that cortical networks with healthy pumps can terminate ongoing CSD. Even a dramatic reduction in pump strength of a single micro-circuit was unable to overcome the dampening effect of the surrounding healthy circuits. This suggests that a single defect in pump strength is insufficient to overwhelm a healthy network and should prevent CSD.

As a next step, we are testing whether more widespread pump defects will cause CSD to spread

## **SQUIRREL-LOCK HOLMES, A TOUGH NUT TO CRACK: INVESTIGATING THE FORAGING AND VIGILANCE BEHAVIORS OF THE WESTERN GRAY SQUIRREL (*SCIURUS GRISEUS*)**

Group Leader: Darter-Krantz, Ava  
Undergraduate, Biological Sciences

Group Member: Peyton Toney, Undergraduate, Biological Sciences

Mentor: Prof. Rebekka Darner

Authorship: Ava Darter-Krantz, Peyton Toney, Rebekka Darner

The purpose of this research project is to examine the foraging and vigilance behaviors of Western grey squirrels (*Sciurus griseus*). We sought to address four research questions. First, we inquired whether the vigilance displays of Western gray squirrels are similar to that of the California ground squirrel. Secondly, we would like to know whether the vigilance behaviors of Western gray squirrels are affected by wind levels. Thirdly, we would like to know whether time of day influences Western gray squirrel foraging. Finally, we would like to know whether squirrels spend more time foraging when humans are present. Studying the vigilance and foraging behaviors of Western gray squirrels is important due to their implications for human-squirrel interactions, which contribute to the spread of zoonotic disease, ecological disruption, and, on a broader scale, the effects of climate change and habitat fragmentation.

## **VIGILANCE AND FORAGING AMONG EASTERN GRAY SQUIRRELS AND EASTERN FOX SQUIRRELS**

Group Leader: Davis, Michaela  
Undergraduate Biological Sciences

Group Member: Hailey Burnett, Undergraduate, Biological Sciences

Mentor: Prof. Rebekka Darner

Authorship: Michaela Davis, Hailey Burnett

The purpose of this research project is to investigate foraging and vigilance behaviors among Eastern gray squirrels (*Sciurus carolinensis*) and Eastern fox squirrels (*Sciurus niger*). We sought to address four research questions. First, does conspecific presence influence vigilance behavior in Eastern gray squirrels? Second, does the biome in which the squirrel is living have an impact on foraging behavior observed in Eastern fox squirrels? Third, is there a relationship between squirrel vigilance in Eastern gray squirrels and the number of dogs in proximity? Finally, is the Eastern fox squirrel foraging behavior impacted by people nearby? This study is important due to its implications for understanding how human activity and other animal presence leads to alterations of habitat that affect squirrel behavior.

## **STRUCTURE OF MALE SONG IN HOUSE WRENS: CONTEXT-SPECIFIC VARIATION IN A COMPLEX SEXUAL TRAIT**

Presenter: DiSciullo, Rachael  
Graduate, Biological Sciences

Mentor: Prof. Charlie Thompson

Co-Mentor: Prof. Scott Sakaluk

Authorship: Rachael A. DiSciullo, Scott K. Sakaluk, Charles F. Thompson

Ornaments shaped by male-male competition and female mate choice are often multifaceted. These components, such as those that comprise bird song, collectively influence reproductive success. To identify how sexual selection has shaped these often-correlated song components, we must first describe the basis of this elaborate, complex trait, when it is produced, and identify the extent to which its components are shared among members of a population. In house wrens (*Troglodytes aedon*) male song composition is highly variable both intra- and interindividually, and its presentation patterns change throughout the breeding season. We have characterized this variation as a first step in determining which song components are favored by sexual selection, and to evaluate how song may play a role in other functions such as social cohesion. Here we present the first described “dictionary” of the male song and syllable types present in a central Illinois population of northern house wrens, to help determine the functional significance of male song in this species.

## **INVESTIGATION OF BEHAVIORAL CHARACTERISTICS AMONG EASTERN FOX SQUIRRELS (*SCIURUS NIGER*)**

Group Leader: Ellis, Marissa  
Undergraduate Biological Sciences

Group Member: Chloe Pryor, Undergraduate, Biological Sciences

Mentor: Prof. Rebekka Darner

Authorship: Marissa Ellis, Chloe Pryor

The purpose of this research project is to investigate behavioral characteristics such as alert feeding, foraging, and vigilance among Eastern Fox Squirrels (*Sciurus niger*). We sought to address four research questions. First, on college campuses, what time of day are fox squirrels most likely to alert feed? Second, are fox squirrels more vigilant in urban areas compared to deciduous forests? Third, is there a relationship between fox squirrels' vigilance and their proximity to humans? Finally, is alert foraging more common among fox squirrels when there are more dogs present? This study is important for understanding feeding and foraging patterns, what time of the day fox squirrels are most likely to alert feed, what affects their activity level, and if foraging is more common when dogs are present. This study can also gain insight into the purpose of their behavior and how they communicate, which can be important to conservation and survivability of the species, as they are important ecologically.

## **STERILE INSECT TECHNIQUE WILL CONTROL MOSQUITOES WHEN IMPLEMENTED EARLY IN THE SUMMER**

Presenter: Evans, Katherine  
Graduate, Biological Sciences

Mentor: Prof. Steven Juliano

Authorship: Katherine G. Evans, Steven A. Juliano

Sterile Insect Technique (SIT) is a species-specific pest control technique used to target *Aedes* mosquitoes. Benefits of SIT include reduced pesticide use for mosquito control, increased effectiveness of control of pesticide-resistant populations, and minimizing harm to non-target organisms. There are environmental contexts in which SIT releases larvae from competition, which may yield no reduction, or even increased, adult production. Thus, it is important to identify such contexts, so that they can be avoided, to maximize the effectiveness of SIT against *Aedes*. I hypothesized that SIT is effective when resource level and larval density do not result in strong negative-density dependent effects on adult production. I predicted that SIT will be effective in the early summer, when *Aedes albopictus* populations are low. I further predicted that SIT would yield more adults in the late season in containers with low resource levels.

We collected *Aedes* eggs, water, and detritus from 26 containers placed in the field for one week, then transferred the field material to controlled lab conditions. We simulated larval density reduction by SIT as a treatment for half of the containers by adding *Aedes albopictus* at 50% the observed egg density for the associated field container; we added *Ae. albopictus* at the original egg density to control containers. We collected detritus resources (which support the microorganisms that are the food of *Aedes* larvae) from the field containers weekly and added those to the corresponding experimental containers. We conducted this experiment in summer of 2022 – once in June and again in August, when *Aedes* abundances were expected to be low and high, respectively.

We recorded the number of adult *Ae. albopictus* that emerged from each experimental container. Resource levels did not affect the number of adult *Ae. albopictus* emerging in either the control or simulated SIT containers in June. Data from the August experiment are still being analyzed, but preliminary data exploration shows that egg densities were much greater in August than in June. Our results suggest that targeting *Ae. albopictus* in June with SIT would be an effective control measure. Our research will help guide managers on when to implement SIT effectively to reduce a mosquito population.



## ECOLOGICAL IMPACTS OF BTI LARVICIDING ON EPHEMERAL POOL COMMUNITIES

Presenter: Everly, Jaclyn  
Graduate, Biological Sciences

Mentor: Prof. Steven Juliano

Larviciding is a mosquito control method targeting immature aquatic larvae with the goal of decreasing adult populations. In larviciding, pesticides are applied directly to the aquatic habitat of immature mosquitoes to reduce vector populations at their source and limit the spread of vector-borne diseases. *Culex* mosquitoes are vectors of viral diseases like West Nile Virus, which are acquired from and passed among hosts during blood-feeding by female mosquitoes. In the Midwest, larviciding is used against *Culex* mosquitoes inhabiting ephemeral pools, ditches, ponds, and temporary wetlands. Although larviciding is beneficial to public health, there is a pervasive concern that it may harm non-target organisms in ephemeral pools via direct (e.g., pesticide-induced mortality) or indirect (e.g., mortality induced by reduction of prey, or intraguild predation) effects. This may in turn affect ecosystem functioning and biodiversity in ephemeral pools that serve important ecological roles as refuges for organisms such as aquatic plants and algae, micro- and macro-invertebrates, and amphibians, particularly in disturbed and agricultural areas. To test whether larviciding directly or indirectly harms ephemeral pool communities, I conducted a 10-week field experiment with the Macon County Mosquito Abatement District (MMAD) in Decatur, Illinois during the summer of 2022. Each week, an MMAD technician applied the biorational larvicide Bti (*Bacillus thuringiensis israelensis*) at their discretion to 10 experimental pools while I collected invertebrate samples from the 10 experimental pools plus 4 untreated control pools to test for changes in community (e.g., diversity) and trophic (e.g., food web) structure over time and across treatments. I predicted that 1. *Culex* abundance would be lower in Bti-treated pools compared to untreated pools (direct effect), 2. community composition would differ between Bti-treated and control pools (direct and indirect effects), and 3. predator abundance would be lower in Bti-treated pools compared to untreated pools (indirect effect). I hypothesized that repeated larviciding with Bti, resulting in elimination or reduction of mosquito larvae and susceptible non-target species, alters community composition and trophic structure via direct and indirect effects on individuals in ephemeral pool communities. The results of this research highlight which organisms are most heavily affected by larviciding, what potentially important ecological roles those organisms fill in ephemeral pool ecosystems, and how their absence from the community may impact future efforts in freshwater conservation and public health.

## TONNEAU RECRUITING MOTIF ROLE IN CELL DIVISION

Presenter: Falk, Tyler  
Graduate, Biological Sciences

Mentor: Prof. Viktor Kirik

Authorship: Tyler Falk, Trevor Rickerd, Viktor Kirik

Cell division is a complicated process that is regulated by many different genes and proteins. It is better understood and studied in animal and prokaryotic cells while most of the processes regulated and controlling plant cell division are unknown. In addition to a cell membrane plant cells have a cell wall that gives plant cells their unique shape and structure. When plant cells don't divide properly it can cause them to have abnormal shapes and alter the function of the cells and the plant as a whole. It is known that plants use a specific microtubule array called the preprophase band to properly orient the cell wall during cytokinesis acting as a guide during division. It is a ring-shaped structure that goes around the cell on the cell cortex and forms perpendicular to the way that the plant cell grows. Another microtubule array that is essential to plant cell division is the phragmoplast. It builds the plate that will divide plant and daughter cells and is made up of microtubules and microfilaments. It builds the plate at the site where the preprophase band was.

A protein in plants that helps regulate preprophase band formation is the tonneau 1 protein. This protein binds to Tonneau recruiting motifs (TRMs). By attaching GFP to different TRMs we are able to look for spots in the plant cells that have the corresponding proteins. These are locations where TRMs are likely to exhibit their functions. Once the purpose or location of individual TRMs are found, crosses will be made using plant lines that have insertion mutations in individual TRM genes. TRM genes are also believed to have redundancy they are grouped together in "families". By crossing plant mutants in the same TRM "family" we can then look for defects in the cell shapes and cell division in their progeny.

## UNCOVERING THE DIFFERENT FUNCTIONAL ROLES OF DYSTROPHIN ISOFORMS IN STRIATED MUSCLE

Presenter: Fazyl, Adina  
Graduate, Biological Sciences

Mentor: Prof. Andrés Vidal-Gadea

Authorship: Adina Fazyl, Jessica Adams, Sabrina Kollbaum, Martin Engel,  
Andrés Vidal-Gadea

Duchenne muscular dystrophy (DMD) is a genetic disorder characterized by progressive muscle degeneration and weakness, caused by a mutation in the gene that codes dystrophin. Dystrophin is a protein that is part of a larger protein complex called the dystrophin-glycoprotein complex (DGC). The DGC helps anchor the actin cytoskeleton to the extracellular matrix and plays a crucial role in maintaining the structural stability of muscle fibers. In recent years, *C. elegans* has been used to study the biology of muscular dystrophies, including DMD. In *C. elegans*, the homolog of the human dystrophin gene has been identified and characterized. Little is known about how many dystrophin isoforms of *C. elegans* there are, where and when those isoforms are expressed, if the expression patterns vary, and how they match the functional needs of the tissues they are expressed in. To determine tissue-specific patterns of dystrophin isoform expression we built transcriptional reporter strains. GFP or mCherry expression is driven by promoters targeting the regulatory region upstream of different dystrophin isoforms. Here we show that *C. elegans* expresses two isoforms of marked different lengths in the body wall musculature responsible for locomotion. To understand how these different isoforms of dystrophin contribute to muscle function within the same cell we are performing targeted antibody staining coupled with behavioral assays designed to challenge the musculature through its natural physiological range while monitoring the expression of these isoforms through fluorescent reporters and qPCR. This study will help us understand the differential contribution of different isoforms of dystrophin to muscle function and might have relevance for therapeutic approaches introducing truncated protein forms as treatment for dystrophic muscles.

Funding provided by NIH (NIAMS) Award 2R15AR068583-02 to AGVG and ME. Some strains were provided by the Caenorhabditis Genetics Center (funded by NIH Grant P40 OD010440).

## **PENNYCRESS (*THLASPI ARVENSE*) SEED SIZE MUTANTS AFFECT SEED OIL ACCUMULATION DIFFERENTLY**

Presenter: Gautam, Liza  
Graduate, Biological Science

Mentor: Prof. John Sedbrook

Authorship: Liza Gautam, Ryan Bayliss, Spencer O'Flaherty, Win Phippin,  
John Sedbrook

Pennycress (*Thlaspi arvense*, Field Pennycress) is being developed as an oilseed-producing winter cover crop for the U.S. Midwest Corn Belt owing to its extreme cold tolerance, high seed yields, and relatively short life cycle. Varieties have been bred to produce over 1,500 pounds of seed per acre, yielding 65 gallons of oil and 1,200 pounds of meal per acre. Seed compositional changes have resulted in the creation of the new crop, CoverCress™, in partnership with CoverCress, Inc. Along with compositional improvements, we have been taking both forward and reverse genetic approaches including CRISPR gene editing to increase seed size allowing for better seed handling of the grain and the ability to plant the seeds at greater depth. Three genes in which we have generated mutations are DA1, DA1-RELATED (DAR1), and UBIQUITIN PROTEIN LIGASE3 (UPL3). In *Arabidopsis*, DA1 and the related homologue, DAR1, encode ubiquitin receptors thought to set final seed and organ size by restricting the period of cell proliferation in the seed integuments. UPL3 mediates proteasomal degradation of, among other targets, the transcription factor LEC2. LEC2 activates expression of seed maturation and seed lipid accumulation genes. We found that single *da1* mutants phenotypically grew like wild type and produced seeds about 14 to 20 percent larger than wild type. Double *da1dar1* mutants were found to have seed sizes about 40 percent larger than wild type. Like *da1dar1* double mutants, *upl3* mutant seeds were bigger than wild type (17 to 32 percent larger) and plants were taller with bigger flowers, pods, and leaves and took relatively longer to flower. Surprisingly, pennycress *upl3* mutant seeds had reductions in total oil content, which is opposite to what was observed with *Arabidopsis* *upl3* mutant seeds. Omics analyses are underway to understand how these pennycress genes function relative to orthologues in other Brassica species.

## **CHARACTERIZING THE HETEROGENEITY OF ELECTRICALLY EVOKED DOPAMINE SIGNALS IN THE RAT STRIATUM UTILIZING CARBON-FIBER MICROELECTRODE ARRAYS**

Presenter: Giles, Jacob  
Undergraduate, Biological Sciences

Mentor: Prof. Paul Garris

Authorship: Jacob Giles, Rebecca Chicosky, Paul Garris

Dopamine (DA) is a neurotransmitter in the brain with important functions related to movement, motivation, and learning. The densest projection of DA neurons in the human brain originates in the midbrain and ascends to the striatum, a forebrain region critical to the brain circuitry mediating movement, cognition, and motivation. Abnormal DA signaling in this region has been implicated in the debilitating neuropathologies of Parkinson's disease, schizophrenia, and substance use disorder. Fast-scan cyclic voltammetry at a carbon-fiber microelectrode has been considered one of the best measurement techniques for quantifying extracellular DA levels in the brain of laboratory animals such as rodents *in vivo*. However, because of the provision for single site recording only, this technique has limited ability to assess the heterogeneity of DA signaling. As a result, DA measurements are often biased in favor of regions that exhibit one type of signal characteristics, such as fast and robust as opposed to, e.g., slow and small. Here, we utilize newly developed self-inserting carbon-fiber microelectrode arrays (CF-MEAs) to characterize DA signaling in the urethane-anesthetized rat striatum at multiple sites (i.e., up to 32) simultaneously. Measurements of the dorsal and ventral regions of the striatum show marked heterogeneity in both the concentration of DA elicited and the kinetics of these DA concentration changes. Our results suggest that the striatum exhibits functional heterogeneity of DA signaling and demonstrate the utility of CF-MEAs for investigating the role of DA in reward learning, drug addiction, and neurological disorders.

## **MACROINVERTEBRATES AS BIOINDICATORS OF THE SUCCESS OF RIPARIAN RESTORATION IN CENTRAL ILLINOIS**

Presenter: Hoberg, Joe  
Undergraduate, Geography, Geology, and the Environment

Mentor: Prof. William Perry

Authorship: Joe Hoberg, Bill Perry, Ryan Meyer, Ava Darter-Krantz

Urban streams are often impacted by channelization, fertilizer and salt runoff, and the loss of riparian vegetation. The resulting response of stream ecosystem structure and function has been called the urban stream syndrome. The increased water temperatures, decreased organic matter inputs, increased peak floods, and lower summer water levels impact the whole food web from algae to macroinvertebrates to fish. Cities such as Bloomington-Normal, Illinois aim to restore urban streams by restoring riparian zones. Healthy riparian zones provide abiotic conditions more suitable for aquatic communities. The objective of this study is to determine the effects of riparian restoration on water quality and aquatic diversity. An array of metrics will be used to assess water quality, including the Family-level Biotic Index, which utilizes aquatic macroinvertebrate diversity, richness, and pollution sensitivity as a bioindicator of water quality. Macroinvertebrates were collected from seven streams in the Bloomington-Normal area with sampling sites upstream and downstream of a restored riparian zone in each stream. Each sampling site consisted of three standardized macroinvertebrate samplers which were left in-stream for four weeks during the fall of 2022. After four weeks the samplers were collected and macroinvertebrates were preserved in ethanol. Macroinvertebrates from each sample will be counted and identified to family. We predict that if restoration is having an effect on streams, we will see improved water quality as measured by macroinvertebrate biotic indices from upstream to downstream on average. The results of this study will help indicate the effectiveness of riparian restoration on water quality.

## **PATHOLOGICAL ALTERATIONS IN DYSTROPHIC MUSCLE DURING MYOGENESIS**

Presenter: Jazireian, Parham  
Graduate, Biological Sciences

Mentor: Prof. Andrés Vidal-Gadea

Authorship: Parham Jazireian, Kiley Hughes, Emily Killian, Martin Engelke,  
Andrés Vidal-Gadea

Duchenne muscular dystrophy (DMD) is a degenerative disease caused by loss-of-function mutations in the gene encoding dystrophin affecting roughly 1 in 5000 males. It is characterized by elevated sarcoplasmic  $Ca^{2+}$  levels, muscle fiber damage and necrosis, loss of ambulation, and ultimately, death. Dystrophin has both structural and signaling functions in muscles, serving as a stabilizer during contraction and mediating the membrane localization of important ion channels. Recent evidence suggests that dystrophic phenotypes begin during embryogenesis. However, there is a lack of understanding about the development of dystrophic muscles compared to healthy ones. Particularly, it is not known to what extent the signaling and structural roles of dystrophin contribute to the onset of dystrophic phenotypes. This makes it important to study dystrophic muscles during their developmental stage. Dystrophic *C. elegans* lay translucent eggs that complete embryonic development within 14 hrs. and are amenable to experimental manipulation and observation. We used calcium ratiometry (GCaMP) to compare myogenesis in dystrophic and healthy nematodes. We found that sarcoplasmic calcium levels show an early increase in dystrophic muscles. We are currently using RNA interference to determine the relative contributions of the signaling vs structural roles of dystrophin to increased sarcoplasmic calcium levels. Understanding how the absence of dystrophin during myogenesis alters muscle physiology will be important for treatments aimed at reducing or reversing this impact.

## CHARACTERIZING THE ROLE OF P38KB AND GARS IN CHARCOT MARIE TOOTH DISEASE

Group Leader: Klos, Piotr  
Graduate Biological Sciences

Group Member: Lauren Naeger, Undergraduate, Biological Sciences

Mentor: Prof. Wolfgang Stein

Authorship: Piotr Klos, Lauren Naeger, MacKenna Duncan, Megan Cross,  
Julia Martin, Alysia Vrailas-Mortimer

Charcot-Marie-Tooth Disease (CMT) is a progressive neuropathology caused by the deterioration of neuronal function in the peripheral motor and sensory nervous systems. Motor symptoms include tripping, ankle twisting, and clumsiness, and sensory symptoms include sensations such as pins and needles and burning pain. There are no preventive therapeutics, but mutations in several tRNA-synthetase genes have been implicated in causing CMT. Though mutations in a variety of genes can give rise to CMT, several of the genes are tRNA-synthetases. We have recently found that the p38 MAPK (p38Kb), a kinase involved in aging and age-dependent locomotor deficits, regulates the levels of several tRNA-synthetase proteins during aging. p38Kb interacts with the Chaperone-Assisted Selective Autophagy (CASA) complex to mediate the degradation of misfolded or nonfunctional proteins, a process that contributes to clearing tRNA-synthetase proteins that are damaged from aging. Failure to clear damaged proteins may result in disease symptoms or worsening of symptoms. We hypothesize that p38Kb-mediated regulation of tRNA synthetase degradation is crucial for maintaining proper neuromuscular function. Utilizing *D. melanogaster*, we tested interactions between p38Kb and the tRNA synthetase GARS and how their contribution to CMT-like phenotypes in flies by measuring p38Kb-mediated clearance of mutant GARS. Western blots of p38Kb knockout flies indicated accumulation of GARS, but sucrose density gradient separation suggested that this accumulation was not aggregation-based. We also found that overexpression of p38Kb in fly muscles improved locomotor function, and that mutant GARS expression in the mesoderm was sufficient to induce neuropathology. In contrast, overexpression of p38Kb in motor neurons decreased locomotor function, indicating a possible tissue specific mechanism of p38Kb functionality. Overall, we have found that knockout of p38Kb in muscles increases GARS levels, and that p38Kb appears to have tissue-specific functionality.



## **COURSE-BASED UNDERGRADUATE RESEARCH EXPERIENCES TO ADVANCE SCIENCE COMMUNICATION SKILLS: A SYSTEMATIC REVIEW**

Presenter: Korkor, Ebenezer  
Graduate, Biological Sciences

Mentor: Prof. Rebekka Darner

Authorship: Ebenezer Korkor, Rebekka Darner

In this study, we performed a systematic literature review using review methods outlined by Bearman et al. (2012) to understand how course based undergraduate research experiences (CUREs) might foster scientific communication (SciComm) skills among undergraduate students. We explored the pedagogical strategies used in developing SciComm skills in undergraduates. Subsequently, we examined the literature on pedagogical strategies used in the implementation of CUREs, and then we did a comparative analysis to decipher point of intersection among pedagogical strategies used in CUREs and to foster SciComm. Most SciComm instructional strategies such as analyzing existing literature, blogging & Infographics, writing and/or summarizing reports and oral presentations have been successfully utilized in one or more CUREs, but they are underutilized. To harness the impact of CUREs, its implementation should be coupled with more explicit SciComm skill development and assessment, particularly regarding communication with lay audiences, which would better prepare students for the workplace, graduate school, and most importantly, as change agents in society.

## **VIGILANCE AND FORAGING BEHAVIOR IN EASTERN FOX SQUIRRELS (*SCIURUS NIGER*) IN RESPONSE TO ENVIRONMENTAL FACTORS**

Group Leader: Krivograd, Sophie  
Undergraduate, Biological Sciences

Group Member: Rylynn Heintz, Undergraduate, Biological Sciences

Mentor: Prof. Rebekka Darner

Authorship: Sophie Krivograd, Rylynn Heintz

The purpose of this research project is to investigate vigilance and foraging behaviors among Eastern fox squirrels (*Sciurus niger*). We sought to address four research questions. First, how does the proximity to safety impact the vigilance of fox squirrels? Second, how does the number of humans nearby affect fox squirrels' vigilance? Third, how does the time-of-day impact how often fox squirrels forage? Finally, how does precipitation affect fox squirrels' foraging behavior? This study is important due to its implications for understanding how habitat can influence behavior, how potential nearby threats can affect squirrel vigilance, and how environmental conditions impact squirrel foraging behavior. Squirrels have a significant role in the ecosystem; understanding what influences vigilance and foraging behaviors can help scientists understand the impact Eastern fox squirrels have on the ecosystem and their ecological interactions.

## **DOES INDIVIDUAL QUALITY AFFECT THE PRODUCTION OF A SECOND BROOD IN HOUSE WRENS (*TROGLODYTES AEDON*) IN ADDITION TO TIMING?**

Presenter: Leischner, Lauren  
Graduate, Biological Sciences

Mentor: Prof. Pirmin Nietlisbach

Authorship: Lauren Leischner, Charles Thompson, Scott Sakaluk, Pirmin Nietlisbach

Climate change affects the reproductive success of migratory species as they are limited by time and appropriate weather conditions during the breeding season. This research asked whether variation in individual quality, in addition to timing, explains some of the variation in production of a second brood. Female house wrens (*Troglodytes aedon*) that nest early often have high quality territory, may be in better condition, and have an increased probability of having a second brood. Because of this, it is unclear whether the production of a second brood is solely due to the constraints of time or also due to female quality. To test this question, we cross-fostered eggs between early, high quality females and later, low quality females. This leads to high quality females raising hatchlings later in the season than intended. We are able to examine the effect of quality while keeping the effect of time equal when comparing to control nests through this manipulation. If delayed, high quality females have a greater probability of producing a second brood compared to the controls, quality may affect the production of a second brood in addition to timing. An association of quality and the production of a second brood could suggest that the population is constrained to evolutionary change over time when responding to climate change. As climate change may extend favorable conditions during the breeding season, the population may benefit from this change if time is the only factor affecting the production of a second brood.

## **POTENTIAL PREDICTORS FOR VIGILANCE IN EASTERN GRAY SQUIRRELS (*SCIURUS CAROLINENSIS*)**

Group Leader: McLarty, Allie  
Undergraduate, Psychology

Group Member: Rachel Moore, Undergraduate, Biological Sciences

Mentor: Prof. Rebekka Darner

Authorship: Allie McLarty, Rachel Moore

The purpose of this research project is to investigate vigilance behavior among Eastern gray squirrels (*Sciurus carolinensis*). We sought to address four research questions. First, is there a relationship between sunny weather and vigilance in Eastern gray squirrels? Second, is there a relationship between vigilance in Eastern gray squirrels and the number of humans present? Third, is there a relationship between vigilance and habitat type? Finally, is there a relationship between vigilance and the number of conspecifics nearby? This study is important for better understanding why Eastern gray squirrels exhibit vigilance and if some stimulus are more likely to predict vigilant behavior over others.

## **POTENTIAL FOR PENNYCRESS TO IMPROVE FRESHWATER QUALITY IN THE UPPER MISSISSIPPI WATERSHED**

Presenter: Meyer, Ryan  
Graduate, Biological Sciences

Mentor: Prof. Bill Perry

Authorship: Ryan Meyer, Nicholas Heller, Bill Perry

Nutrient loading to freshwater systems is a key environmental issue concerning agriculture in the Upper Mississippi Watershed (UMW). In Illinois, EPA suggested nutrient reductions are being met by wastewater treatment and industrial facilities, but not by agricultural producers. Solutions are needed to reduce nutrient losses from agricultural fields. In the tile drained systems of the UMW, edge-of-field practices are not sufficient to meet nutrient reduction goals. In-field practices such as winter cover crops are a promising tool for agriculture to meet nutrient reduction targets. Pennycress, a new winter cash crop being domesticated for biofuel and animal feed purposes, may help meet nutrient reduction goals while also providing economic incentive to producers. Our objective is to quantify how pennycress may help the UMW meet nutrient reduction targets as a winter cash crop. Using replicated and independently drained 0.8ha plots we assessed the potential for pennycress to immobilize nutrients in-field and in subsurface drainage systems. Our results demonstrate that pennycress is an effective short-term, winter to spring nutrient sink. Pennycress use resulted in up to 5-fold reductions in soil porewater nitrate-nitrogen relative to fallow conditions and significant reductions in soil nitrate-nitrogen relative to fallow conditions. Additionally, pennycress reduced subsurface discharge, resulting in near zero nutrient export to freshwater systems. We show that by utilizing in-field nutrients pennycress may effectively eliminate nutrient export to freshwater systems during the winter fallow period of the UMW. The use of pennycress as a short-term nutrient sink will assist the UMW in meeting EPA nutrient reduction goals.

## PROSPECTS FOR HETEROLOGOUS EXPRESSION IN NEUROSPORA CRASSA

Presenter: Mierendorf, James  
Graduate, Biological Sciences

Mentor: Prof. Thomas Hammond

Authorship: James Mierendorf, Thomas Hammond

The filamentous fungus *Neurospora crassa* has been utilized in molecular research for decades, most notably in the fields of genetics and biochemistry. Despite this, *Neurospora*'s research value as a model system has been diminished by its recalcitrance towards expressing certain non-native DNA sequences inserted into its genome. Molecular techniques requiring such heterologous expression are largely incompatible with *Neurospora* research, despite being successfully implemented in other model systems. We propose this phenomenon results from heretofore unidentified native regulatory mechanisms encoded within the fungal genome which targets heterologous sequences for silencing and is itself susceptible to inactivation through mutation. To test this an experimental transgenic strain was created containing inexpressible cas9 sequence fused upstream of the native leucine synthesis gene *leu-1*. This renders the experimental strain auxotrophic, with a distinct poor growth phenotype in the absence of supplementation due to heterologous silencing activity. By subjecting the clonal conidia spores of the experimental strain to random mutagenesis by UV exposure, we successfully generated a mutant lineage in which heterologous silencing of the construct has been disrupted. Here we demonstrate that this heterologous expression positive (hep) mutation is heritable and resides within the third chromosome of *N. crassa*.

## **FORAGING AND SOCIAL BEHAVIORS IN EASTERN FOX SQUIRRELS (*SCIURUS NIGER*)**

Group Leader:        Nguyen, Kathleen  
                             Undergraduate, Biological Sciences

Group Member:      Kendy Reyes-Cruz, Undergraduate, Biological Sciences

Mentor:                Prof. Rebekka Darner

Authorship:          Kathleen Nguyen, Kendy Reyes-Cruz

The purpose of this research project is to explore foraging and social behaviors among Eastern fox squirrels (*Sciurus niger*). We sought to address four research questions. First, is there a significant difference between foraging times in fox squirrels near conspecifics versus in the absence of them? Second, how does number of conspecifics influence alert foraging behavior in fox squirrels? Third, are fox squirrels in core college campuses more social than squirrels in deciduous forests? Finally, how does the number of humans influence vigilance in fox squirrels? This study is important due to its implications for understanding habitat alterations' impact on squirrel behavior. Squirrels are important organisms for tree seed dispersal, and if habitat alteration impact squirrel behavior in a way that prevents them from being able to disperse seeds that promote tree growth or to forage, this would result in larger ecological implications. This study would also highlight ways in which Eastern fox squirrels maintain healthy population sizes in the context on habitat degradation.

## **FUNCTION OF DYSTROPHIN ISOFORMS IN THE NERVOUS SYSTEM**

Presenter: Niha, Shifat  
Graduate, Biological Sciences

Mentor: Prof. Andrés Vidal-Gadea

Authorship: Shifat Niha, Andrés Vidal-Gadea, Adina FazyI

Duchenne Muscular dystrophy (Dmd) is a degenerative disease caused by mutations in the gene encoding the dystrophin protein. The dystrophin protein (DYS-1) plays an important structural role for both muscles and neurons. Loss of dystrophin leads to muscle degeneration and is often accompanied by neurological impairments. Several isoforms of dys-1 are expressed throughout the nervous system; however, the exact functional role of these isoforms in neurons is still not fully understood. How the loss of the gene leads to known neurological phenotypes of this disease is also unknown. The goal of this study is to map out the neuronal expression of the dystrophin isoforms, their role in the nervous system, and how their loss leads to the neurological phenotypes of DMD. Preliminary data has shown that different isoforms of dys-1 being expressed in different neurons resulting in certain behavioral defects. The completion of this study will allow us to get a better understanding of the function of dystrophin in the nervous system and the cognitive defects associated with the loss of the gene.



## CHARACTERIZATION OF THE SILVER-CONTAINING NOVEL ANTIMICROBIAL AGXX®

Presenter: Orellano, Carl  
Undergraduate, Biological Sciences

Mentor: Prof. Jan-Ulrik Dahl

The development of antimicrobial resistance is a growing public health concern, which is intensified by the lack in the discovery of new novel antibiotics. The opportunistic pathogen *Pseudomonas aeruginosa*, which is found, among others, in patients with cystic fibrosis, burn wounds, and urinary tract infections, is characterized by its high intrinsic antibiotic resistance. *P. aeruginosa* has evolved many mechanisms that contribute to its pathogenesis, including its ability to form biofilms and produce and release a plethora of virulence factors upon infection, which require novel treatment regimens. The silver and ruthenium-based antimicrobial surface coating AGXX® has recently been shown to kill multi-drug resistant gram-positive bacteria through the production of reactive oxygen species (ROS), while it was non-cytotoxic to mammalian cells. However, how gram-negative bacteria, such as *P. aeruginosa*, respond to and defend AGXX® is currently unknown. In my work, I exposed the *P. aeruginosa* strain, PA14, to increasing concentrations of different AGXX® formulations (AGXX894 and AGXX720C) and compared their survival, growth behavior, and virulence factor production. My growth and survival data indicate that AGXX894 is more potent in killing PA14 as lower concentrations were needed to see substantial killing. Exposure of PA14 to sublethal AGXX720C concentrations resulted in elevated production of pyocyanin, a ROS-generating compound. AGXX720C induced changes in pyoverdine and pyochelin levels, two molecules that aid in iron intake. These were in stark contrast as pyoverdine levels were increased and pyochelin production decreased. Rhamnolipids, a factor that aids in quorum sensing, motility, and biofilm formation, showed declined levels upon exposure of PA14 to AGXX720C. A deeper understanding of how *P. aeruginosa* respond to this ROS-generating antimicrobial may provide insights into how they develop resistance and ideas on how to develop treatments more efficiently.

## **PLASTICITY IN THE COMPOSITION OF NUPTIAL GIFTS IN RESPONSE TO VARYING RISK OF SPERM COMPETITION: A MOLECULAR DISSECTION OF A POTENTIAL GENOTYPE x ENVIRONMENT INTERACTION IN DECORATED CRICKETS**

Presenter: Rengifo, Laura  
Graduate, Biological Sciences

Mentor: Prof. Ben Sadd

Co-Mentor: Prof. Scott Sakaluk

Authorship: Lauren Rengifo, Bert Foquet, Scott Sakaluk, Ben Sadd

Although mating in sexually reproducing species is a necessity, the male and female interests during and after mating may be at odds, leading to sexual conflict. In polyandrous systems in which females mate with multiple males, females can derive indirect genetic benefits by producing offspring with different sires. However, males benefit by monopolizing female reproduction, and have evolved manipulations to this end. This includes plastically increasing sperm allocation under a high risk of sperm competition, when females are likely to mate with additional males. However, less is known about plasticity in non-sperm components of the ejaculate. Nuptial gifts provisioned to females by males are a widespread sexual tactic in insects used by males to maximize sperm transfer. In decorated crickets, *Gryllodes sigillatus*, the gift comprises a portion of the spermatophore, the spermatophylax, that the male transfers at mating. Proteins in the spermatophylax may function to modify female behavior and physiology to increase male paternity. By experimentally varying the perceived risk of sperm competition of males derived from genetically distinct lines, I will test the hypothesis that sperm competition risk and male genotype influence the composition of food gifts. Specifically, I will assay gene expression profiles of accessory-gland proteins putatively involved in sexual conflict. A molecular dissection of the ability of males of different genotypes to plastically modify the composition of their gifts in response to increased sperm competition risk will deepen our understanding of the importance of sexual conflict in the evolution of nuptial gifts.

## **INVESTIGATING THE EFFECTS OF LATE CORTICOSTERONE EXPOSURE ON EMBRYONIC DEVELOPMENT**

Presenter: Roseland, Anna  
Undergraduate, Biological Sciences

Mentor: Prof. Ryan Paitz

Authorship: Anna Roseland, Ryan Paitz

Investigating embryos within the first few weeks of development allows for further understanding of embryonic endocrinology and their responses to their environment. Previous investigations demonstrated that early embryonic exposure to glucocorticoids was lethal, but this lethal effect could be prevented by pharmacologically blocking the glucocorticoid receptor with the drug RU486. However, administering RU486 early in development led to decreased embryo mass by day fourteen of development. To further study the effect of RU486 and cortisol on growth and survival later in development, chicken eggs were given late exposure on day six of development to cortisol and RU486. The hypothesis of this experiment was that late exposure will not affect mortality rates while simultaneously limiting the decrease in birth weight. The aim of this study was to determine if late exposure to RU486 and cortisol would continue to decrease mortality while also maintaining birth weight of the embryos, and to compare the findings. To conduct this experiment, chicken eggs were injected with a control group of oil along with the experimental groups RU486 and cortisol. The eggs were removed from the incubator, removed from their shells, and weighed on day fourteen of development. There was not a significance of any treatment on mortality. Embryos that were injected with cortisol averagely weighed more than the eggs injected with RU486, but less than the eggs injected with oil. The embryos exposed to RU486 injections resulted in the lowest birth weights. This study shows that late injection of cortisol and RU486 did not have a significant effect on mortality, unlike the lethality resulting in early exposure. However, cortisol and RU486 exposure continued to decrease birth weight similarly to early injection.

## PEPTIDE MODULATION ENABLES TEMPERATURE ROBUSTNESS IN PATTERN-GENERATING NEURONS OF DUNGENESS CRAB

Presenter: Sanford, Mason  
Graduate, Biological Sciences

Mentor: Prof. Wolfgang Stein

Authorship: Mason Sanford, Wolfgang Stein

The abnormal rise in ocean temperatures and the persistent extreme weather conditions over the last few decades pose significant challenges for marine wildlife. Ectothermic aquatic animals that live in the intercoastal areas are the most affected since they experience a wide range of temperatures, and their body temperature closely mirrors the ambient temperature. Maintaining nervous system function in extreme temperature conditions is particularly critical because the nervous system controls various biological processes, including decision-making, respiration, and other vital behaviors. The extent to which nervous systems are temperature-sensitive and how much rising environmental temperatures affect neurons and their activities are currently being investigated. Still, recent studies have suggested the release of peptide neuromodulators, either hormonally or by neurons, enables the nervous system to become more robust against extreme temperatures.

We investigate the effects of neuromodulation on temperature robustness using the crustacean stomatogastric nervous system (STNS), an established model for studying how neural circuits generate rhythmic behaviors. The STNS contains well-studied central pattern generators (CPGs), making it ideal for studying temperature sensitivity in neural circuits. We compare temperature robustness in three crab species: *Cancer borealis* (Jonah Crab), *Cancer magister* (Dungeness Crab), and *Callinectes sapidus* (Blue Crab). Data from *Cancer borealis* suggested that increased temperatures cause the CPG to become less excitable, eventually ceasing neuronal activity. Studies have also shown that the release of peptides from neuromodulatory neurons that innervate the CPG increases excitability and contributes to how tolerable the nervous system is when exposed to excessive temperatures. We hypothesize that this is a general mechanism by which neurons achieve temperature robustness.

In this study, we test whether neuropeptide release increases temperature robustness also in *Cancer magister*. Using electrophysiology, we will isolate the nervous system, record rhythmic CPG activity, and then expose the CPG temperature until it is arrhythmic. We will then increase neuropeptide release from modulatory projection neurons by raising the bath temperature in which they are located. We predict that this will restore rhythmic CPG activity.

Our preliminary data show that the CPG became arrhythmic within 4-5 °C (n=2) when only the CPG was heated. However, when the modulatory projection neurons were heated up along with the CPG, the rhythmic activity was maintained at a much higher temperature (8-9 °C). This suggests that peptide neuromodulation plays a critical role in the temperature robustness of the STNS in *Cancer magister* and that this phenomenon is not idiosyncratic to one crab species.

## **MAINTAINING ORDER IN THE GUT: THE ROLE OF HOST IMMUNITY IN SHAPING MICROBE COLONIZATION OF THE BUMBLE BEE GUT**

Presenter: Shosanya, Teni  
Undergraduate, Biological Sciences

Mentor: Prof. Ben Sadd

Authorship: Teni Shosanya, Logan Sauers, Bert Foquet, Ben Sadd

Organisms harbor microbial communities termed microbiota, with gut microbiota often important for many aspects of health including digestion, detoxification and infection resistance. Factors shaping the composition of these communities and thus their functional effects on host health are therefore critical. Host immunity is proposed to play a role in determining microbiota structure, but the importance of innate immunity has not been extensively investigated in systems with relatively consistent and vertically transmitted microbiota. Members of the beneficial microbial communities in bumble bee guts have been shown to be vertically transmitted and have specific patterns of colonization depending upon the host and bacterial genotypes. I hypothesize that the innate immune system of the bumble bee determines community composition, by limiting the colonization of foreign microbes while maintaining native microbial strains. I will investigate the interaction between the innate immune system and the beneficial gut microbial community using RNA interference (RNAi) to knock down the Toll and IMD antimicrobial pathways combined with cross inoculation of microbiota native and foreign to the host lineage. We anticipate that the colonization of the foreign microbiota will be closer to that of the native in knockdown treatments, as host control is reduced. Currently, RNAi knock down of immune genes is being validated to use in this approach. Understanding the effect of host immunity on the structure of their microbial communities will add to our knowledge of the evolution of these interactions and factors moderating them.

## A TWO-PRONGED APPROACH TO CHARACTERIZE A NOVEL Na, K-ATPASE INVOLVED IN ADAPTATION OF BRINE SHRIMP TO HIGH-SALINITY ENVIRONMENTS

Group Leader: Strandquist, Evan  
Graduate, Chemistry

Group Members: Julia Retter, Undergraduate, Biological Sciences; PJ Patterson, Undergraduate, Biological Sciences; Cameron Tyler, Undergraduate, Biological Sciences

Mentor: Prof. Craig Gatto

Authorship: Julia Retter, PJ Patterson, Tyler Cameron, Kerri Spontarelli, Craig Gatto, Evan Strandquist

Brine shrimp (*Artemia*) are members of an elite club of animals that can survive in the high-salinity waters of inland salt lakes. Many animals cannot survive in these environments because of the extreme osmotic and ionic forces present in these environments. Previous work by the Gatto group found that *Artemia* utilize an isoform of the Na, K-ATPase, named  $\alpha 2\text{KK}$ , which pumps out 2  $\text{Na}^+$  and takes in 1  $\text{K}^+$  every cycle, as opposed to the otherwise ubiquitous stoichiometry of 3  $\text{Na}^+$  : 2  $\text{K}^+$  observed in all other isoforms of the Na, K-ATPase. We believe that this novel pump is related to *Artemia*'s osmoregulation and the organism's capacity to survive in the demanding environment. Analysis of the Na, K-ATPase activity was performed using a two-pronged approach involving both electrophysiological and chemical kinetic means. As the pump works, a net +1 charge is exported from the cell. This movement of charge creates a current that is related to the membrane potential of the cell. Two-electrode voltage clamping (TEVC) is an electrophysiological technique that allows for the study of cell membrane voltage and changes in current produced by ion transporters by inducing a voltage potential and measuring the reactionary current produced as the pump functions. When used in conjunction with the *Xenopus laevis* oocyte expression system, TEVC is an invaluable and universal tool to study the Na, K-ATPase. The work described involves the analysis of a dose-response analysis of oocytes expressing  $\alpha 2\text{KK}$  to the steroidal Na, K-ATPase inhibitor ouabain. Our results show that the  $\alpha 2\text{KK}$  isoform of the Na, K-ATPase has a significantly higher  $K_{0.5}$  than uninjected controls, suggesting that this novel isoform has a remarkable resistance to inhibition by ouabain. In addition to TEVC, chemical kinetic analyses were performed. Hydrolysis of ATP by the pump produces inorganic phosphate ( $\text{P}_i$ ), which can be measured using a molybdate-based colorimetric assay. Dose response to the substrate  $\text{K}^+$  can be performed to characterize the protein, reported as  $K_M$ . This work contributes to a growing body that characterizes this fascinating  $\alpha 2\text{KK}$  isoform.

## CHARACTERIZING A NOVEL NA, K-ATPASE ASSOCIATED WITH BRINE SHRIMP ADAPTATION IN HIGH OSMOLARITY ENVIRONMENTS

Group Leader: Strandquist, Evan  
Graduate, Chemistry

Group Members: Kathleen Nguyen, Undergraduate, Biological Sciences; Gracie Trader,  
Undergraduate, Biological Sciences

Mentor: Prof. Craig Gatto

Authorship: Kathleen Nguyen, Gracie Trader, Alyvia Hogge, Kerri Spontarelli,  
Craig Gatto, Evan Strandquist

Brine shrimp (*Artemia*) are a model organism that live in high-salinity inland lakes. These organisms have adapted mechanisms of water retention and changes to proteins that transport ions across membranes in order to fight enormous osmotic and ionic gradients. Previous investigations from the Gatto laboratory reveal that *Artemia* express a novel isoform of the Na, K-ATPase ( $\alpha 2\text{KK}$ ) that has a stoichiometry of  $2\text{Na}:1\text{K}$ , as opposed to the ubiquitous stoichiometry of  $3\text{Na}:2\text{K}$  seen in all other Na, KATPases recorded in nature. It is hypothesized that this isoform is upregulated when shrimp are introduced to a high-salt environment, as its novel stoichiometry facilitates this organisms unique survival in an extreme, saline environment. To study the  $\alpha 2\text{KK}$  isoform, various molecular biological techniques were used to insert modified subunits of the Na, K-ATPase into frog (*Xenopus laevis*) oocytes for characterization of the Na, K-ATPase via Two-Electrode Voltage Clamping (TEVC). TEVC is an important technique to analyze ion pump activity, as each catalytic cycle results in a net charge moving out of the cell. The potential difference (voltage) across the membrane is maintained by a flow of charge through an injector electrode, which is controlled and recorded by the instrument. An increase in the injected current required to maintain a constant membrane potential represents an increase in the activity of the Na, K-ATPase, as more current injected into the cell is required to equilibrate the increased loss of charge by pump activity. The data presented below represents the techniques used to insert a gene into a plasmid, transcribe it, and produce mRNA for oocyte injection. We successfully transformed NEB5 $\alpha$  E. coli cells with a control  $\alpha$ -subunit isoform of the Na, K-ATPase, though we were unable to successfully construct the corresponding  $\beta$ -subunit. Despite this, the *X. laevis* oocyte expression was successfully utilized in combination with TEVC to analyze isoforms of the Na, K-ATPase. Specifically, the Na, K-ATPase isoform sensitivity to the steroidal inhibitor ouabain was studied. Previous studies suggest that oocytes expressing the  $\alpha 2\text{KK}$  Na, K-ATPase have demonstrated significant resistance to ouabain relative to *X. laevis* wild-type. We studied this more carefully via TEVC by measuring the dose-response of current to increasing amounts of ouabain. Remarkably,  $\alpha 2\text{KK}$ -expressing oocytes demonstrated a much higher  $K_{0.5}$  (134  $\mu\text{M}$ ) for ouabain than uninjected oocytes ( $<1\mu\text{M}$ ). This work contributes to a growing body that describes this novel Na,K-ATPase.

## CHARACTERIZING NA, K-ATPASE ISOFORMS IN ARTEMIA GROWN IN LOW AND HIGH SALT

Group Leader: Strandquist, Evan  
Graduate, Chemistry

Group Member: Emily Pranskevicius, Undergraduate, Biological Sciences

Mentor: Prof. Craig Gatto

Authorship: Emily Pranskevicius, Michael Marcheschi, Joe Boyer, Craig Gatto  
Evan Strandquist

The Na, K-ATPase is a heterodimeric transmembrane protein found in all animal cells that is essential in maintaining the membrane potential. The stoichiometry of the Na, K-ATPase is three Na<sup>+</sup> transported out of the cell for two K<sup>+</sup> transported into the cell, at the cost of one equivalent of ATP to power the reaction. Interestingly, the brine shrimp (*Artemia*) maintains a novel isoform of the  $\alpha$ -subunit of the Na, K-ATPase ( $\alpha$ 2KK) that has different stoichiometry of 2 Na<sup>+</sup> and 1 K<sup>+</sup> at the cost of one ATP molecule. This novelty is quite rare in the animal world, as is the ability of *Artemia* to survive in such high salinity environments as those of the inland salt lakes. It is possible that this unique isoform of the Na, K-ATPase is upregulated to overcome the high osmolarity environment that give the brine shrimp their common name. The goal of this work was to characterize and compare the Na, K-ATPase isolated from *Artemia* that was lab-grown in either low- or high-salt environments. Characterization was performed using a dose-response colorimetric assay, indirectly measuring Na, K-ATPase activity by monitoring the formation of phosphate as a product of ATP hydrolysis. Kinetic data of Na, K-ATPase protein preparations from the low salt and high salt growth conditions were collected for the Na<sup>+</sup> substrate. We found that Na, K-ATPase preparations from *Artemia* grown in 250 mM salt water indicated a  $K_M$  of 3.6 mM Na<sup>+</sup>, while the protein extracted from *Artemia* grown in 2 M salt water showed a similar  $K_M$  of 3.5 mM. The  $K_M$  values are the same, suggesting the binding affinity for Na<sup>+</sup> of the Na, K-ATPase present in the preparations are not different. This is an interesting finding, as transcriptomics suggest a significant change in expression levels of the  $\alpha$ 2KK isoform when *Artemia* are raised in high salt. Additional work is recommended to further characterize the protein preparations of *Artemia* in different conditions, to be performed in tandem with gene expression analyses. Finally, this work is the result of the investigator's involvement in a CURE course, a multilevel training experience that reinforced scientific skills at both the undergraduate and graduate levels, while providing training to graduate students as future mentors. This work was supported by NSF grant MCB-2003251.



## THE EFFECTS OF HEMIPARASITIC PLANTS ON INTRASPECIFIC AND INTERSPECIFIC COMPETITION IN NATIVE PRAIRIE SPECIES

Presenter: Thompson, Margaux  
Undergraduate, Biological Sciences

Mentor: Prof. Victoria Borowicz

Authorship: Margaux Thompson, Victoria Borowicz

In Illinois, multiple factors have reduced the extent and threatened the functioning of native prairies. Consistent with other ecological communities, competition between species in prairie grasslands is prevalent and for threatened or endangered prairie species, interspecific competition could lead to local extinction. A novel idea to manage interspecific competition among prairie species is the addition of hemiparasitic plants. Hemiparasites are green plants that attach to the vascular system of neighbors and steal water, minerals, and other nutrients to the detriment of the host. Hemiparasites are hypothesized to be keystone species in a community if they promote increased species diversity. For the keystone effect to occur, less competitive species must gain greater access to resources in the presence of hemiparasites, resulting in species coexistence and increased species diversity. However, if the less competitive species is more strongly suppressed by the hemiparasite, it could be competitively excluded, depressing community diversity. In our experiment, we test the keystone hypothesis and postulate that the annual hemiparasitic species *Agalinis tenuifolia* promotes coexistence by more strongly reducing growth of the competitive dominant in interspecific competition. In order to test this hypothesis, we need to compare the effects of competition between two species without the interference of the hemiparasite and when the hemiparasite is present. We will determine the strength of competition between pairs of host species, by measuring the growth of a single target plant when grown with 0, 1, 2, or 4 competitors of the same (intraspecific competition) or other species (interspecific competition). If our hypothesis is supported, growth of competing species should be more even in the presence of *A. tenuifolia*.

## **DECIPHERING THE MECHANISMS UNDERLYING THE LETHAL CONSEQUENCES OF EMBRYONIC EXPOSURE TO CORTICOSTERONE**

Presenter: Tillman, Libby  
Undergraduate, Biological Sciences

Mentor: Prof. Ryan Paitz

Authorship: Libby Tillman, Ryan Paitz

During stressful events, vertebrates increase their production of glucocorticoids in order to help coordinate a physiological response to the stressor. However, if developing embryos are exposed to elevated glucocorticoids, that can result in decreased embryo weight and even embryonic death. These effects are thought to arise in the embryos because glucocorticoids activate the glucocorticoid receptor and induce inappropriate gene expression. In this experiment, we tested the hypothesis that blocking activation of the glucocorticoid receptor prevents early embryonic death. To block the receptor, RU486, an inhibitor that blocks the glucocorticoid receptor and prevents these receptors from binding to glucocorticoids, was injected into chicken eggs already injected with glucocorticoids (corticosterone). Oil (control) and corticosterone alone were also injected into the eggs. After being incubated for fourteen days, the embryos were dissected from their shells and weighed. Injections of cortisol resulted in decreased embryo mass and survival rate. Injections of RU486 plus corticosterone prevented the negative effect of corticosterone on embryo survival rate, but surviving embryos were smaller than control embryos. These results illustrate that activation of the glucocorticoid receptor is necessary to induce the pathways that result in embryonic mortality. Depression Scale, to self-report trait anxiety. Then, they will complete two working memory tasks and a long delay prospective memory task to test the researcher after a several hours or a few days. We predict that elevated levels of anxiety will have a negative effect on both working memory and performance in the prospective memory task.

## HOW DOES COLD SNAP EXPOSURE AFFECT SEX DETERMINATION IN A FRESHWATER TURTLE?

Presenter: Warren, Clinton  
Graduate, Biological Sciences

Mentor: Prof. Rachel Bowden

Co-Mentor: Prof. Ryan Paitz

Authorship: Clinton Warren, Anthony Breitenbach, Rachel Bowden, Ryan Paitz

In species with temperature-dependent sex determination, temperatures above or below a threshold result in the formation of either an ovary or a testis. Although these thresholds exhibit limited variation within species, individuals vary in the time it takes to respond to a thermal cue. Consequently, we are characterizing temporal variation as a metric of thermal responsiveness to warm and cool temperatures in red-eared slider turtle embryos (*Trachemys scripta*). We previously demonstrated that an 8-day heat wave is enough to induce ovary formation and produce a female-biased sex ratio but that embryos become less responsive to heat wave conditions with further development at cooler baseline temperatures. Here, we similarly exposed embryos to cold snaps at varying points in development from warmer baseline conditions. We predicted that responsiveness to cold snaps would decrease with developmental stage as embryos spent more time at baseline conditions. Lastly, we examined the necessary length of cold snap exposure needed to produce a male-biased sex ratio. We found that cold snaps beginning on incubation day 14 were early enough to induce testis formation as indicated by increased expression of the testis-producing gene *Dmrt1* and suppression of the ovary-producing gene *Cyp19A1* across development in embryonic gonads. Conversely, cold snap treatments beginning on incubation day 18 or 22 both resulted in an eventual rise in *Cyp19A1* expression and either minimal or unchanged *Dmrt1* expression, suggesting responsiveness to cold snaps decreased with developmental stage. Furthermore, sex ratio data revealed that embryos swapped to cold snap conditions on incubation day 14 require 21-24 days of exposure to commit to males; roughly 13-16 days longer than that previously shown for heat waves to produce a female-biased sex ratio, suggesting sexual development in *T. scripta* is more responsive to warm than cool thermal cues.

## LIVER X RECEPTOR HELPS PROTECT EMBRYOS FROM CORT INDUCED MORTALITY

Presenter: Waters, Sara  
Undergraduate, Biological Sciences

Mentor: Prof. Ryan Paitz

Co-Mentor: Prof. Emily Harders

Authorship: Sara Waters, Ryan Paitz, Emily Harders

During times of stress, developing embryos can be exposed to elevated levels of glucocorticoids and this can be lethal for the embryo. To protect themselves from glucocorticoid exposure, extraembryonic membranes contain the enzyme 5 $\beta$ -reductase (AKR1D1) to convert maternally derived glucocorticoids into inactive metabolites. Given this important role of this enzyme in development, we wanted to better understand how AKR1D1 levels are regulated. One potential receptor involved in the regulation of AKR1D1 is Liver X Receptor (LXR) since it is a nuclear receptor activated by a variety of cholesterol derivatives present in the yolk. When activated, it acts as a transcription factor and increases expression of a target gene, in this case, AKR1D1. We hypothesized that LXR regulates the expression of AKR1D1 to confer protection against the lethal effects of corticosterone. To test this, we injected chicken (*Gallus gallus*) eggs with either oil, a LXR inhibitor, corticosterone, or a combination of LXR inhibitor and corticosterone on day zero of development. We incubated the eggs for 14 days, then determined the proportion of embryos that survived. We found being exposed to corticosterone while LXR was inhibited significantly reduced survival compared to when embryos were exposed to only cort ( $p = 0.0277$ ). Ongoing studies are characterizing the effect of LXR inhibition on AKR1D1 expression. By understanding how AKR1D1 is regulated, we can learn more about the capacity of embryos to protect against glucocorticoid exposure early in development.

## CHEMISTRY

### AN ASYMMETRIC GLYCOLATE ALDOL ADDITION STRATEGY FOR THE PREPARATION OF A P1-STRUCTURALLY MODIFIED DARUNAVIR DERIVATIVE WITH AN AROMATIC MOTIF: STEREOSELECTIVE SYNTHESIS OF $\alpha$ -NAPHTHARUNAVIR

Presenter: Bambalas, Lillian  
Undergraduate, Chemistry

Mentor: Prof. Shawn Hitchcock

Authorship: Emmanuel Ayim, Jasmine Service, Shawn Hitchcock

Darunavir is a potent non-peptidic HIV-1 protease inhibitor developed by Ghosh and coworkers.<sup>1</sup> Darunavir was approved by the Food and Drug Administration accelerated approval for treating drug-experienced adults who do not respond to therapy with other anti-retroviral drugs. Ultimately, darunavir was approved for the treatment of patients with HIV/AIDS infection. Even though darunavir has received much success, there is an ongoing search to structurally modify the core structure to increase the efficacy of darunavir. In this regard, our research group is interested in the synthesis of structurally modified derivatives of darunavir in order to determine if our proposed changes would lead to increase efficacy in *in vitro* studies.

The process involves reducing the commercially available 1-naphthylacetic acid with borane to the corresponding naphthyl alcohol. This product was then oxidized to the corresponding aldehyde by using the Swern oxidation using dimethylsulfoxide as a reactant with oxalyl chloride at -78 °C. This process gave rise to the aldehyde as determined by <sup>1</sup>H NMR spectroscopy. With the aldehyde available, our synthetic work will be focused on conducting an asymmetric aldol addition reaction using an N-methoxyphenoxylacetyl-1,3-oxazolidine-2-thione chiral auxiliary. The product of the asymmetric aldol addition reaction is anticipated to be a single diastereomer that will be taken through of transamidation using isobutylamine. The product of this product is expected to be the corresponding N-isobutyl amide. The molecular structure of this compound will be confirmed through a combination of <sup>1</sup>H and <sup>13</sup>C NMR spectroscopy, infrared spectroscopy, and high resolution mass spectrometry.

The amide will be reduced using borane generated *in situ* to afford the corresponding beta-aminoalcohol, and this material in turn will be treated with two equivalents of *para*-nitrobenzenesulfonyl chloride to create a beta-*p*-nitrobenzenesulfonamido-*p*-nitrobenzene nosylate. Reaction of this intermediate with sodium azide in dimethylsulfoxide is expected to cause nucleophilic substitution to yield the azide. The overall synthesis is planned to be concluded by oxidatively cleaving the *p*-methoxyphenoxy (PMP) protecting group. Finally, reduction of the nitro group of the *para*-nitrobenzenesulfonamide and the azido functional group in the presence of the darunavir bis(tetrahydrofuran)carbonate will yield the desired target of the P1-naphthyl modified system.

1. Ghosh, A. K.; Sridhar, P. R.; Leshchenko, S.; Hussain, A. K.; Li, J.; Kovalevsky, A. Y.; Walters, E. Wedekind, J. E.; Grum-Tokars, V.; Das, D.; Koh, Y.; Maeda, K., Gatanaga, H.; Weber, I. T.; Mitsuya, H. Structure-Based Design of Novel HIV-1 Protease Inhibitors to Combat Drug Resistance. *J. Med. Chem.* 2006, 49, 5252-5261.

## **A MODIFIED 3D-PRINTED CONE SPRAY IONIZATION (3D-PCSI) SOURCE FOR ON-SITE, TRACE FORENSIC EVIDENCE PROCESSING VIA INTEGRATED VACUUM COLLECTION**

Presenter: Bondzie, Ebenezer  
Graduate, Chemistry

Mentor: Prof. Christopher Mulligan

Authorship: Adewale Adehinmoye, Christopher Mulligan

Trace evidence (e.g., fibers, hair, soil/dust, gunshot residue (GSR), etc.) has long been of value to forensic investigations, as it can potentially associate suspects with specific crimes and/or crime scenes or identify individuals via DNA typing. The vacuum-based collection is commonly employed at crime scenes for this, and the filtration media employed is processed at off-site facilities. Often, these are targeted efforts, and exogenous chemical residues that could be of investigative value are not examined. Here, we report a novel MS ion source that integrates vacuum collection of trace evidence, as well as extraction, filtration, and ionization, from a singular vessel, allowing simplistic and reliable usage in field by non-technical operators via portable MS systems.

Post-processing of filtration media via MS methods can allow complimentary, chemically specific information to be collected after targeted, trace physical evidence has been removed. The intention here is to collect as much ancillary information from collected evidence as possible. To demonstrate and evaluate the utility and performance of vacuum collection 3D-PCSI-MS, mock scenarios were generated to mimic crime scenes commonly probed for trace forensic evidence, including clothing samples and automotive upholstery surfaces. Systematic studies were undertaken to determine the detection limit, robustness, repeatability, and reliability of this combined sampling and analysis method. Here, it was established that vacuum collection had the capability to sample material weights as low as 1  $\mu\text{g}$ , and analyte-specific detection limits were found to be in the mid-nanogram range

## **EFFORTS TOWARD N-HETEROCYCLIC CARBENE (NHC)-CATALYZED INTRAMOLECULAR OXIDOPYRYLIUM-BASED [5+2] CYCLOADDITIONS**

Presenter: Darko, Kwabena  
Graduate, Chemistry

Mentor: Prof. Andy Mitchell

The cycloaddition reaction is an important transformation in the field of organic chemistry since it serves as an indispensable tool in organic synthesis. The oxidopyrylium-based [5+2] cycloaddition reaction has received enormous attention in chemical synthesis due to its usefulness in the formation of seven-membered heterocyclic ring systems present in bioactive complex natural product. Previous work revealed [5+2] cycloadditions at room temperature for enamine-based reactions.

The aim of this work is to provide an alternate method to generate electron-rich dipolarophiles. A silyloxyprone- $\alpha$ -chloroaldehyde generated from the corresponding silyloxyprone-aldehyde was treated with the NHC catalyst and Et<sub>3</sub>N. Despite not obtaining the desired cycloadduct, adding alcohols afforded esters in moderate yields (25-72% yield). This provides evidence for the formation of the key Breslow intermediate needed to obtain the NHC-catalyzed [5+2] cycloaddition. Work is still ongoing in the Mitchell research group to subject the silyloxyprone-esters synthesized to enolate chemistry.

## **CATALYSIS BY THE ENZYME GLYCEROL KINASE FROM THE THERMOPHILIC ORGANISM SULFOLOBUS ISLANDICUS**

Presenter: Drew, Emily  
Undergraduate, Chemistry

Mentor: Prof. Jon Friesen

Authorship: Emily Drew, Sara Walis, Caleb Welsh, Jon Friesen

*Sulfolobus islandicus* is a thermophilic organism that grows in hot springs under high acidity and temperature. In order for a cell to grow and divide a variety of protein molecules, called enzymes, are needed to catalyze a multitude of chemical reactions. We have studied catalysis by a specific enzyme called glycerol kinase. Glycerol kinase catalyzes the first step of glycerol metabolism by transforming glycerol into glycerol 3-phosphate. To synthesize the recombinant glycerol kinase protein, we employed *E. coli* cells (BL21(DE3) RIPL) that contained the gene encoding *Sulfolobus islandicus* glycerol kinase. We expressed the protein by ligating the amplified DNA into the plasmid vector pET-45b and transforming the vector into *E. coli* cells. The protein was then successfully purified before being assayed. The protein was then assayed to determine the varying concentration between the fractions obtained from the purification process. After determining which fractions of the wash column contained the highest concentration of glycerol kinase, we performed phosphorus NMR to ensure that the enzyme successfully transformed glycerol and ATP into glycerol 3-phosphate and ADP. After a successful round of phosphorous NMR displayed a peak for glycerol 3-phosphate, we then began the identification of ideal conditions for glycerol kinase. The ideal time for glycerol kinase to react was the first aspect tested. The enzyme was permitted to work at various time intervals along with a control group. A phosphorous NMR was then run and when analyzing the data, the intended product of glycerol 3-phosphate was found to be produced at all time intervals but showed higher efficiency at 4 minutes. The ideal temperature was determined next by allowing the enzyme to be placed in water baths at various temperatures for 15 minutes. When analyzing the phosphorous NMR, it was determined that glycerol 3-phosphate was produced at temperatures of 55°C and 75 °C. The ideal divalent cation and amount of enzyme will be the next conditions to be tested.



## INVESTIGATING THE INTERACTIONS BETWEEN $[\text{Re}_6\text{Se}_8]^{2+}$ CLUSTERS AND TBDPS MALTOL

Presenter: Ingram, Kalli  
Undergraduate, Chemistry

Mentor: Prof. Lisa Szczepura

Authorship: Kalli Ingram, Lisa Szczepura

The synthesis of  $[\text{Re}_6\text{Se}_8]^{2+}$  clusters has been widely studied throughout the years. In particular, the reactivity of  $[\text{Re}_6\text{Se}_8]^{2+}$  clusters has been examined in terms of ligand coordination. However, cyclization reactions between  $[\text{Re}_6\text{Se}_8]^{2+}$  clusters and organic compounds are widely unstudied. We are investigating the cyclization abilities of  $[\text{Re}_6\text{Se}_8]^{2+}$  clusters and protected maltol. Various solvents were tested for their abilities to maintain a reaction without allowing a deprotection of TBDPS maltol. The reactions are monitored through  $^1\text{H}$  and  $^{31}\text{P}$  NMR and products are confirmed using the integration values of the triethylphosphine ligand and aromatic region peaks. Chlorobenzene proved to be the ideal solvent to run the cyclization reactions in, as no deprotection was observed. A high temperature is required to produce a reaction between the two compounds. Further characterizations on the products are performed to establish the success of the reactions and evaluate the identity of the products.

## SPECTROSCOPIC STUDIES INVOLVING RHENIUM CLUSTERS

Presenter: Lauper-Cook, Brianna  
Undergraduate, Chemistry

Mentor: Prof. Lisa Szczepura

Authorship: Brianna Lauper-Cook, Julia Edwards, Lisa Szczepura

Hexanuclear rhenium selenide clusters have importance in the development of functional and multifunctional materials with applications in temperature sensing, spectroscopy, and holography. The Szczepura group has a specific focus of incorporating new terminal ligands onto this rhenium selenide cluster core. Some of these ligands include alkoxy groups, acetonitrile, and thiolates. My project thus far has been to synthesize, purify, and explore the stability of these compounds in different solvents for their use in spectroscopy. The stability of alkoxy and thiolate ligand complexes in acetonitrile has been tested through NMR spectroscopy. This presentation will focus on an analysis of the spectroscopic data for these compounds, specifically UV-Vis and emission spectroscopy. The four compounds of interest are  $[\text{Re}_6\text{Se}_8(\text{PEt}_3)_5(\text{X})]^+$  (where X =  $^-\text{OMe}$ ,  $^-\text{OPh}$ ,  $^-\text{SPh}$ , and  $^-\text{STol}$ ) This spectral data is important to obtain for characterization purposes as well as for reporting data for publication. The emission spectra give an indication of relative quantum yield for use in the rhenium clusters' various applications, such as sensing.

## CHARACTERIZATION OF AN ARCHAEAL INORGANIC PYROPHOSPHATASE FROM SULFOLOBUS ISLANDICUS USING A [31P]-NMR-BASED ASSAY

Presenter: Oliver, Ethan  
Undergraduate, Biological Sciences

Mentor: Prof. Jon Friesen

Authorship: Ethan Oliver, Joshua Friesen, Jacob Walker, Steven Peters  
Christopher Weitzel, Jon Friesen

Inorganic pyrophosphatase catalyzes the conversion of pyrophosphate to phosphate and is often critical for driving reactions forward in cellular processes such as nucleic acid and protein synthesis. Commonly used methods for quantifying pyrophosphatase enzyme activity employ reacting liberated phosphate with a second molecule to produce measurable absorbance changes or employing a second enzyme in coupled reactions to produce a product with a detectable absorbance, or the use of radiolabeled phosphorus [32P] to track and measure high energy beta particles. Despite the significance of older methods, colorimetric spectroscopy is not always feasible, and special care must be taken with radioisotopes. In this investigation, a novel [31P]-NMR spectroscopy-based assay was used to quantitatively measure the formation of phosphate and evaluate the activity of inorganic pyrophosphatase from the thermoacidophilic Crenarchaeota *Sulfolobus islandicus*. The enzymatic activity was directly measured via integration of the [31P] resonance associated with the phosphate product ( $\delta = 2.1$  ppm). *Sulfolobus islandicus* inorganic pyrophosphatase preferentially utilized Mg<sup>2+</sup> as a divalent cation and had pH and temperature optimums of 6.0 and 50 °C, respectively. The V<sub>max</sub> value was 850  $\mu\text{mol}/\text{min}/\text{mg}$  and the K<sub>m</sub> for pyrophosphate was 1.02 mM. Sequence analysis indicates the enzyme is a Family I pyrophosphatase. *Sulfolobus islandicus* inorganic pyrophosphatase was shown to be inhibited by sodium fluoride with an IC<sub>50</sub> of 2.26 mM, compared to an IC<sub>50</sub> of 0.066 mM for yeast inorganic pyrophosphatase. These studies reveal that a [31P]-NMR spectroscopy-based assay is a safe, sensitive, and effective method for analyzing catalysis by phosphate-producing enzymes

## IN SILICO INVESTIGATIONS OF SURFACE IMPACT ON HALOGEN...HALOGEN INTERMOLECULAR FORCES

Presenter: Sage, Jarrod  
Graduate, Chemistry

Mentor: Prof. Bhaskar Chilukuri

Authorship: Jarrod Sage, Bhaskar Chilukuri

As chemistry converges on a complete understanding of the nature of the covalent bond, it has become clear that turning attention towards the nature of non-covalent interactions is vital for developing, controlling, and understanding complex chemical systems. Intermolecular interactions involving halogen atoms—"halogen-bonding" (XB) interactions—are prolific in contemporary literature regarding self-organization and nanotechnology development. XB interactions between two halogens ( $X\cdots X$ ) have even greater potential here, as the relative weakness of their interaction allows for fine-tuning of molecularly assembled structures. The work presented here probes the nature of  $X\cdots X$  bonds in self-assembled monolayers with insight gained from  $X\cdots X$  bonding model simulations in silico. A wide scope of haloarenyl substrates were used to study  $X\cdots X$  bonding on surfaces, with both non-periodic and periodic density functional theory (DFT) calculations performed with Gaussian 16 and the Vienna Ab Initio Simulation Packages (VASP) respectively. VASP calculations allow for the exploration of the impact of substrate physisorption on surfaces common in self-assembly literature, like highly ordered pyrolytic graphite, gold(111), and silver(111).

## **SYNTHESIS OF N-METHYLPHENANTHROPORPHYRINOIDS WITH EXTENDED CONJUGATION PATHWAYS**

Presenter: Salrin, Jared  
Undergraduate, Chemistry

Mentor: Prof. Timothy Lash

Authorship: Jared Salrin, Timothy Lash

Fusion of aromatic rings to porphyrins and their derivatives has been shown to cause variable bathochromic shifts that can give insights into how extended conjugation effects the aromaticity of the porphyrin ring. Fusion of phenanthrene has been studied in the past in an attempt to induce bathochromic shifts in the UV-vis spectra, and to potentially expand the normal porphyrin 18 pi-electron pathway through the phenanthrene ring to give a 30 pi-electron circuit. These effects were not found to be as strong as predicted, possibly due to the favored tautomer 1a providing a conjugation pathway that avoids the fused aromatic unit. Addition of an N-methyl group to this system allows an alternative tautomer 1b to be locked into place, thereby enabling a 30 pi-electron pathway. A MacDonald-type "3+1" condensation was used to react N-methyl phenanthrotripyrane 2 with a pyrrole dialdehyde 3 to afford N-methyl phenanthroporphyrin 4. Furan, thiophene, selenophene, and indene dialdehydes were similarly condensed to afford a series of N-methyl heteroporphyrins with a fused phenanthrene units. A palladium(II) complex of N-methylphenanthrobenzocarbaporphyrin 5 was also synthesized and spectroscopic evidence was obtained that demonstrated that methyl group migration across the porphyrinoid macrocycle to give 6 had occurred. These compounds all showed bathochromic shifts towards the red region and downfield shifts in the <sup>1</sup>H NMR spectra when compared to N-unsubstituted porphyrinoids.

## **ELECTRON AFFINITY EQUILIBRIUM STUDIES OF N1 AND N2-PHENYLTRIAZOLE ISOMERS**

Presenter: Santarelli, Joseph  
Graduate, Chemistry

Mentor: Prof. Steven Peters

Authorship: Joe Santarelli, Steven Peters

Substituted 1,2,3-triazoles have displayed use as effective agents in numerous pharmaceuticals. Specifically, compounds containing substituents at the N1 and N2 position have shown promise as antifungal and anticancer agents. The medicinal potential of these compounds can be derived from their structural stability, polarity, and ability to hydrogen bond to macromolecules. Our previous work involves low temperature EPR studies of N1 and N2-alkyltriazole anion radicals, reveal that much of the electron spin density resides within the N3 moiety of the triazole ring. A comparison of the electron affinity of these anion radicals was not possible due to the short lifetime of the N1-alkyl anion radical species. Phenyl substituted triazoles are expected to exhibit greater stability as anion radicals since the unpaired electron can delocalize throughout the difference in electron affinity of both N1 and N2-Phenyltriazoles is of interest to us. N1 and N2-Phenyltriazoles were successfully synthesized using methods developed by Patterson et al. (2020) and Chen et al. (2020), respectively. The low-temperature potassium metal reductions were performed in THF, and stable anion radicals of each were generated. EPR spectra have been successfully obtained and simulated, and the hyperfine coupling constants (hfccs) were carefully measured. DFT calculations were performed, and the calculated hfccs agree with the measured values. Our results indicate a majority of the spin density resides on the N1 and N3 atoms in the N2-phenyltriazole species, while most spin resides on the N2 atom in the N1- isomer. Equilibrium electron affinity studies of these phenyl triazole isomers are currently underway. The syntheses/characterization of these two triazole compounds, the EPR-spectroscopic results, and the preliminary results from the equilibrium electron affinity studies will be presented.

## COMPUTATIONAL MOLECULAR-LEVEL STUDY OF PORPHYRIN SYSTEMS

Presenter: Suthaharan, Sivanujan  
Graduate, Chemistry

Mentor: Prof. Bhaskar Chilukuri

Authorship: Sivanujan Suthaharan, Bhaskar Chilukuri

Porphyrins are macrocyclic molecules with impressive structural and functional properties with a broad spectrum of applications. Porphyrins function as crucial components in many electric and electronic systems including dye sensitized solar cells, chemical sensors, optoelectronics and field effect transistors. The characteristic porphine group with a large pi-electron conjugated system present in porphyrins leads to their fascinating chemical and structural behavior. Porphyrin systems have received increased attention related to their intrinsic electronic, magnetic and spectroscopic characteristics. Theoretical and computational investigations best complement the experimental approaches analyzing these molecular properties. Quantum mechanical density functional theory (DFT) calculations help understanding characteristic features including orbital configuration, electronic nature and stability. In this work we investigate select porphyrin systems via quantum mechanical calculations of molecular properties at the DFT level.

## **EVALUATING THE LEISHMANIA TARENTOLAE RESPONSE TO INORGANIC STRONTIUM BASED OXYFLUORIDES**

Presenter: Terry, Katelyn  
Undergraduate, Biological Sciences

Mentor: Prof. Marjorie Jones

Leishmaniasis is a vector-borne parasitic disease, caused by the protozoa parasite genus *Leishmania*, found in portions of the tropics, subtropics, and southern Europe. Transmission of this disease in humans starts with a bite from an infected female phlebotomine sand fly. The sand fly can become infected with the parasite by sucking blood from an infected animal[1]. Phlebotomine sand flies are silent and hard to see, so infection can go undetected for a long time, and prevention is extremely difficult. Infection can leave lifelong effects such as scarring and decreased immune response as the parasite is not eradicated from the body with the treatments that are available[2]. There are currently several drugs used as treatment, consisting of pentavalent antimonials, miltefosine, and amphotericin B, all of which are not without faults[3]. Resistance is developing quickly, and the side effects are extensive. This abstract aims to evaluate the effects of strontium-based compounds on cultures of *Leishmania tarentolae*, a species of *Leishmania* that is found in reptiles and has been shown to act similarly to human strains, in order to find a substance suitable for potential novel therapeutic use. Using methodology previously performed by Apuzzo et al.[4], we will culture cells with novel strontium compounds—in collaboration with Dr. Sullivan, University of Northern Florida—and evaluate their viability and enzyme activity over time.



## CATALYSIS BY THE ENZYME, RIBOFLAVIN KINASE, FROM THE THERMOPHILIC ORGANISM SULFOLOBUS ISLANDICUS

Presenter: Walis, Sara  
Undergraduate, Chemistry

Mentor: Prof. Jon Friesen

Authorship: Sara Walis, Emily Drew, Jon Friesen

*Sulfolobus islandicus* is an archaeon which optimally grows at a pH 2-4 (acidophiles) and temperatures of 65-85°C (thermophiles). *Sulfolobus islandicus* was first isolated from acidic springs in Iceland and they can also be found in hot springs in Yellowstone National Park. Scientists use *Sulfolobus islandicus* as a model system for understanding cellular processes such as DNA replication and repair. Riboflavin kinase catalyzes the phosphorylation of riboflavin (vitamin B2) to form flavin mononucleotide (FMN). It is required for the synthesis of FMN from riboflavin. Archaeal riboflavin kinase is CTP dependent and has a name riboflavin 5' - phosphotransferase which catalyzes the reaction: cytidine triphosphate (CTP) + riboflavin → cytidine diphosphate (CDP) + flavin mononucleotide (FMN). Eukaryotic and bacterial riboflavin kinases utilize ATP instead of CTP.

To study riboflavin kinase, the enzyme first had to be isolated from *Sulfolobus islandicus*. To do this the enzyme's gene was amplified through a polymerase chain reaction. The protein was then successfully ligated into plasmid DNA, pET-45b, where then it was transformed into competent *E. coli* cells. Riboflavin kinase was then successfully expressed and purified. The enzyme was then run on a sodium dodecyl sulfate polyacrylamide gel electrophoresis and showed up on the gel as two bands around 24 kDa and 57 kDa, which demonstrated that riboflavin kinase was a dimer. Multiple tests were conducted, such as using different concentrations of sodium dodecyl sulfate and different amounts of time in an 80-90°C water bath. Through this the dimer broke apart successfully into its monomer and showed a band around 24 kDa on the gel, the size of riboflavin kinase. We then wanted to determine if the enzyme catalyzed riboflavin to flavin mononucleotide, what divalent cation was necessary for catalysis, and if riboflavin kinase utilized ATP or CTP. To do this, enzyme assays and phosphorous NMR were run. The results were inconclusive, and more research and assays need to be conducted to figure out the best conditions for catalysis.

## **A STEREOSELECTIVE SYNTHESIS OF BETA-ALKOXYOXETANES USING A ASYMMETRIC GLYCOLATE ALDOL ADDITION METHODOLOGY**

Presenter: Wright, Daniel  
Undergraduate, Chemistry

Mentor: Prof. Shawn Hitchcock

Authorship: Jordan Witte, Gregory Ferrence, Shawn Hitchcock

The functional group of oxetanes are valuable structural conformations in modern medicinal organic chemistry (1). Oxetanes are not common in nature but with the few that appear in nature the functional group is integral to the bio-physiological effects of the compounds. A few examples of these compounds are Oxetanocin A, or Taxol. Taxol is a very prominent chemotherapy drug for treating lung, breast, and ovarian cancers. While other synthetic routes and functional group synthesis are being tested for Taxol derivatives, Taxol is still one of the highest efficacy chemotherapy drugs. The oxetane containing derivative of Taxol is still the leading form of the drug used globally. Because many modern drugs and chemicals that contain oxetanes are chiral and have relevant stereochemistry, stereo- and regioselective oxetane cyclization is important. The goal of Hitchcock organic synthesis lab at Illinois State University is to explore synthetic methodology towards the development of new synthetic tools that can be exploited in the synthesis of value added compounds such as pharmaceutical agents. This poster presentation will feature the work that has been completed on the usage of an asymmetric glycolate aldol addition based reaction pathway in the synthesis of beta-alkoxyoxetanes.

(1) James A. Bull, Rosemary A. Croft, Owen A. Davis, Robert Doran, and Kate F. Morgan. *Chemical Reviews* 2016 116 (19), 12150-12233. DOI: 10.1021/acs.chemrev.6b00274

## COMMUNICATION

### **IDENTIFYING GAPS BETWEEN FIRST- AND CONTINUING-GENERATION COLLEGE STUDENTS IN THEIR LEVEL OF COLLEGE PREPAREDNESS: AND ITS INFLUENCE IN THEIR SELF-EFFICACY IN HIGHER EDUCATION**

Presenter: Del Rosario, Kathryn  
Graduate, Communication

Mentor: Prof. John Baldwin

Authorship: Kathryn Del Rosario

This study examined the gaps present between first- and continuing-generation college students in their level of college preparedness and how these gaps affect their self-concept and self-efficacy. Semi-structured interviews were conducted with a total of 8 participants from different backgrounds participated in the study. They were asked questions pertaining to their educational background, source of support, and self-efficacy. The findings showed several gaps within students' college preparedness: gaps between first- and continuing-generation students; and potential solutions to closing these gaps. Continuous research in identifying these gaps would allow for better understanding of the support needed by both students.

## **“IT IS STILL ME”: THE INFLUENCE OF INSTAGRAM BEAUTY FILTERS ON FEMALE COLLEGE STUDENTS' PERCEPTIONS OF BEAUTY STANDARDS**

Group Leader: Gomes, Gabriela  
Graduate, Communication

Group Member: Daria Parfenova, Graduate, Communication

Mentor: Prof. John Baldwin

Authorship: Gabriela Gomes, Daria Parfenova

This qualitative study examined Instagram beauty filters effects on the beauty perceptions of female college students. Ten students participated in one-on-one in-depth interviews and were asked questions about their use of filters, feelings, and beauty standards surrounding filtering practices. Results revealed positive, negative, and neutral influence on young women. We found that beauty filters promote unrealistic beauty standards, which lead to frustration and dissatisfaction with self-image. However, the female students seemed to recognize the harmful impact of editing tools on themselves and future generations, promoting positive self-image awareness. Implications for marketers and creators, as well as limitations of this study, were discussed.

Keywords: AR beauty filters; Instagram; self-perception; social comparison; self-discrepancy; beauty standards.

## **MUSIC AND SOCIAL CHANGE**

Presenter: Mangels, Rebekah  
Graduate, Communication

Mentor: Prof. John Baldwin

Authorship: Rebekah Mangels, Emily Bollinger

In this study, we explored ways in which musicians in Central Illinois attempt to influence social change. Previous research has claimed popular music genres such as rock and punk music simultaneously reinforced dominating structures while also subverting them. Using open-ended interviews and qualitative methods of analysis, we found that participants reported varying levels of commitment to political activism. Through their lyrics, venue choices, and performance choices, participants have reportedly attempted to create more equity in areas such as mental health, race relations, reproductive rights, and gun control. Lastly, we found the participants played songs in popular genres, reaching local and even global audiences. Therefore, we concluded that the field of popular music studies would benefit from understanding musicians' intentions for social change. Keywords: music, social change, audience, lyrics, activism.

## **HOW ORGANIZATIONS CAN CREATE PSYCHOLOGICAL SAFETY IN THE WORKPLACE FOR ATTRACTING AND RETAINING GEN ZS**

Presenter: Okoli, Ebuka  
Graduate, Communication

Mentor: Prof. John Baldwin

As organizations continue to evolve to have a competitive edge in the global market, they focus on recruiting a vibrant and reliable workforce. The latest generation joining the workforce is Gen Z, and they come with peculiarities that distinguish them from other generations. This study investigates these peculiarities by interviewing members of the Gen Z workforce. The findings demonstrate that the Gen Z workforce value a safe work environment where they can express their creativity and where their opinions can make a difference. Overall, this study shows that for organizations to improve the workplace, they need valuable input from the Gen Z workforce.

## **SCIENTOLOGY IS YOUR PARENT: CHILDREARING IN SCIENTOLOGY**

Group Leader: Smith, Courtney  
Graduate, Communication

Group Member: Reilly Card, Graduate, Communication

Mentor: Prof. Lindsey Thomas

Authorship: Courtney Smith, Reilly Card

Despite recent popular interest on the minutia of Scientology, virtually no studies have analyzed the effect Scientology practices have on children. Close Textual Analysis is used to uncover the meaning behind the writings of L. Ron Hubbard and the docuseries Leah Remini: Scientology and the Aftermath as it pertains to childrearing within the Scientology. Several themes emerged in the data; a better life, parenting techniques, abuses, disconnection, and mental illness. These themes are flushed out fully in the analysis. Conclusionary statements reiterate that Scientologist parenting techniques can be viewed as unethical and potentially lead to incredibly damaging effects. Limitations of this study include alienation of the effects of disconnection on adulthood and the role of the researchers as outsiders. Future research may focus on motherhood specifically in Scientology.

## **GENDER OFFENDERS: GENDER REPRESENTATIONS OF SERIAL KILLERS ACROSS 100 YEARS IN "SERIAL KILLERS"**

Presenter:           Smith, Courtney  
                          Graduate, Communication

Mentor:             Prof. John Baldwin

Employing social role theory and constructs of monstrosity, I examine a female and male serial killer from each of three time periods in American history using the podcast Serial Killers on Spotify. Social role theory explains the significance of gender stereotypes in societal expectations and implications assigned to each sex due to roles that each group has historically been responsible for. Monstrosity is the label attached to individuals that dare to deviate from their prescribed gender roles. These individuals are associated with horror, unspeakable acts, and evil. Emergent themes suggest a need to qualify and demonize female serial killers over males, discrepancies between graphicness of introductory stories, identity, and impact of media. Based on gender roles, stories reveal biases based on societal expectations. Knowing how gender expectations are created and maintained is the first step to combating these stereotypes.



## COMMUNICATION SCIENCES AND DISORDERS

### ACCESS TO HEARING HEALTH CARE FOR RURAL AND AGING POPULATIONS

- Group Leader: Barkauski, Natalie  
Undergraduate, Communication Sciences and Disorders
- Group Members: Kip Crozier, Undergraduate, Communication Sciences and Disorders;  
Maggie Zibutis, Undergraduate, Communication Sciences and Disorders;  
Madison Aimone, Undergraduate, Communication Sciences and Disorders;  
Channing Collins, Undergraduate, Communication Sciences and Disorders
- Mentor: Prof. Antony Joseph
- Authorship: Natalie Barkauski, Kip Crozier, Maggie Zibutis, Madison Aimone  
Channing Collins, Antony Joseph

The primary purpose of this project was to determine the degree to which the literature has described the status of access to hearing health care for rural and aging populations. Using publicly available data, we discovered that the median age in Illinois was lower (younger) for more populated counties, and older for more rural, less populated, counties. Previous research conducted in the laboratory identified that the prevalence of hearing loss is significantly higher for older populations than younger ones, especially for those over 80 years of age. From this information, we surmise that residents of rural Illinois counties may be older and hearing impaired. In addition, occupations and businesses in the agricultural sector contribute to increased rates of auditory injury and noise-induced hearing loss. Taken together, we should expect a higher level of hearing health care access in rural areas, but the opposite is true. We turned to the literature to determine the number of studies that have explored this phenomenon. Solutions to this problem could include remote-satellite audiology clinics, mobile audiological rehabilitative care, and tele-audiological health services. Geographic information systems may be used to analyze datasets using specific overlays and mapping methods to identify viable solutions for Illinois and other states.

## **SIGNIFICANCE OF CAREGIVER COACHING IMPLEMENTATION IN EARLY INTERVENTION PRACTICES**

Group Leader: Hemp, Tori  
Undergraduate, Communication Sciences and Disorders

Group Members: Rebbeca Nygren, Undergraduate, Communication Sciences and Disorders;  
Allie Robinson, Undergraduate, Communication Sciences and Disorders

Mentor: Prof. Jamie Mahurin Smith

Co-mentor: Prof. Ciera Lorio

Authorship: Tori Hemp, Rebecca Nygren, Allie Robinson

Early Intervention (EI) services are offered to children birth-three years of age who present or are at risk for developmental delays (Getting Started in Early Intervention, 2022). EI providers implement caregiver coaching strategies, where providers instruct caregivers on how to practice EI strategies during everyday routines when a provider is not present. This allows children to receive the maximum benefit of EI (Friedman et al., 2012). While many speech-language pathologists (SLPs) and other EI providers acknowledge the importance of caregiver coaching implementation during intervention services, it is often overlooked. This qualitative study aimed to provide rationale behind the lack of coaching implementation in EI services as well as benefits of the use of coaching and improvements for future provider training.

## **INFANT-TODDLER SHARED BOOK READING PROJECT: AIMS, DATA COLLECTION, AND CODING**

Group Leader: Johnson, Reece  
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Mentor: Prof. Ciera Lorio

Authorship: Peyton Kraft, Alyson Garnhart, Emma Maier, Lauren Graue,  
Natalie Swartz, Reece Johnson

Shared book reading is a common routine in many American households; however, little is known about the shared book reading behaviors between parents and their infants/toddlers. This poster describes a longitudinal study that has recently moved to the video coding stage. Shared book reading interactions between parents and their infants and toddlers were tracked across various time points, beginning when the child was 6 months through 36 months of age. Videos are being coded for parent behaviors, child behaviors, and parent responsiveness. Descriptions of the participants, coding schemes, and our initial findings from coding procedures will be shared.

## **ACCESS TO HEARING HEALTH CARE FOR URBAN, DIVERSE, AND AGING POPULATIONS**

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Jenna Hedge, Undergraduate, Communication Sciences and Disorders

Mentor: Prof. Antony Joseph

Authorship: Taylor Meadors, David Vargas, Daniel Ferguson, Isabel Gardner  
Jenna Hedge, Antony Joseph

This project was designed to describe how access to hearing health care for urban, aging, and diverse populations has been studied in the literature. The significantly unmet need for accessible hearing health care has been estimated to be 67% and 86%. Our society has predetermined that racially-diverse individuals will have less healthy lives than others due to exposure to poor housing, inadequate insurance coverage, and minimal access to preventive health care. Besides this pre-disposition, there is a profound lack of racially and ethnically diverse professionals in healthcare, health management, and graduate school training programs. The State of Illinois contains one of the largest cities in the world, Chicago. Although this city boasts of having some of the most medically advanced, hospitals in the world, most urban, aging, and diverse Chicago residents have limited access to hearing-health care. Previous research conducted in the laboratory identified that there is an inadequate number of adult and geriatric Audiology courses in many doctoral programs. So, Doctors of Audiology are not being prepared extensively with clinical-rehabilitative coursework about aging adults. Overwhelmingly, there are not enough audiologists to accommodate the aging sector of the patient population, especially those who reside in urban areas where door-to-door transportation is lacking. We explore solutions for this truly deplorable condition, including mobile audiology clinics, web-based quality resources, physician outreach, and geographic information systems.

## **AN INTERDISCIPLINARY EARLY INTERVENTION LEARNING EXPERIENCE FOR UNIVERSITY STUDENTS**

Group Leader: Milton, Jillian  
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Group Members: Hannah Rudkin, Undergraduate, Communication Sciences and Disorders;  
Christina Rauwolf, Undergraduate, Communication Sciences and Disorders

Mentor: Prof. Ciera Lorio

Authorship: Jillian Milton, Hannah Rudkin, Christina Rauwolf

There is currently a nationwide shortage of early intervention (EI) providers (Barton et al., 2012), and there are limited EI experiences for students at Illinois State University. To meet this need, professors in Communication Sciences and Disorders (CSD) and Special Education designed the Early Intervention Learning Community (EILC). The EILC is an interdisciplinary independent study that includes undergraduate students from CSD and Special Education programs. The students learn about EI topics through self-guided modules, readings, reflections, guest speakers, and community-based observations of EI providers. A total of 20 students have participated in the EILC across 3 semesters, and we are currently analyzing their written reflections to learn more about their experiences in the program. This poster will highlight the components of the EILC program and some of the themes that are emerging from the qualitative analysis of students' written reflections. The results of this study will support the EILC faculty in improving the EILC experience for future cohorts of students.

## CRIMINAL JUSTICE SCIENCES

### **ANTI-ASIAN AMERICAN PACIFIC ISLANDER RHETORIC AND THE LIKELIHOOD OF HATE CRIME VICTIMIZATION REPORTS: A THEMATIC LITERATURE REVIEW**

Presenter: Conde, Alyssa  
Undergraduate, Criminal Justice Sciences

Mentor: Prof. Ashley Farmer

Anti-Asian American Pacific Islander (AAPI) hate crimes have been continuously rising since the start of the COVID-19 pandemic, but reported statistics may be a gross underestimation as AAPI victims are less likely to report their experiences to law enforcement than other racially marginalized groups. Since the start of the COVID-19 pandemic, anti-AAPI rhetoric has also begun to rise. Asian American Pacific Islander or "AAPI" is defined as having ancestry in Asia or the Pacific Islands. A hate crime in this review will be defined as a criminal act committed against an individual such as, but not limited to, verbal, physical, or sexual assault, vandalism to personal or private property on the basis of sex, gender, race, ethnicity, sexual orientation, and/or ability. The purpose of this review is to explore the relationship between anti-AAPI rhetoric and the likelihood of AAPI victims reporting their experience(s). This review of literature will examine hate crime legal definitions, anti-AAPI rhetoric in historical events and COVID-19, the examination of the shifts within legal definitions of anti-LGBTQ+ hate crimes, and calls for further research. Pulling definitions of another marginalized community poses solvency and allows for similar reform in the legal framework for AAPI victims.

## ECONOMICS

### **A GAME WITHIN A GAME: MINIMAX PLAY IN MAJOR LEAGUE BASEBALL**

Presenter: Riffle, Samuel  
Graduate, Economics

Mentor: Prof. Susan Chen

Authorship: Samuel Riffle

This paper investigates the existence of mixed strategy Nash equilibria in two-player games between a pitcher and a batter in baseball. The findings of the existing studies on real-life data are inconclusive. Using a unique sample from the 2017-2022 seasons of Major League Baseball (MLB), my analysis shows that pitchers deviate from all three conditions of Von Neumann's Minimax Hypothesis, (i.e., equalized expected payoffs across actions, actions played with a positive probability must have a higher expected payoff than actions that are not played with positive payoff, and serial independence of selected actions across games) I thus conclude that no mixed strategy Nash equilibria exist in the MLB games in the sample. My research adds to the literature by using the latest available data and the dynamic panel estimation method (i.e., the generalized method of moments, or GMM). Finally, these results entail important implications for optimal strategies implemented by Major League pitchers, and I offer recommendations for improving their payoffs.

## HOW MUCH COULD AMERICANS SAVE IN AUTO EXPENSES?

Presenter: Van Plew, Michael  
Undergraduate, Economics

Mentor: Prof. Susan Chen

The personal auto market is constantly changing in almost every way. There are countless factors affecting running costs, prices of used and new cars, gas prices, and so on. This has an effect on the purchase decisions from the consumer's perspective. I study a sample retrieved from the US Department of Transportation's Bureau of Transportation Statistics on "Average Cost of Owning and Operating a Vehicle" between 2000 and 2022 (along with other supporting data). My analysis will take into consideration highway congestion cost, gasoline prices, total vehicle sales, average age of automobiles in operation, and personal expenditures on transportation, and examine how these factors affect average Americans' expenses on vehicles. I hypothesize that if there was less congestion, smoother roads, etc., people would waste less gas, pollute less toxins, have a more efficient running cost in the long run, and ultimately save a significant amount of time and money.



## FAMILY AND CONSUMER SCIENCES

### FALSE NARRATIVES OF INCARCERATION AS PORTRAYED IN FILM

Presenter: Ryan, Delaney  
Undergraduate, English

Mentor: Prof. Cristina Prestin-Beard

The reality of incarceration has been repeatedly falsely advertised in modern media forms, such as television and movies. Not only does this alter the views of the public about what life is like as an inmate, but dehumanizes those who are incarcerated. By collecting data on what the general public has experienced through the media about life as an incarcerated individual, I will hopefully break stereotypes of prison life. Most of society's views of prison life today come from TV shows such as Orange is the New Black, Criminal Minds, and Netflix's newest bank heist thriller, Kaleidoscope. While shows like these are action-packed and highly entertaining, they contain a plethora of misinformation about life in prison. After visiting the McClean County Jail and doing in depth research on other aspects of incarceration in America, I will hopefully provide insight on the advancements that have been made in the prison system, and some things that the media has simply gotten wrong.

## **MEDIA PORTRAYAL OF FEMALE MODELS' SEXUALIZATION IN FASHION ADVERTISEMENTS**

Presenter: Tellez, Damaris  
Undergraduate, Family and Consumer Sciences

Mentor: Prof. Ui-Jeen Yu

Authorship: Damaris Chantal Tellez, Sydney Kokenes, Allie Carlson, Emma Watson,  
Ui-Jeen Yu

Fashion magazines tend to reflect beauty and fashion ideals of current times. Females are more likely affected by the appearances and sexuality of model images in fashion ads. Obviously, sexuality today is more accepted than it was during the 1990s, but it is meaningful to examine how media portrayal of sexualized model images have changed in fashion ads over time. This study aims to examine whether sexuality and ethnicity of female models in fashion ads differ from the 1990s to the 2020s. Body objectification theory was applied to explain how fashion magazines influence body objectification and sexualization of females in U.S. culture. A total of 100 fashion ads from August issues of Vogue in 1990, 2000, 2010, and 2020 were collected. Through content analysis, sexuality and ethnicity of female models in the fashion ads were analyzed. Results indicated significant increases of sexualized model images in 2000 and 2020, but a decrease of sexualized model images in 2010, compared to those in 1990. A majority of female models depicted in Vogue was predominantly white across all decades, but the ethnicity of female models was more diversified in 2020. Overall, white female models were more sexualized in the ads, indicating greater influences of sexualization on white viewers than other ethnicities. This study provides an understanding of media portrayal of female models' sexualization and their ethnicity in fashion ads, which potentially influence young women's body objectification and self-sexualization tendency.

## GEOGRAPHY, GEOLOGY, AND THE ENVIRONMENT

### **INFLUENCE OF TILE WATER ON NITRATE CONCENTRATIONS IN THE GROUNDWATER: A CASE STUDY OF A SATURATED RIPARIAN BUFFER ZONE, MCLEAN COUNTY, CENTRAL ILLINOIS**

Presenter: Abdulsalam, Aminat  
Graduate, Geography, Geology, and the Environment

Mentor: Prof. Eric Peterson

Authorship: Aminat Absulsalam, Eric Peterson

Agricultural activities, particularly the use of inorganic fertilizers and animal manure are a major cause of the increase in nitrate levels in our water bodies in many areas of the world. The use of tile drains coupled with the excessive application of nitrogen fertilizers, which is a prevalent practice in the U.S. Midwest, alters water quality, leading to eutrophication, the development of harmful algal blooms, and hypoxic conditions of surface water bodies. This study focuses on understanding the interaction between the redirected tile-drain water and nitrate concentrations in the groundwater. To this end, we utilized historic data that spans seven years (2015-2022) from a saturated riparian buffer (SRB) zone, adjacent to an agricultural field in McLean County to observe the trend that exists over time between the nitrate concentrations in the groundwater and the tile-drain water. The collected data include nitrate as nitrogen ( $\text{NO}_3\text{-N}$ ) concentrations, dissolved oxygen, and water elevation.  $\text{NO}_3\text{-N}$  concentrations of the tile-water (diversion box), groundwater upgradient from the tile, and groundwater downgradient of the tile will be compared during two different regimes, when the tile is running and when the tile is not running to assess the influence of tile-drain water on the groundwater within the SRB. A two-way ANOVA will be used to test the hypothesis that higher  $\text{NO}_3\text{-N}$  concentrations will be observed in the downgradient water when the tile is running as compared to when the tile is not running. Additionally, the downgradient water will be compared to the upgradient water under both tile conditions to evaluate if changes in the  $\text{NO}_3\text{-N}$  concentrations of the downgradient water occur independent of  $\text{NO}_3\text{-N}$  concentrations trends in the upgradient water. It is expected that the downgradient water will have higher  $\text{NO}_3\text{-N}$  concentrations when the tile is running, and lower concentrations when the tile is not, which is a consequence of the presence and absence of the tile water. Lower  $\text{NO}_3\text{-N}$  concentrations will also be observed in the downgradient water than the tile as a result of the processes in the soil such as plant uptake, denitrification and dilution. Also, for upgradient water, I expect to see steady  $\text{NO}_3\text{-N}$  concentrations in both tile conditions, and the level of  $\text{NO}_3\text{-N}$  concentrations in the downgradient water slightly higher than the upgradient water (background concentration) when the tile is not running. Further, the results of this work will show how tiles control nitrate concentrations in the system.

# THE INFLUENCE OF TILE FLOW ON WATER MOVEMENT IN THE VADOSE ZONE, AND THE TRANSPORT AND FATE OF NITRATE IN A SATURATED RIPARIAN BUFFER: A CASE STUDY OF THE T3 SITE, CENTRAL ILLINOIS

Presenter: Akrofi, Benedicta  
Graduate, Geography, Geology, and the Environment

Mentor: Prof. Eric Peterson

Authorship: Benedicta Akrofi, Eric Peterson

An increase in nitrate ( $\text{NO}_3^-$ ) concentration in surface water and groundwater from agriculture is a growing cause for concern all over the world. As farmers seek to meet global food demand, the amount of available nitrogen in the terrestrial cycle has doubled as more nitrogen (N) fertilizer is being applied to fields to enhance grain crop yield and quality. The Midwest States, including Illinois, have highly fertile soils and represent one of the most intense areas of land growing corn and soybeans. Approximately, 7.7 billion kilograms of N-fertilizer are applied to Illinois corn and soybean fields annually. While fertile, the soil does not drain well, which has resulted in the installation of tile-drainage systems. Tiles drain the soil above it directly into streams giving little opportunity for denitrification, plant uptake, and microbial immobilization to remove nitrogen, hence, short-circuiting the roles of the soils in the nitrogen cycle and contributing to pollutants in surface waters. Excessive nitrate accumulation in surface waters has led to eutrophication and the development of hypoxic zones in aquatic environments. One method that has exhibited success in lowering  $\text{NO}_3^-$  concentration is the diversion of tile-drained waters from the agricultural fields into a saturated riparian buffer (SRB) before the water enters a stream. Previous works have shown a reduction in the concentrations of nitrate as nitrogen ( $\text{NO}_3\text{-N}$ ) in water flowing through an SRB, but what happens in the immediate area near the tile in terms of water flow and nitrate transport and fate is unknown. Most  $\text{NO}_3\text{-N}$  exported from tile-drained watersheds in the Midwest occur from January to June, which corresponds to periods of tile flow. The top 20 cm of the vadose zone serves as a critical nitrogen storage location and foci for biogeochemical processes that utilize nitrate. This study is to examine the influence of tile flow on water movement in the vadose zone, and the transport and fate of nitrate in a saturated riparian buffer at the T3 site in Hudson, Illinois. Two questions will be explored to understand the research objectives: (1) How does tile flow change the flow in the vadose zone; Vertical flow may be slow, and horizontal flow may increase. When the tiles start running, the water table rises, and water is delivered to the SRB. 2) Will nitrate be collected and transported as the tile water saturates the zone than when the tiles are not running? Nitrate sampling will be undertaken once every week from March to September 2023; when the tiles are running versus when the tiles are not running. A two-way ANOVA will be used to determine how independent variables, time (when the tiles are running versus when the tiles are not running) and among the various depths, 0.3m, 0.6m, and 1.5m from subgroups (wells, head data from tension meters) affect a dependent variable,  $\text{NO}_3\text{-N}$  concentration (mg/L). We expect to see a lower nitrate concentration in the vadose zone when the tiles are running as compared to when the tiles are not running. As the water table rises, water is delivered to the SRB and saturates the vadose zone, collecting and transporting some of the nitrates out of the vadose zone.

## **INTERNAL FACTORS THAT INFLUENCE OVERALL ROCK STRENGTH: ST. PETER SANDSTONE IN STARVED ROCK STATE PARK, ILLINOIS**

Presenter: Bowen, Adeline  
Undergraduate, Geography, Geology, and the Environment

Mentor: Prof. Lisa Tranel

Authorship: Adeline Bowen, Lisa Tranel

Weathering and erosion of exposed rocks like those of the St. Peter Sandstone in Starved Rock State Park is an ongoing process driven by a multitude of factors, both internal, such as rock strength, and external, such as human-made carvings. Rock strength is an important characteristic to examine when studying erosion, and many things can influence rock strength, such as grain size, cementation, and porosity. Schmidt hammer tests performed on fallen boulders in various canyons throughout Starved Rock State Park gives us a range of rock strength values to analyze with corresponding rock thin section samples. Thin section samples were analyzed using a petrographic microscope to quantify grain size, amount of cement, and amount of pore space. Following analysis of thin sections and comparison to rock strength values, we hypothesized that there is a negative correlation with rock strength and grain size and porosity. This shows that as grain size, amount of pore space, or both increases, a rock's strength decreases. A positive correlation was expected with rock strength and cementation, showing that a rock with greater amounts of cement will have a larger rock strength value. This study allowed us to further our understanding of the relationship between a rock's internal characteristics and its strength and how this affects erosion mechanics in the sample area. This study could further help us with predicting erosion patterns, specifically in susceptible, high-trafficked areas such as Starved Rock State Park.

## MONITORING INVASIVE SPECIES DIEBACK IN RESPONSE TO AN INTRODUCED PREDATOR

Presenter: Brasen, Jake  
Undergraduate, Geography, Geology, and the Environment

Mentor: Prof. Jonathan Thayn

Authorship: Jonathan Thayn, Jake Brasen

Early settlers in the American west introduced tamarisk, or salt cedar, to fight erosion along riverbanks. Tamarisk quickly displaced native species; like box elder, cottonwood, and willow; and reduced the habitat of native birds and mammals. The National Park Service has spent years trying to burn, dig and poison tamarisk, but it is too resilient, dense and thorny.

In 2006, after careful study, the NPS and other national and state agencies intentionally released a foreign species in Dinosaur National Monument and other locations along the Green, Colorado and Yampa Rivers. The tamarisk beetle (*Diorhabda carinulata*) is monophagous, meaning it only eats tamarisk leaves. It is originally found in southern Russia, Iran, Mongolia and western China. We can now add southern Utah to its habitat. If the beetle successfully reduces the extent of tamarisk, it could free-up over a million acres of prime riparian habitat in the American Southwest.

While several small-area studies have shown that beetle-caused die-back is occurring, no large-area, repeated monitoring program is in place. The large extent of the effected area prohibits traditional field-based methods; however, satellite and drone imagery could be used to track the annual distribution and condition of tamarisk. During the early summer of 2022 we conducted a field census of tamarisk beetles along the Colorado River near Arches and Canyonlands National Parks. We also collected extensive low-altitude drone imagery, particularly in the near-infrared portion of the spectrum. The drone data was used to calibrate a model that predicted the amount of healthy tamarisk in each pixel of satellite imagery. Our results suggest that satellite sub-pixel analysis can be easily and accurately used to monitor tamarisk die-back over time. Future work will include time-series analysis of satellite data and field expeditions to determine which species replace the tamarisk plants.

## **ASSESSMENT OF SPATIAL AND TEMPORAL VARIATIONS IN CHLORIDE CONCENTRATION IN AN AGRICULTURAL TILE-DRAINED AREA IN CENTRAL ILLINOIS**

Presenter: Commander, Okiemute  
Graduate, Geography, Geology, and the Environment

Mentor: Prof. Eric Peterson

Authorship: Okiemute Commander, Eric Peterson, Catherine O'Reilly, Johnathan Thayn, Bill Perry, Rick Twait

Long-term increase in chloride (Cl<sup>-</sup>) concentration in surface water and groundwater from anthropogenic sources, including deicing salts, agriculture, septic effluents, and wastewater treatment plants is a growing cause for concern all over the world. In rural areas with less impervious surface cover, agriculture may serve as a source for Cl<sup>-</sup> in water systems. A saturated buffer zone (SBZ) installed adjacent to a Central Illinois stream (tributary of Lake Evergreen) to reduce nutrient losses was used to identify groups of Cl<sup>-</sup> in the SBZ and to identify temporal Cl<sup>-</sup> variation within the SBZ. Water samples collected from 37 wells, a diversion box and stream over a 7-year period within the SBZ were analyzed for major anions. Based upon well depth and locations within the SBZ, subgroups were delineated into deep groundwater, downgradient shallow groundwater, upgradient shallow groundwater, diversion box, and stream. Seasons were divided to correspond with agricultural practices: spring/planting, summer/growing, fall/harvest, and winter/fallow. A cumulative probability plot indicates three populations of Cl<sup>-</sup>, and two-way ANOVA results identify three distinct groups: 1) stream, 2) upgradient shallow groundwater, and 3) diversion box, downgradient shallow groundwater, and deep groundwater. The ANOVA identified seasonal differences in only the stream, while both the stream and upgradient shallow subgroups were spatially different from the others. Principal component analysis (PCA) of the water chemistry data indicated that water-rock interaction explained 28% of the variance while surface processes explained 23% of the variation. Classifications from the PCA correspond to the three groups of Cl<sup>-</sup> population within the SBZ, hence supporting results from the ANOVA and the cumulative probability plot. Understanding the different populations and seasonal variations of Cl<sup>-</sup> within the SBZ will help in reducing chloride and other nutrients loading into the stream and further downstream into Lake Evergreen (City of Bloomington water reservoir).

Keywords: ANOVA, Chloride, Cumulative probability plot, Principal component analysis, Saturated buffer zone

## **WATER COLOR OF MINNESOTA'S SENTINEL LAKES (SLICE) BY SATELLITE REMOTE SENSING**

Presenter: Dooley, Andrew  
Graduate, Geography, Geology, and the Environment

Mentor: Prof. Wondy Seyoum

Authorship: Andrew Dooley, Wondy Seyoum

Surface waters are preciously vital resources requiring expensive and time intensive labor to effectively monitor for adequate water quality management. New applications of water color analysis by satellite remote sensing are a promising holistic approach to water quality monitoring for scientific, industrial, recreational, and cultural benefit. This research expands previous applications of lake water color analysis and pioneers water color patterns of midcontinent lakes in Minnesota, USA. In documenting lake water color, the first observations of water color homogeneity within ecoregions and color consistency through historical satellite mission data may begin. NASA's Landsat 8 OLI satellite provides an active historical record of visible light reflectance of the Earth's surface. Chromaticity analysis concludes unbiased interpretation of dominant visible wavelength as water color from tristimulus reflectance samples. The Sustaining Lakes In a Changing Environment (SLICE) program, predefines "Sentinel Lakes" representative of the population of lakes within major ecoregions of Minnesota. Visible light reflectance records will be extracted at randomly generated points within Sentinel Lakes at late summer when peak insolation bolsters trophic activity. The expected results of this work will provide groundwork of lake water color distribution and variability across the State of Minnesota. Cartographic representation of Sentinel Lake modal water color will aid in interpretation of water color variability within ecoregions. Graphical displays of modal dominant visible wavelength from each ecoregion will yield quantifiable comparison of water color as wavelength. All Sentinel Lakes within an ecoregion are expected to share consistent water color. Ecoregions are anticipated to possess distinguishable water colors from each other. Chromaticity diagrams of historical water color will display what trends of water color exist and compile ecoregion water color trends since Landsat 8's launch. Individual Sentinel Lake water color trends are hypothesized to not remain a consistent color through time. The results of this project further develops the possibilities of water color analysis for water quality monitoring and surface water management at unprecedented scales. Cost reduction, historical backlogs, and recurrent sampling are few of the major benefits for further scientific investigations with water color methodology for water quality monitoring.



## **TRANSPORT OF SUSPENDED SEDIMENT AND PHOSPHOROUS IN AN AGRICULTURAL WATERSHED: A CASE STUDY OF THE MONEY CREEK WATERSHED, CENTRAL ILLINOIS**

Presenter: Efobo, Oghenevwe  
Graduate, Geography, Geology, and the Environment

Mentor: Prof. Eric Peterson

Authorship: Eric Peterson, Bill Perry, Catherine O'Reilly

Suspended sediment and phosphorus are a threat to surface waterbodies. Excessive supply of suspended sediment to streams can alter water quality, reduce reservoir storage capacity, and degrade ecological functions including the displacement of aquatic habitats. Phosphorus is a limiting nutrient in freshwater. Excessive phosphorus in streams has led to eutrophication, the development of harmful algal blooms and hypoxic conditions that restrict the water for fisheries, recreation, industry, and drinking. For the City of Bloomington, central Illinois, high nutrient loads and sediment concentrations are a major problem in water reservoirs. The primary sources of suspended sediment and phosphorus in the area are from agriculture, which dominates local land- use. To aid our understanding of the transport dynamics between suspended sediment and phosphorus between April 2018-December 2019, two hypotheses were proposed. They are: (1) the flow-weighted concentration of total suspended sediment (TSS) will be linearly related to the flow- weighted concentration of total phosphorus (TP) for storm events, and (2) there will be seasonal variations between the flow-weighted concentration of TSS and flow-weighted concentration of TP. For hypothesis 1, a nonlinear regression analysis was used to evaluate a potential relationship between the independent variable, TSS concentration and the dependent variable, TP concentration. For hypothesis 2, a Kruskal-Wallis test was used to identify statistical differences among flow-weighted TSS and TP concentrations throughout the four seasons. The Pairwise Wilcox test was used to determine which seasons the differences in flow-weighted TSS and TP concentrations were significant. Results showed a strong positive linear relationship between flow- weighted TSS and TP concentration for all storm events ( $R^2 = 0.86$ ); this relationship was observed among the storms in the winter ( $R^2 = 0.84$ ), spring ( $R^2 = 0.95$ ), summer ( $R^2 = 0.64$ ), and fall ( $R^2 = 0.97$ ). Both the median flow-weighted TSS and TP concentrations were statistically similar among the seasons, with the exception between summer-fall when both TSS and TP concentrations were different. Despite the similarity in flow-weighted concentrations among the seasons, discharge controls sediment transport. The higher the discharge, the more TSS and TP that were transported. Summer discharges were the lowest, producing low flow-weighted concentrations for both TSS and TP. Winter and spring saw elevated discharge volumes that produced higher flow-weighted concentrations. Elevated discharge in winter and spring were due to high precipitation and snowmelt. Mitigation strategies should be focused on the winter and spring in which high TSS and TP have been reported.

## **DO ANIMALS USE URBAN STREAMS AS CORRIDORS?**

Presenter: Fever, Lacey  
Undergraduate, Geography, Geology, and the Environment

Mentor: Prof. Catherine O'Reilly

Co-Mentor: Michael Brown

Authorship: Lacey Fever, Catherine O'Reilly, Michael Brown, Cathy Oloffson

Wildlife are increasingly found in urban environments. However, it is not clear how wildlife moves around the urban landscape. The purpose of our project is to determine whether animals use urban streams as corridors to move through town. We speculated that animals use the town's streams as a corridor to cross into residents' yards. To test this hypothesis, trail cameras were set up alongside the creeks at Hidden Creek Nature Sanctuary, Anderson Park, Oakdale elementary, and North Blair Drive in Normal, Illinois. The cameras were used to collect data between September 2021 and September 2022. The footage was reviewed on a weekly basis and the images were routinely uploaded onto Colorado Parks and Wildlife (CPW) Access database. Information identified by visually inspecting the images was then used to create graphs. The input data consisted of the animals' species, location, and time of day. Results from the camera images and our graphs indicated that raccoons and coyotes are often present at Hidden Creek Nature Sanctuary around 3:00am. Raccoons and stray cats were commonly observed near Oakdale elementary around 3:00am. Squirrels and ducks were common at Anderson Park around 12:00pm. Birds were common at North Blair Drive around 7:00am to 7:00pm. We also saw herons, chipmunks, dogs, foxes, opossums, and rabbits. There was seasonality in animal activity. The data collected through the trail cameras support our hypothesis; animals do use streams as passageways through town. By inspecting the trail camera footage and noting wildlife location and direction of movement, we observed various native species using the streams to travel through town.

## **EVALUATING THE POROSITY AND ROCK STRENGTH OF CARTER COUNTY, KY**

Presenter: Hoberg, Joe  
Undergraduate, Geography, Geology, and the Environment

Mentor: Prof. Eric Peterson

Authorship: Joe Hoberg, Eric Peterson, Ethan Conley

Carter Caves State Resort Park (CCSRP) located in, Carter County, KY, is a fluviokarst system consisting of 106 km<sup>2</sup> deeply incised valleys characteristic of the Cumberland Plateau. Stratigraphically the region consists of approximately 25m of Mississippian age limestone of the Slade Formation overlain by the lower Carter Caves sandstone member of the Mississippian Paragon Fm. Over the course of the last decade, numerous studies conducted terrain analyses to characterize CCSRП for cave collapse, paleoclimate data, and evolutionary history. These studies have primarily focused on the use of digital elevation models (DEM) and GIS driven techniques to identify and correlate cave levels to stream incisions.

This region lacks numerical descriptions of in-situ parameters, such as porosity and rock strength, that are commonly used as components in hydrogeologic and karst genesis models. There has been minimal efforts completed to conduct or advance any research in porosity in recent time. Ultimately, this has limited the ability and domain to which further advancements in characterizing CCSRП could be done.

Two samples of the Warix Run member and five samples of the Mill Knob member of the Slade formation were collected near the entrances to Horn Hollow cave. The Mill Knob member consists of light-olive-grey quartzose calcarenite and lesser calcilutite while Warix Run contains calcarenite and calcilutite with lesser amounts of dolomite and shale. In general, both also contain medium- to coarse-grained red and grey chert, silt, and sand with large crossbedding.

All samples were evaluated for rock strength using a Schmidt hammer, and four samples were evaluated for porosity. Thin sections of these samples were acquired and applied with a blue dye epoxy to enhance the visibility of any pore spaces. Using ImageJ and INFINITY ANALYZE 7, 25 images at 4x magnification of each slide were digitized to calculate the average porosity of each sample as well as a cumulative average for both geologic members. The porosity data for Mill Knob displays a mean of 5.05%, with a range from 3.16% to 6.62% while the Warix Run data illustrate a mean of 2.63%. Rock strength data for Mill Knob shows a mean of 28.5 n/mm<sup>2</sup>, with a range from 21.5 to 42 n/mm<sup>2</sup> while Warix Run data displays a mean of 26.5 n/mm<sup>2</sup>, with a range from 22 to 30.5 n/mm<sup>2</sup>.

## **UNDERSTANDING GROUNDWATER FLOW IN A SATURATED BUFFER ZONE (SBZ) USING NUMERICAL MODELS: CASE STUDY OF T3 SITE, MCLEAN COUNTY, CENTRAL ILLINOIS**

Presenter: Nsude, Henry  
Graduate, Geography, Geology, and the Environment

Mentor: Prof. Wondy Seyoum

Co-Mentor: Prof. Eric Petereson

Authorship: Henry Nsude, Wondy Seyoum, Eric Peterson

Excess nitrate due to use of fertilizers is a threat to surface water bodies in the United States. It leads to high nitrate content in water discharged to streams which degrade aquatic ecosystems through process of eutrophication and subsequent hypoxic conditions. The presence of nitrate also threatens the potability of numerous aquifer bodies globally due to their high solubility in water. To tackle this problem, the Environmental Protection Agency (EPA) recommends the use of saturated buffer zone (SBZ) as best management practice for filtering nutrients from nitrate laden water prior to discharge at streams. However, there isn't a good understanding of how groundwater flows in the SBZ. This knowledge is important as it will aid in optimal design of the width of the buffer zone. To aid understanding of groundwater flow in the SBZ with the T3 site as case study, the aim is to prove two hypotheses: (1). Radius of influence will increase as rate of discharge of tile water increases. (2). There is interaction between regional groundwater flow and local tile water flow and vice versa To test the first hypothesis, a finite difference groundwater modeling software (MODFLOW) is used to produce a three-dimensional steady state groundwater model. After calibration using autocalibration techniques, several scenarios are run where tile discharge is increased and the resulting change in radius of tile water measured. To test for the second hypothesis, a particle tracking software (MODPATH) is used to place particles at the eastern edge of the model and run flow simulations to compare fluid flow when the tile is turned on to when the tile is turned off. It is expected that the radius of influence of tile water will increase as discharge of tile water is increased up until the point the tile water reaches the stream. At that point, the radius no longer increases but flattens (takes shape of asymptote). It is also expected that there would be interaction between the regional groundwater flow and local tile water flow. Thus, a buildup of hydraulic head is expected when tiles are turned on. This would lead to a reduction in percentage of particles entering the buffer zone as compared to when the tiles are turned off.

## **EXPLORING THE EFFICACY AND ETHICS OF PRONATALISM: HOW GOVERNMENT POLICIES SHAPE POPULATION DYNAMICS**

Presenter: Panek, MK  
Undergraduate, Geography, Geology, and the Environment

Mentor: Prof. Matt Himley

Authorship: MK Panek

Declining fertility rates in many parts of the world have contributed to a surge of interest in 'pronatalist' policies, or policies designed to stimulate an increase in birth rates. These propositions vary from an expansion of social welfare programs (parental leave, subsidized childcare, free education) to more coercive mechanisms, such as limitations on access to abortion and birth control. Reasoning behind these policies ranges from economic to military – and are, in some parts of the world, shaped by ethnonationalism. In this context, the present research project asks three interrelated questions: (1) Is there evidence of pronatalist policies effectively increasing birth rates? (2) What sorts of policies have been shown to be most effective? (3) What can an examination of existing pronatalist policies tell us about the ethical/normative implications of pronatalism? To address these questions, the research focuses on the history of pronatalist policies in three countries: France, Hungary, and South Korea. Based on a review of academic and non-academic source materials, the poster presentation will report on the specific historical and cultural contexts in which pronatalist policies emerged in the case study countries. It will be supported by evidence available to date on the effectiveness of policies implemented in each country. And it will reflect on how analysis of the case studies can inform an ethical approach to the world's demographic changes.

## **MAKE GEOPOLYMER CONCRETE USING WASTE GLASS AND INDUSTRIAL BY-PRODUCTS**

Presenter: Roslewski, Lucas  
Undergraduate, Geography, Geology, and the Environment

Mentor: Prof. Guang Jin

Co-Mentor: Prof. Pranshoo Solanki, Technology

Authorship: Lucas Roslewski, Guang Jin, Pranshoo Solanki

Portland cement-based products such as concrete are the most common building material used in the world. However, cement production comes with its high energy consumption, emission of greenhouse gasses, and consumption of nonrenewable materials. Geopolymer concrete (GeoPC) offers a more environmentally friendly alternative to Portland cement due to its lower energy consumption, greater durability, and lower greenhouse gas emissions. GeoPC is prepared by mixing an alkaline activator along with industrial by-products such as fly ash, slag, and quarry by-product to form a dense three-dimensional polymeric chain and ring structure of silicon-aluminum minerals.

The purpose of this study is to explore the feasibility of using waste glass as a potential alkaline activator, along with other industrial by-products such as fly ash, slag and quarry-by products, in the preparation of GeoPC. Compressive strength of GeoPCs prepared from recycled glass were also tested and compared with GeoPCs prepared using commercial water glass at equivalent sodium silicate concentration. Results show that compressive strength of GeoPC prepared using recycled glass (fine ground) are comparable or higher than those prepared using commercial waterglass at various mix designs and curing conditions. Further research in expanding recycled glass from fine-ground to coarse-ground is needed in order to further reduce cost.

## **HUMAN IMPACTS ON EROSION RATES IN STARVED ROCK STATE PARK, IL**

Presenter: Thielbar, Savannah  
Graduate, Geography, Geology, and the Environment

Mentor: Prof. Lisa Tranel

Authorship: Savannah Thielbar, Lisa Tranel

State and National parks are some of the most visited wildlife areas within the United States, making local geologic features more susceptible to human-induced change. As more people visit these parks throughout the year, we see major impacts on the interactions between biological and geological processes. This study determines if human activity, through rock carvings, influence erosion rates within Starved Rock State Park and provides a new perspective on our compounding anthropogenic influence on Earth. Through natural stream and artificial human erosion, the base of the bedrock slope is potentially changing at a much faster rate than the upper portion of the outcrop. By monitoring the fragile sandstone cliffs that preserve these human-created carvings, we collect specific erosion data on four different canyons within the park. Canyon wall data are collected and monitored using an Empire contour gauge, a rebound Schmidt hammer, and an iPhone 13 LiDAR camera and app program to determine seasonal variations in erosion throughout the park as well as the influence of surficial case hardening on the outcrops. The contour gauge and Schmidt hammer data collected suggest the bedrock of the area is affected on a small, millimeter scale within a course of a year. We compared data collected from the carvings to bedrock that is naturally eroding without human influence to understand localized changes to bedrock and consider connections to long-term erosion of these surfaces. Analysis of Schmidt hammer values and previously collected thin sections indicate that some locations have stronger rock surfaces driven by differences in cement concentrations from the surface to the interior of the rock outcrops. Differences in rock strength produce variation in erosion rates across the canyons and provide context to seasonal implications for weathering. Future research identifying the magnitude of this impact over a longer period, as well as the impact on other lithologies, can prove to be valuable in increasing education and awareness at other state or national parks.

# HISTORY

## **GENDER, RACE, AND "EMPTY SPACE": DEPICTIONS OF THE BRITISH EMPIRE IN THE GOLDEN AGE OF BRITISH CHILDREN'S LITERATURE**

Presenter:            Ruske, Jessica  
                            Undergraduate, History

Mentor:                Prof. Taylor Soja

Authorship:          Jessica Ruske

Over the course of a semester, I conducted historical research with the goal of answering questions about how the British Empire has generally been depicted in nineteenth century British children's literature. My research focuses on four books which I believe are important in understanding how the British Empire is portrayed in literature: Rudyard Kipling's *The Jungle Book*, Lewis Carroll's *Alice's Adventures in Wonderland*, Charles Kingsley's *The Water Babies: A Fairy Tale for a Land-Baby*, and James Matthew Barrie's *Peter and Wendy*. Additionally, I conducted research on the reception of this literature in newspaper articles and the secondary literature describing the popularity of these new children's books and how the "Golden Age" of children's literature came to be.

Through researching these books, I discovered how the British Empire was generally depicted as a place designed for adventures; these books make clear to British children that when they grow up, the British Empire is there for them to eventually explore and live out the dreams they had as children. However, the type of adventures children could have varies greatly depending on gender. Boys were intended to have adventures in which they could explore and have fun, while girls were still expected to uphold the gender roles that British society expected of them. This is especially clear when comparing *The Jungle Book* and *Alice's Adventures in Wonderland*. Mowgli and Alice's adventures contrast each other in almost every way because of gender.

Nineteenth century children's literature portrays the British Empire as being filled with empty space; a place where no one lived and no other cultures existed. We can see this depiction in all four of the books, where the Empire is described only as a place filled by animals and other British individuals. If natives are mentioned, their depictions center around racist stereotypes. The passages speaking of natives refer to them as being less than human, and the images shown in the books reflect racist depictions common in nineteenth century images.

Each of the books reflect how the British viewed their Empire as well as how they wanted their citizens to utilize the Empire. Through my research, I was able to come to the conclusion that the popularity of these books after their release reflect British sentiments surrounding colonization and imperialism in the nineteenth century.



# INFORMATION TECHNOLOGY

## **CHATGPT LITERATURE REVIEW: USE AND IMPLICATIONS IN VARIOUS SECTORS**

Presenter: Abadeer, Elyse  
Undergraduate, Information Technology

Mentor: Prof. Yousra Javed

ChatGPT is a brand new artificial intelligence tool that was launched on November 30, 2022, by OpenAI. This emerging chatbot technology will likely have many significant implications for information security and privacy, but it also is expected to impact a broad range of other sectors. This research project is a literature review conducted to explore the trends in current research about ChatGPT, to observe how different fields and disciplines are responding to this new technology, and to analyze and draw conclusions about the information found.

## COMPUTATIONAL APPROACH TO STUDY ABNORMAL BRAIN ACTIVITY

Group Leader: Jacob, George  
Graduate, Information Technology

Group Member: Twinkle Jaswal, Undergraduate, Information Technology

Mentor: Prof. Rosangela Follmann

Co-Mentor: Prof. Epaminondas Rosa

Authorship: George Jacob, Twinkle Jaswal, Rosangela Follmann, Epaminondas Rosa

Neurons are the fundamental building blocks of the nervous system. A neuron is a cell that uses electrical impulses and chemical signals to transmit information between different areas of the brain, as well as with the rest of the nervous system. Computational modeling of neurons can provide a powerful tool to study neurological processes, including neurological disorders. Epilepsy, for example, is a nervous system disorder characterized by excessive brain activity, which includes abnormal neuronal synchronization. It affects around 50 million people worldwide and can have devastating disruptions in their lives. Much progress has been made in the diagnosis and treatment of this disorder, but presently there is no guaranteed cure for the disease. Computer simulation studies using quantitative neuron network models can help the understanding of brain functions under neuropathological conditions. The outcome may be useful not only in the development of detection but also, in the prevention of seizures. In this work, we employ the Huber-Braun neuron model based on the Hodgkin-Huxley equations to provide an accessible, meaningful mathematical representation of neural processes, detailing how action potentials are triggered and simulating neuronal behavior. Moreover, we developed a biophysical model to simulate and analyze a network of coupled neurons following the functional connectivity prior and during the onset of a seizure. We also investigated how temperature changes in the proposed model can trigger seizures, mimicking the conditions observed during fever induced seizures in infants.

## KINESIOLOGY AND RECREATION

### RELATIONSHIP BETWEEN BMI, WAIST CIRCUMFERENCE, WAIST TO HEIGHT RATIO, PERCENT FAT, AND RESTING METABOLIC RATE

Presenter: Garneau, Renee  
Undergraduate, Kinesiology and Recreation

Mentor: Prof. David Thomas

Co-Mentor: Prof. Kristen Lagally

Authorship: David Thomas, Kristen Lagally, Laina Runyon, Alex Cerrato

Overweight and obesity are major problems worldwide. It has been speculated that body fatness is related to resting metabolic rate. **PURPOSE:** The purpose of this study was to determine the relationship between body mass index (BMI), waist circumference (WC), waist to height ratio (WHtR), percent body fat (%BF), and resting metabolic rate (RMR). **METHODS:** Twenty-eight (11M, 17F) volunteers (mean age =  $21.3 \pm 1.4$  years) participated in height (Ht), mass, WC, %BF, and RMR measurements in a single session. Ht and mass were measured on a clinical stadiometer. BMI was calculated by dividing mass in kilograms by the square of their Ht in meters. WC was measured using a standard measuring tape, with the measure taken at the narrowest part of the trunk between the ribs and iliac crest. WHtR was calculated by dividing WC by Ht. RMR was measured using a metabolic cart measuring oxygen consumption and carbon dioxide production. Percent fat was measured using air displacement plethysmography. To provide a measure of RMR relative to body mass (RMR/kg), RMR was divided by mass. Means and standard deviations were determined for all variables. Pearson product-moment correlations were used to statistically analyze the results. **RESULTS:** Means and standard deviations for each variable were: Ht  $169.7 \pm 9.7$  cm; Mass  $79.2 \pm 18.8$  kg; RMR  $1666 \pm 398.7$  kcals/d; BMI  $27.3 \pm 5.1$  kg/m<sup>2</sup>; WC  $81.6 \pm 10.9$  cm; WHtR  $0.48 \pm 0.06$ ; RMR/kg  $21.4 \pm 4.1$  kcals/d; and %BF  $28.5 \pm 12.1\%$ . Correlations between RMR and the body composition variables were: BMI  $r = 0.49$ ,  $R^2 = 0.24$ ; WC  $r = 0.6$ ,  $R^2 = 0.36$ ; WHtR  $r = 0.31$ ,  $R^2 = 0.11$ ; and %BF  $r = -0.35$ ,  $R^2 = 0.13$ . Correlations between RMR/kg and the body composition variables were: BMI  $r = -0.47$ ,  $R^2 = 0.22$ ; WC  $r = -0.36$ ,  $R^2 = 0.13$ ; WHtR  $r = -0.39$ ,  $R^2 = 0.15$ ; and %BF  $r = -0.67$ ,  $R^2 = 0.44$ . **CONCLUSIONS:** Results indicate weak to moderate correlations between both absolute and relative RMR, the anthropometric variables, and %BF. The relationships between absolute RMR and the other variables indicates larger people have higher RMR. The relationships between RMR/kg and anthropometric measures and %BF were inverse, suggesting lower metabolic rates per unit of mass, and lower metabolically active tissue in those with higher levels of body fatness.

## **META-ANALYSIS OF TRADITIONAL ACUPUNCTURE POINTS, ASHI POINTS AND DELAYED-ONSET MUSCLE SORENESS**

Presenter: Shao, Yufang  
Graduate, Kinesiology and Recreation

Mentor: Prof. Kelly Laurson

Delayed onset muscle soreness (DOMS) is a type of muscle injury that can occur in all exercises following moderate-to-high intensity physical activity. Symptoms of DOMS, such as pain, muscle tenderness, stiffness, and restricted range of motion, occur 6 to 24 hours post-exercise and can continue for three to five days. DOMS may influence performance in athletes and activities of daily living in the general population. More recently, acupuncture has been considered as an alternative treatment method for muscle injury, which includes DOMS. The purpose of the proposed study aims to analyze existing data in the literature through March 2023, to investigate the effectiveness of acupuncture treatment with traditional acupoints or ashi points to treat DOMS. Traditional acupoints are the points on the traditional meridians and have their action and benefits in traditional Chinese medicine (TCM) theory. Ashi points do not have a specific location and are similar to trigger points. Previous meta-analysis studies for DOMS and acupuncture did not find significant evidence to support that acupuncture can help DOMS improvement or prevention, but they found other benefits for acupuncture. The reasons included 1) not enough studies for analysis, and 2) criteria and conditions were not clear for the treatment function. Through this research, we hope to determine the effectiveness of acupuncture for DOMS, while distinguishing between the utility of traditional acupoints and ashi points.

## MANAGEMENT AND QUANTITATIVE METHODS

### REACTIONS OF STUDENTS BETWEEN USA AND BARBADOS

Presenter: Samake, Oumou  
Undergraduate, Management and Quantitative Methods

Mentor: Prof. Tina Williams

Research in psychophysiology reported that the body exhibits evidence of chronic stress after experiencing traumatic events. This research aims to contribute to the conversation by examining whether the racial composition of society influences strain reactions (i.e., frustration, emotional exhaustion, anxiety, or depression) and whether that relationship is significantly moderated by membership in the dominant or marginalized race. This study will use a longitudinal design to assess the strain reactions between students who attend college in the U.S. and Barbados and within students who attend college in the U.S. in different social environments. The research tests whether the relationship between the racial composition of society and strain reactions will be moderated by race and whether the relationship between the racial composition of society and strain reactions will negatively (positively) influence strain reactions when participants are of the marginalized (dominant) race.

## **SOCIAL ENTREPRENEURSHIP INDEPENDENT STUDY**

Presenter: Ward, Faith  
Undergraduate, Management and Quantitative Methods

Mentor: Prof. Tina Williams

My project is a focused study on social entrepreneurship. The study is an in-depth look into what social entrepreneurship is, how it is formed, and the impact it has on society in the United States and abroad. The project is a semester-long research on this topic.

The project consists of interviews, literature studies, and research abroad in Barbados and on campus. While abroad, I will be analyzing the different kinds of social enterprises, and the impact these businesses have on ex-patriots and native Barbadians while considering intersectionality in Barbados.

The project will also include social entrepreneurship in the visual and performing arts. I will be working with filmmakers in Barbados and analyzing their work and impact on their community.

## MATHEMATICS

### TRAVELING SALESMAN PROBLEM: HOW A REDBIRD CAN FIND THE FASTEST PATH AROUND ISU?

Group Leader: Domingo, Eugene  
Undergraduate, Mathematics

Group Member: Tiyun Harvey, Undergraduate, Mathematics

Mentor: Prof. Mehdi Karimi

Authorship: Eugene Domingo, Tiyun Harvey

Traveling Salesman Problem (TSP), the problem of finding a minimum cost Hamiltonian cycle in a graph, is the most important graph optimization problem, which is NP-complete. In addition to its theoretical importance, the TSP has many applications in transportation, logistics, and microchip design. Even though the TSP has been studied for years by classical optimizers, new approaches in machine learning have been proposed to solve some cases of the problem faster. In this research, we will explore the classical and modern approaches for the TSP for graphs involving the Illinois State University community. By starting with a small data set, we find the shortest distance to visit twelve cities throughout the Midwest of the United States and return to the starting point. After developing this model, we find the shortest tour to visit many points of interest at the Illinois State University campus. To implement classical optimization approaches for the TSP, we use Python and the GUROBI Python API, which is the current fastest commercial integer programming solver. We will also study some machine learning and heuristic techniques for the TSP and their pros and cons compared to optimization techniques. Our techniques can be used for solving large-scale TSP instances.

## **PREDICTING ENROLLMENT FROM PROSPECTIVE STUDENT DATA AND SCHOLARSHIP VALUE**

Group Leader: Martin, Emma  
Undergraduate, Mathematics

Group Members: Robert Skudnig, Undergraduate, Mathematics; Emma Rouger,  
Undergraduate, Mathematics; Brandi LaFontaine, Undergraduate,  
Mathematics

Mentor: Prof. Mehdi Karimi

Authorship: Emma Martin, Robert Skudnig, Emma Rouger, Brandi LaFontaine

In this research project, we use modern Data Science and Machine Learning techniques to optimize the scholarship process at Illinois State University (ISU). Almost every academic institution provides some form of scholarship to first-year students classically based on factors such as GPA, SAT score, and financial situation. This project aims to analyze the previous data sets thoroughly to find a model that optimizes the scholarships while maintaining an acceptable enrollment. This comprehensive data science project contains data preparation and pre-processing, model definition and training, model evaluation, and data visualization and presentation. We use the Python programming language, several machine learning packages, and mathematical tools in this project to develop a more robust and efficient method of awarding scholarships. The data set has 20,000 entries of historical information on admission and enrollment. We explore several models, such as neural networks (NN), to model a function that approximates the likelihood of enrollment from a prospective student's data and possible scholarship award amount. We explain our methodology and results with effective visualization techniques to simplify decision-making by the administration. The data science methods and models we develop can be used in many decision-making scenarios at ISU and outside companies.



## **ON THE RISK FACTORS OF CARDIOVASCULAR DISEASES**

Group Leader: Mozid, Nishat Ara  
Graduate, Mathematics

Group Members: Kwabena Duku, Graduate, Mathematics

Mentor: Prof. Olcay Akman

Authorship: Kwabena Duku, Nishat Ara Mozid, Olcay Akman

Cardiovascular diseases (CD) are one of the leading causes of death worldwide. They include coronary heart disease, strokes, transient ischemic attacks, peripheral arterial disease, and aortic disease, among others. With this study we investigate the association between these risk factors and non-physiological categories of risk factors such as demographics, health practices, and biological markers as they relate to the development of CD. We also derive the risk coefficient of developing CD as a result of inclusion in specific risk factor groups.

## **A COMPUTATIONAL MODELING APPROACH TO UNDERSTANDING THE OUTCOME OF ISCHAEMIC HEPATITIS**

Group Leader: Utterback, Madison  
Undergraduate, Mathematics

Group Member: Christiana Beard, Undergraduate, Mathematics

Mentor: Prof. Olcay Akman

Authorship: Christiana Beard, Madison Utterback, Aditi Ghosh, Priya Kohli

Ischemic Hepatitis (IH) is a liver injury preceded by hepatocyte death. The only way to diagnose this disease is to eliminate the possibilities of all other liver injuries currently. To combat this issue, our goal is to explore computational models that are able to predict the outcome in terms of death or survival of a person who suffers from IH based on various biomedical indicators such as: creatinine peak, international normalized ratio peak, aspartate aminotransferase peak, alanine transaminase peak, and bilirubin peak. The real patient data was collected across multi centers from the US by the Acute Liver Failure Study Group. We clean, process, and analyze the data utilizing classification models like logistic regression and regression tree method, including BART, to predict the outcome of the patients suffering from IH. We then apply SMOTE and boosting techniques to improve the prediction accuracy. Obtaining the sensitivity and specificity of the testing methods helps us compare the outcome to determine the best model.

## NURSING

### THE FUTURE OF HEALTHCARE- FOUNDATIONS FOR CHANGE

Presenter:           Avisé, Leah  
                          Undergraduate, Nursing

Mentor:             Prof. Melissa Calvillo

Authorship:         Leah Avisé, Melissa Calvillo

Healthcare professionals are expected to maintain an understanding of current research and adapt to new evidence in order to provide excellent patient care. To understand important contributors to the long-term success of our healthcare system, a special issue of the International Journal of Environmental Research and Public Health was reviewed and synthesized. This issue includes 15 articles from international scholars regarding the future of the healthcare workforce. A critical theme that emerged is the importance of professional development and continuing education at all healthcare system levels. Creating a culture that supports this further learning also allows for innovation and improves employee satisfaction. A shortage of healthcare workers is an international phenomenon. Employee retention is key to maintaining staff-patient ratios which contribute to a safe environment for patients, therefore it is important for the system to promote the satisfaction of employees. An additional theme includes a workplace culture that encourages communication and interdisciplinary teamwork. An interdisciplinary approach to problem-solving facilitates creativity and, ultimately, improved efficacy. Interdisciplinary teams also increase compliance with treatment plans and general well-being for both patients and staff.

## PHILOSOPHY

### **AGENCY AND ATROCITY: TOWARDS THE METAPHYSICS OF HISTORY IN INTERWAR HUNGARY**

Presenter: Lynch, Erik  
Undergraduate, Philosophy

Mentor: Prof. David Sanson

Authorship: Erik Lynch

The pioneering work of Randolph Braham on the development of the Holocaust as it occurred in Hungary broke with conventional English-language accounts, which had placed their analysis and agency almost solely on Hungary's regent, Miklós Horthy, whereas Braham's work had accounted for a wider variety of causal factors in the Hungarian descent into fascism and genocide. Braham's most significant contribution to the historiography of the Holocaust in Hungary was his institutional-structural analysis of factionalism within the ruling Government Party of Hungary as a key actuator of the muddled foreign, domestic, and Jewish policies of the Government Party during the Interwar period and throughout the Second World War. This work further develops Braham's position, and presents the historiographical debate concerning agency in the Holocaust in Hungary as a type-case situated within a broader discussion of historiological method, agency, causation, and the metaphysics of history, time, and memory. The memory of the Holocaust as it occurred in Hungary is a living memory, one that exerts considerable influence over contemporary Hungarian politics and culture. As such, the metaphysics of history and of historical memory are very much live and relevant issues in reference to the Holocaust in Hungary. This work seeks to make sense of the stakes of, and the methods appropriate to, approaching the metaphysics of history.

# PHYSICS

## **NANOMATERIAL GROWTH USING BLOCK COPOLYMER AS A TEMPLATE**

Presenter: Herbert, Carter  
Undergraduate, Physics

Mentor: Prof. Mahua Biswas

Authorship: Carter Herbert, Amelia Korveziroska, Mahua Biswas

Nanomaterials, the building blocks of many developed and emerging technologies have received significant attention in last few decades. There are tremendous efforts in nanomaterial synthesis and patterning with well controlled size, shape, composition and spatial arrangement for device applications. Hence identifying and developing a process that allows for controllable size and shaping is critical. For well-ordered and tunable size and spacing control of the nanostructures on a substrate one of the most effective strategies is to use template-based fabrication that allows for a high degree of control. In our experimental physics laboratory at Illinois State University, we use block copolymers (BCPs), a special type of polymer with self-assembly property to create nanostructures, as templates and different inorganic deposition methods for the fabrication of inorganic material nanostructures with different morphology. BCPs have the capability to create nanopatterns of different shape, size and spacing which can be tuned by tuning the properties of BCPs such as molecular weight and volume fraction. In my presentation, I will give an overview of the BCP template fabrication method and inorganic material nanostructure fabrication using BCP as template that we perform in our laboratory at ISU.

## FABRICATION OF NANOMATERIALS USING POLYMER AND SEQUENTIAL INFILTRATION SYNTHESIS

Presenter: Korveziroska, Amelia  
Undergraduate, Physics

Mentor Prof. Mahua Biswas

Authorship: Jaydah Bell, Mahua Biswas

The demand for higher efficiency, compact, and cost effective technologies creates a need for smaller dimension nano-materials. These materials are used on a daily basis and in advancing scientific revolution such as in our phones, laptops, emerging devices like solar cells, nanolasers, memory devices, and sensors. To improve these technologies, we study the fabrication of nanomaterials and advancement of their properties. Exploring different methods of making patterns on inorganic nanomaterial with adjustable size and spacing becomes necessary. This research focuses on developing a sequential infiltration synthesis (SIS) process for silicon nitride ( $\text{Si}_3\text{N}_4$ ) and silicon dioxide ( $\text{SiO}_2$ ) materials. SIS involves gas phase molecular assembly reactions and enables the control of localized inorganic nanopatterns using a polymer as a template inside an atomic layer deposition (ALD) chamber. The selective infiltration in SIS is important for assuring large-scale uniformity in mass production of organized nanoscale materials with controlled material properties and for patterning purposes. We have studied the growth process of  $\text{Si}_3\text{N}_4$  and  $\text{SiO}_2$  during SIS deposition using in-situ Fourier Transform Infrared (FTIR) Spectroscopy in collaboration with Argonne National Laboratory. We worked with films and nanoparticles of polymers as templates for the SIS deposition and studied the growth process and parameters using in-situ FTIR Spectroscopy and X-ray photoelectron spectroscopy (XPS). In our work, we identified the precursors which have significant interactions with the polymers using in-situ spectroscopy. There are significant SIS interactions between four polymers and  $\text{SiO}_2$  precursors and we have observed weak interactions between  $\text{Si}_3\text{N}_4$  and polymers.

## NANOPATTERNING INORGANIC MATERIALS FOR EMERGING TECHNOLOGIES

Presenter: Patra, Sudarshana  
Graduate, Chemistry

Mentor: Prof. Mahua Biswas

Co-Mentor: Prof. Uttam Manna

Authorship: Sudarshana Patra

The research and developments of nanomaterials has made great strides in recent years. Nanomaterials have revolutionized the way technology is used in modern society and is showing promises for emerging technologies. With their unique properties, these materials have enabled numerous applications that could not be imagined before. Their small size and high surface area can lead to enhanced optical, electrical, and mechanical properties. Nanopatterning of inorganic materials is an emerging field with a wide range of applications. It has been used in various fields, such as electronics, optics, photonics, energy, and biomedical engineering. Sequential Infiltration Synthesis (SIS), an inorganic materials infiltration method has shown potential for nanopatterning inorganic materials used for microelectronics and optoelectronics industry. SIS involves the alternate deposition of two different precursor chemicals onto a patterned polymeric surface which acts as a guiding material. SIS can be used to create a wide variety of nanostructured materials, including metal oxides, metals, and semiconductors, with precise control over their size, shape, and composition, making it useful for making long range patterns for various applications such as electronics, energy, and catalysis. In our work, we grow nanometer-scale inorganic material (such as aluminum oxide ( $\text{Al}_2\text{O}_3$ ), aluminum nitride ( $\text{AlN}$ ), and gallium nitride ( $\text{GaN}$ )) patterns using SIS. In our laboratory, we study the growth mechanism of these inorganic materials in polymers using Scanning electron microscopy, energy dispersive x-ray electron spectroscopy and Fourier Transform Infrared spectroscopy. Our work also focuses on the challenges associated with SIS and provides possible solutions to these challenges. In this presentation, an overview of current and future research works in our group on SIS nanopatterning will be presented.

## **THEORY OF MIND IN CHILDREN WITH AUTISM: IMPLICATIONS FOR ANXIETY AND DEPRESSION**

Presenter:           Aguilar, Sarah  
                          Graduate, Psychology

Mentor:             Prof. Karla Doepke

Autism is defined by two core characteristics: difficulties in social communication and restrictive interests or routine behaviors. Individuals with autism often have comorbid anxiety and depression. Little is known about what contributes to the development of anxiety and depression in this population. One possible factor is theory of mind. Theory of mind, often known as perspective taking, is the extent to which an individual can evaluate their own behavior and other people's behavior. Theory of mind is used in everyday activities that promote social interactions and communication styles. It is an important ability, given it impacts social communication and is pivotal for social and cultural learning. Individuals with autism often have difficulties with theory of mind. This study explores the relationship between theory of mind, anxiety, and depression in autistic individuals.



## **THE IMPACT OF TEACHER RELATIONSHIPS ON STUDENTS' SELF-ESTEEM AND CONDUCT PROBLEMS**

Group Leader: Bradley, Brittany  
Graduate, Psychology

Group Member: Arielle Flint, Graduate, Psychology

Mentor: Prof. Brea Banks

Authorship: Brittany Bradley, Arielle Flint

As part of the current study, we will examine (a) between school differences in adolescent students' perceptions of school climate, (b) the relation between school climate perceptions and self-reports of conduct problems and self-esteem among adolescent students, and (c) gender and race differences amount these associations. We recruited 700 participants from a Midwestern school district in an urban area. Participants were in grades 6-12 at the time of data collection and were recruited from two alternative schools, three high schools, and five middle schools. We administered a survey electronically via Qualtrics. Participants first completed demographic items before being presented with the following measures: Teacher Relationships Scale (created by researchers), the Rosenberg Self Esteem Scale (Rosenberg, 1965), and the Conduct Problems Scale (created by the author).

We are beginning data analysis this month, as data have already been collected. We will use a multilevel regression analysis to examine variable relations while accounting for nesting that may have occurred given data collected at multiple schools within the same district. Our primary research questions surround the impact of teacher relationships (Teacher Relationships Scale) on self-esteem (Rosenberg Self-Esteem Scale; Rosenberg, 1965) and self-reported conduct problems (Conduct Problems Scale). We will also explore the role of race and gender as moderators on the above relations. We hypothesize that: (1) positive perceptions of teacher relationships/social support will predict higher ratings of self-esteem and lower ratings of conduct problems among participants, (2) negative perceptions of teacher relationships/social support will predict lower ratings of self-esteem and higher ratings of conduct problems, and (3) gender and race will moderate these relationships. Specifically, it is predicted that the association between perceived teacher relationships/social support and self-reported conduct problems and self-esteem will be stronger for girls than boys, as well as for Students of Color than white students.

During the proposed session, attendees will learn the results of the study, as they will specifically obtain information surrounding the impact that students' perceptions of student-teacher relationships have on their self-reporting of self-esteem and conduct problems. Further, research and practice implications surrounding ways to improve school climate and address systemic inequities present in school systems, along with future directions and limitations, will be discussed.

## **THE GOLD STAR MISSION: BICYCLE RIDE TO REMEMBER FALLEN MILITARY VETERANS**

Group Leader: Brandys, Larysa  
Graduate, Psychology

Group Member: Erin Marchand, Graduate, Psychology

Mentor: Prof. Eric Wesselmann

Co-Mentor: Prof. Mark Swerdlik

Authorship: Larysa Brandys, Erin Marchand, Eric Wesselmann, Eros DeSouza,  
Mark Olson, Mark Swerdlik

This research provides a quantitative approach to evaluating one of the Gold Star Mission's key events: the Gold Star 500 bicycling event. This year's event was conducted in a face-to-face group setting, which differed from the virtual versions conducted during the COVID-19 pandemic. Thus, we will discuss the results from both the in-person event and the previous virtual event for comparison. This year's event also had guest participants from a Polish Veterans' Organization, which provides an opportunity to examine the event's impact on participants from two different countries.

We collected a sample of Gold Star 500 riders and volunteers (virtual event  $N = 43$ ; in-person event U.S. sample  $N = 32$ , and Polish sample  $N = 27$ ). Participants from the virtual event received emails with an anonymous survey link over listservs moderated by the GSM. Participants from the in-person event completed survey measures either in hard copy survey or by scanning a QR code and completing them online. Polish participants completed version of the survey measures translated into Polish. All participants completed measures assessing the perceived efficacy of the GSM program in meeting its goals (e.g., preserving the memory of our fallen heroes; providing support to Gold Star Families), the degree to which GSM activities provided participants a general sense of belonging, and the degree to which participant influenced their meaning in life. Veterans also answered questions assessing how the GSM events influence their perceptions of military-based social support.

Analyses for the in-person event are in progress. Results from the virtual event suggest that participants perceived moderate-to-high levels of the GSM meeting its goals and providing a general sense of belonging. Further, there were significant positive correlations between perceived goal success and belonging, success and desire for future participation. Finally, participants perceived that their participation in GSM events increased their perceived meaning in life on pre-post recall measures.

The virtual data provide promising support that the GSM generally is effective in satisfying its goals. We anticipate that the in-person event data will replicate these findings, with the effects perhaps being descriptively larger given the increased intimacy of the event format. Further, data from the Polish participants will provide interesting explorations for cross-cultural considerations, both for the GSM specifically and for military-focused social support initiatives broadly.

## **MICROAGGRESSIONS AND SCHOOL PSYCHOLOGISTS' SATISFACTION WITH THE FIELD**

Presenter: Callahan, Mackenzie  
Graduate, Psychology

Mentor: Prof. Brea Banks

Authorship: Brea Banks, Mackenzie Callahan

Although research suggests that school psychologists are generally satisfied with their experiences in the field, scholars have yet to examine how exposure to racial microaggressions, or subtle race-based insults, may impact satisfaction. The purpose of the current study was to examine the relation between exposure to microaggressions and satisfaction among practicing school psychologists, students, and university faculty. We were particularly interested in the role of race. We collected survey data from 93 school psychologists, and found that exposure to microaggressions predicted reported satisfaction with jobs and placements, but that the relation was only relevant for People of Color (POC). We also found that the relation between microaggression exposure and satisfaction was moderated by the demographic of one's work setting, as POC in settings that were primarily Black and Brown reported less satisfaction when they experienced high levels of microaggressions. Future directions and implications for the field of school psychology are discussed.

## **EFFECTIVENESS OF MINDFULNESS TRAINING FOR PARENTS**

Group Leader: Giannakouras, Demetria  
Undergraduate, Psychology

Group Member: Jackie Kasalko, Undergraduate, Psychology

Mentor: Prof. Adena Meyers

Authorship: Jackie Kasalko, Demetria Giannakouras

Stress levels among parents of children with intellectual and developmental disabilities are often higher than those of parents of children with typical development. Mindfulness-based practices have been shown to alleviate parental stress. This study examines the effectiveness of mindfulness-based lessons in reducing stress levels in parents of children at The Autism Place (TAP). The mindfulness-based lessons will be held weekly at TAP for an hour. They will include a variety of formal and informal mindfulness practices, such as meditation and mindful movement. The effectiveness of these mindfulness-based lessons will be measured through quantitative surveys as well as qualitatively, by having participants complete semi-structured interviews. Researchers used scales and also created interview questions that would help determine if the mindfulness-based lessons effectively increased participants' levels of self-compassion and mindfulness while decreasing symptoms of stress, anxiety, and depression.

Keywords: mindfulness, stress, parent wellbeing

## **RELATIONSHIP BETWEEN INSTAGRAM USAGE AND ANXIETY AMONG COLLEGE FRESHMEN**

Presenter:           Israels, Emma  
                          Graduate, Psychology

Mentor:             Prof. Gary Cates

Authorship:        Emma Israels, Luke Jasinski, Casey Grage, Gary Cates

This study investigates the relationship between Instagram usage and anxiety among college freshmen. Specifically, college freshmen were asked to provide their data related to total number of posts, how long they have had their account, how many accounts follow them (number of following), and the number of followers they have. In addition, these students were asked to complete an anxiety measure. Correlations between the above variables were calculated. Results and discussion focus on implications of understanding the relationship between social media usage and mental health. Discussion also focuses on directions for future research.

## **BRAIN TRYPTOPHAN HYDROXYLASE IMMUNOREACTIVITY AFTER PCPA-INDUCED SEROTONIN DEPLETION AND THE EFFECTS OF THE 5-HT<sub>1A</sub> AGONIST 8-OH-DPAT ON CARDIAC AND RESPIRATOR RATE**

Presenter: Kant, Caitlyn  
Graduate, Psychology

Mentor: Prof. Byron Heidenreich

Authorship: Caitlyn Kant, Byron Heidenreich

This study investigates the relationship between Instagram usage and anxiety among college freshmen. Specifically, college freshmen were asked to provide their data related to total number of posts, how long they have had their account, how many accounts follow them (number of following), and the number of followers they have. In addition, these students were asked to complete an anxiety measure. Correlations between the above variables were calculated. Results and discussion focus on implications of understanding the relationship between social media usage and mental health. Discussion also focuses on directions for future research.

## **IS PRECRASTINATION THE DEFAULT TENDENCY IN TASK ORDER CHOICES?**

Group Leader: Masih, Sanaii  
Undergraduate, Psychology

Group Members: Mackenzie Brownrigg, Undergraduate, Psychology; Katherine  
Lichter, Undergraduate, Psychology; Scout Paul, Undergraduate,  
Psychology

Mentor:  
Prof. Dawn McBride

Authorship:  
Sanaii Masih, Mackenzie Brownrigg, Katharine Lichter, Scout Paul

Precrastination describes the tendency to complete tasks as soon as possible despite the action requiring more effort (Rosenbaum et al., 2019). In this study, the relationship between precrastination and working memory was examined by studying the relation between working memory task performance and task order choices. This was achieved by presenting a randomized three-part task order to each participant. The three tasks included a Stroop Test, Simon Task, and a Box-Moving Task, with the box moving task involving six different category item list generation tasks. The box moving task required participants to solve simple math problems in order to move the boxes in numerical order. Participants were also instructed to choose to generate the category items during the box moving task at any time they were not moving a box (i.e., before moving any boxes, after moving all of the boxes, or between moving any one of the boxes). The trial position chosen by each participant was measured. We expected that the majority of participants would choose to generate the category items early during the box moving task based on previous studies, and that trial position would be predicted by working memory task performance.

Keywords: precrastination; working memory; effect task type; task order

## **ACADEMIC STRESS AND COPING: POTENTIAL MODERATING ROLES OF PERFECTIONISM**

Group Leader: Meyer, Derek  
Undergraduate, Psychology

Group Members: Jennifer Fishman, Undergraduate, Psychology; Sarah Galati,  
Undergraduate, Psychology

Mentor: Prof. Jeffrey Kahn

Authorship: Jeffrey Kahn, Jennifer Fishman, Sarah Galati, Derek Meyer

College students routinely experience academic stress. This stress is partly determined by one's perfectionistic tendencies (Rice et al., 2016), but perfectionism is associated with different forms of coping (Dunkley et al., 2000). Concerning interpersonal emotion regulation (Zaki & Williams, 2013), students high in perfectionistic concerns tend not to talk with others about distress (Kahn et al., 2021), especially when stress is high (Richardson & Rice, 2015). By contrast, those high in perfectionistic strivings report lower academic stress (Rice et al., 2016) but engage in greater distress disclosure (Kahn et al., 2021). We extended existing research by focusing specifically on simulated academic stressors and examining both interpersonal and intrapersonal coping. We hypothesized that perfectionistic concerns would attenuate the stress-coping relation whereas perfectionistic strivings would amplify the stress-coping relation. College students (N = 268) completed an online questionnaire that included the Almost Perfect Scale-Revised (Slaney et al., 2001) to measure perfectionistic concerns (Discrepancy subscale) and perfectionistic strivings (High Standards subscale). Participants then read 6 scenarios describing academic stressors (e.g., failing a final exam), and they rated how stressful the event would be and how much they would cope using (a) two interpersonal methods (asking someone for advice, venting emotions to someone) and (b) two intrapersonal methods (dealing with it on their own, not dwelling on it).

We conducted four regression models—one for each form of coping—with all two-way interactions among stress, perfectionistic concerns, and perfectionistic strivings specified. Perfectionistic strivings moderated the stress-coping relationship for both interpersonal forms of coping—asking someone for advice,  $p = .02$ , and venting emotions to someone,  $p < .01$ . In both cases, stress and coping were most strongly positively related for those high in perfectionistic strivings. Surprisingly, perfectionistic concerns was not significantly associated with any form of coping in this study.

A complete understanding of how academic stress relates to coping requires knowledge of one's perfectionistic strivings. So-called "healthy perfectionists" (Stoeber & Otto, 2006) are likely to ask others for advice or vent emotions to others when faced with academic stress, whereas those who are not healthy perfectionists show less of a stress-coping association. Our poster will expand on these results and connect these findings to broader theory and research on academic stress, coping, and perfectionism. Limitations (e.g., the use of simulated events) will be discussed.



## IDEAS DON'T HAPPEN IN ISOLATION: AN ACADEMIC INTERVENTION

Group Leader: Motuelle, Jake  
Undergraduate, Psychology

Group Member: Stuart Rand, Undergraduate, Psychology

Mentor: Prof. Jordan Arellanes

### Problem or purpose

Inclusion, diversity, equity, and action (IDEA) is being emphasized more than ever in the world of higher education. Incorporating multicultural content into courses has positive effects of supportive climates on student engagement, learning, and perceptions of an inclusive learning environment (Grover et al., 2020). Such strategies are both a pedagogical and strategic imperative. It is critical that our work promotes inclusion and cultural responsiveness, which are practices that respect and honor diversity through the incorporation of cultural interests and preferences, and builds safe, inclusive, and respectful environments for the promotion of justice and equity (Miller et al., 2019).

### Procedure

This mixed methods study was designed using a SoTL framework to understand the impact of an IDEA intervention. We measured students' changes in IDEA perspectives during the course. A treatment (students in IDEA classes) and a control group (students not in these classes) completed a pre-test and a post-test at the beginning and end of the semester. A focus group was also completed in each IDEA class to gain additional insight into student perceptions of the university and surrounding community. Paired sample t-tests were conducted to test differences for each group. A thematic analysis was conducted for qualitative data.

### Results

The IDEA treatment group demonstrated significant mean increases and a medium effect size for inclusion (Cohen's  $d = .57^{***}$ ), diversity (Cohen's  $d = .32^*$ ), equity (Cohen's  $d = .33^*$ ), and action (Cohen's  $d = .62^{***}$ ) across the semester. Qualitative data also supported these findings. Students discussed the value of diversity within a course and of their understanding and feelings of IDEA. "The class spreads a lot of awareness on the whole community, what they go through and believe in. It gives a better understanding and appreciation of culture." Students shared that having a dedicated space to talk about diversity made them feel valued and heard. No significant differences were found in the control group.

### Conclusions

The increased need to incorporate IDEA within education requires an effective way to employ it into a course setting. Our work provides a possible solution to increase perceptions of IDEA within undergraduate courses. Emphasizing to professors and faculty the value of including diversity in class discussions could increase students' IDEA perceptions. Students feel more valued and heard in a diversity course and when a professor can connect to them. Students also feel more inclusive and a part of the class and the community.

## **DOCUMENTATION STATUS, MINORIZED IDENTITIES, AND PSYCHOLOGICAL OUTCOMES IN COLLEGE STUDENTS**

Presenter: Saavedra, Anthony  
Undergraduate, Psychology

Mentor: Prof. Eric Wesselmann

Co-Mentor: Prof. Eros Desouza

Authorship: Anthony Saavedra, Eric Wesselmann, Eros Desouza

Across all universities/colleges in the United States about 24% of students are immigrants, and 2.14% are undocumented students (Higher Education Immigration Portal, 2018). Researchers have begun assessing how factors like discrimination, both interpersonally and structurally, may foster an environment that makes undocumented Latinx students feel unwelcomed. These experiences may also contribute to poor academic and mental health outcomes. Similar findings occur among students who hold other minoritized identity categories. This study will examine how college students' documentation status and other identity affiliations differ on measures of perceived ostracism, as well as their academic and psychological wellbeing.

Participants will be recruited undergraduate psychology courses. First, participants will complete a demographic measure that includes documentation status, and other identity categories (e.g., race/ethnicity, gender identity), a 10-item perceived ostracism measure, measures of mental and physical health, and their current GPA as an academic outcome indicator. Data are currently being collected.

Generally, we expect that perceived ostracism will correlate negatively with all indicators of physical, mental, and academic wellbeing. We also expect that individuals who are members of minoritized identity categories will have lower scores on wellbeing measures than individuals who are in majoritized categories. We will also explore the possibility that undocumented individuals may outperform documented individuals on academic outcomes (i.e., "immigrant paradox").

We expect our data will provide preliminary evidence for the importance of creating an inclusive environment for all students, paying particular attention to providing support and a sense of community for students who are undocumented. The same is true for individuals belonging to other minoritized identity categories. Further, these connections may be intensified for individuals who hold multiple minoritized identities. These data will also connect the research literatures on university climate and ostracism/social exclusion.

## **MICROAGGRESSIONS SCALE FOR ADOLESCENTS**

Group Leader: Signa, Caroline  
Graduate, Psychology

Group Members: Tyra Jackson, Graduate, Psychology; Lourdes Concepcion Caban,  
Graduate, Psychology; Berenice Contreras, Graduate, Psychology;  
Lisette Munoz, Graduate, Psychology; Mackenzie Callahan, Graduate,  
Psychology

Mentor: Prof. Brea Banks

Authorship: Brea Banks, Tyra Jackson, Caroline Signa, Keeley Hynes,  
Lourdes Concepcion, Mackenzie Callahan, Lisette Munoz, Berenice  
Contreras Caban

We created the Racial Microaggressions Scale for Adolescents to examine the experiences of adolescents of color. Scale development and validation will be discussed, as well as scholarly and practical use.

## THE OPENNESS TO DIVERSITY PROGRAM FOR PROMOTING CULTURAL EMPATHY

Group Leader:	Strain, Audrey Undergraduate, Psychology
Group Member:	Trevor Goodman, Undergraduate, Psychology; Estrella Gomez Hernandez, Graduate, Psychology
Mentor:	Prof. Suejung Han
Authorship:	Audrey Strain, Trevor Goodman, Estrella Gomez Hernandez

Background: This study examined the effectiveness of a psychoeducational program Openness to Diversity (OtD). Responding to recent calls for more theory- and evidence-based diversity interventions and given increased diversity and political tensions in the U.S., OtD was developed by the faculty mentor to promote openness to diversity by enhancing cultural empathy among college students. OtD is in a peer-led, small group structured discussion format that takes 1.5-2 hours to complete. From an evolutionary psychological perspective (Confer et al., 2010), humans are naturally inclined not to be open to differences because it had been useful for human survival (Cole & Teboul, 2004). This evolutionarily inherited closed-mindedness may still operate with modern-time diversity because diversity can be perceived as a threat (Strauss, Connerley, & Ammerman, 2003). Similarly, people are more likely to be empathic for ingroup members than outgroup members (Cikara, Bruneau, Bavel, & Saxe, 2014) due to the self-serving bias. OtD aims to normalize such discomfort by a brief psychoeducation on the biopsychological basis of reactions to cultural differences thereby motivating people to be more empathic and open to the culturally different. It also consists of experiential activities for cultural perspective taking and empathy, considering personality factors that affect OtD (e.g., Han & Pistole, 2017; Mallinckrodt, McNett, Celebi, Tsai, & Williams, 2013). It was hypothesized that participants in OtD would show increased levels of Universal-Diverse Orientation (UDO, i.e., appreciation of both cultural similarity and differences) and Ethnocultural Empathy compared to control group participants.

Procedure: Ninety-nine undergraduates enrolled in a Midwestern university were recruited for research participation credits and randomly assigned to either OtD or the control condition (i.e., a focus group discussion on healthy eating) (data collection ongoing). Student research assistants were trained and facilitated the OtD or focus groups. Participants completed the Miville-Guzman UDO-Short Form (Fuertes, Miville, et al., 2000) and the Ethnocultural Empathy Scale (Wang et al., 2003) pre- and post-groups.

Results: Repeated measures ANOVAs revealed that OtD group showed a significantly larger increase in UDO-behavioral component than the control group, Wilk's  $\Delta = .95$ ,  $F(1, 97) = 4.66$ ,  $p = .033$ . Both groups showed significant increases in all the other outcome variables.

Implications. The program was effective in motivating behavioral approach to cultural differences. The control group participants also reported positive changes in the diversity-related attitudes, suggesting that reflecting on them by completing measures may be effective in promoting more open attitudes at least temporarily.

## **FACTORS PREDICTING SATISFACTION WITH A MICROAGGRESSION WORKSHOP FOR SCHOOL PERSONNEL**

Presenter: Torres González, Nitza  
Graduate, Psychology

Mentor: Prof. Brea Banks

Authorship: Brea Banks, Nitza Torres González, Keeley Hynes, Megan Donnelly

Satisfaction with a microaggression workshop for school personnel was predicted by participants' colorblind racial attitudes and interpretations of the training as necessary.

## SOCIAL WORK

### THE EFFICACY OF SENSORY ROOMS IN SCHOOLS: THE STAFF'S PERSPECTIVE

Presenter: Grealish, Annie  
Graduate, Social Work

Mentor: Prof. Christopher Gjesfjeld

Authorship: Annie Grealish, Christopher Gjesfjeld

Many students struggle with sensory processing. Sensory processing has been defined as “part of normal development and reflects one’s ability to interpret and respond to daily sensory experiences” (Miller, 2014). Sensory processing can have a great impact on an individual's ability to self-regulate. Previous research on this topic has found that multi-sensory environments or sensory rooms have been used for individuals that have sensory needs, specifically those with autism or other developmental diagnoses. Many of these rooms have a variety of objects to assist with sensory needs such as weighted blankets, rocking chairs, self-massagers, exercise balls, squeeze balls, and sensory swings. Through a literature review, it was found that sensory rooms and objects have had a positive effect on students with autism as it has increased attention and on-task behavior. Additionally, the use of sensory rooms in schools has also shown to be effective for increasing attention, positive behavior, and mood (Unwin, Powell, and Jones, 2021). Along with benefits, studies have also noted challenges with sensory rooms in schools such as students becoming obsessive over the room (Unwin, Powell, & Jones, 2021). After reviewing the literature, it was clear there were studies that provided positive results and negative results. This posed the question: what do staff members think of the sensory rooms? Does the staff feel there is a difference in regulation from before and after sensory room use

The research design of this project will be a nonexperimental cross sectional quantitative design utilizing surveys asking the Brigham Early Learning staff about a child’s regulation after using the sensory room. The participants of the study are the consenting staff members of Brigham Early Learning. The measurement tool used in this study asks demographic questions of the participant with an additional two item scale measuring regulation and whether or not the student has an Individualized Education Plan.

Data from this study will be forthcoming March of 2023. Our hope is for our results to assist settings that use sensory rooms to educate staff about its advantages and when it can be contradicted. We would also hope that staff take the results of this evaluation into consideration and make any adjustments we may suggest. Future research may look at what sensory items benefit students the most or what sensory items do children prefer?

## **AFFIRMATIVE GROUP THERAPY IMPACT ON LGBTQIA+ STUDENT'S MOOD AND IDENTITY**

Presenter: Piercy, Emily  
Graduate, Social Work

Mentor: Prof. Christopher Gjesfeld

Authorship: Emily Piercy, Chris Gjesfeld

Students who identify as lesbian, gay, bisexual, trans, queer, questioning, intersex and/or asexual struggle with mental health concerns at an alarming rate. Oftentimes the cause of mental health concerns, such as depression and suicide ideation, are sourced from bullying, non-inclusive practices, and family rejection. LGBTQIA+ students face multifaceted stigma and microaggressions but have little supports when it comes to social emotional health. Affirmative and inclusive practices reduce depression, anxiety, and suicide ideation among high school students, but not many school districts implement these practices or have programs such as a Gay-Straight Alliance, or Pride Clubs. The AFFIRM method is a form of CBT therapy, that targets negative self-talk and stereotypes while building up coping skills and establishing resources to better support the student.

Participants were recruited by viewing posters about a therapy group that targets LGBTQIA+ mental health issues, which were sent out to every student via school district email during an advisory period and were displayed at various locations around the central Illinois high school. The poster had a QR code to a Qualtrics intake survey where we received contact information for the student wanting to participate. Students were required to attend a 10-15 minute informational presentation that outlined the 6-week program, discussed confidentiality and consent before committing to this study. Parent or guardian consent was achieved by passive consent after 3 contact attempts. Each participant was given two surveys, the U-MICS Sexual Identity and the SMFQ, via Qualtrics during the first session of the intervention and during the last session of the intervention. Data was compared to see if the affirmative therapy interventions improved participant's mood and identity development, and if identity development improved mood.

Data will be forthcoming March 2023. We hope that the AFFIRM intervention is providing LGBTQIA+ students a space to confront and process internalized and externalized homophobia and transphobia. By combatting these stigmas with positive self-talk, coping skills, and a peer support system, we maintain optimism that the mental health of these students may improve. Lastly, we encourage more high schools to adopt similar programs to serve the needs of all students and combat the serious mental health needs of marginalized student populations.



## SOCIOLOGY/ANTHROPOLOGY

### **CHOP SUEY HABITS: THE AMERICAN CHINESE RESTAURANT DURING COVID TIMES**

Presenter: Ma, Rebecca  
Graduate, Sociology/Anthropology

Mentor: Prof. Nobuko Adachi

Authorship: Rebecca Ma

The Yellow Peril has shown itself once again to be a fixture in American life when the global COVID pandemic started in 2020. People were quick to blame Chinese people for its origin and spread. More than half of all American Chinese restaurants shut down, while others remained only partially open. Nonetheless, numerous American Chinese restaurants have made the decision to try and reopen in 2022. This paper ethnographically examines some of these reopenings, and explores how they cope with the new economic and social challenges, from a changed food-service market to new social attitudes.

## **ELEMENTAL ANALYSIS OF GROUND STONE AXES FROM NOBLE-WIETING USING PXRF**

Presenter: Marvel, Julian  
Undergraduate, Sociology/Anthropology

Mentor: Prof. Logan Miller

With my thesis, I am hoping to answer three questions with this research experiment. Can the ground stone axes from Noble-Wieting be associated with known geological sources using pXRF (portable x-ray fluorescence)? Are the Noble-Wieting axes manufactured from the same sources as those in Greater Cahokia? Is there a difference in source material between axes found in wall trenches and those recovered from other features at Noble-Wieting? By attempting to answer these questions, we can bring a multiscale perspective into a not so known topic. The pXRF determines the elemental composition of stone and rock. Different stones from different places have different elemental signatures. I will use the pXRF data gathered with comparable data from geologic samples that we tested, as well as, published by Crow (2014) to see if any of the Noble-Wieting artifacts conform to any known sources. This is important because there is no determining research regarding the source location of the materials used in the ground stone axes found at Noble-Wieting. I will also provide a background into Mississippian culture, including Cahokia, c.a. A.D. 1200, to give perspective into the lives and burial traditions of the Mississippian people of North America.

My research gave me definitive data and answered all my questions directly. The data showed that there was correlation between the ground stone axes found at Noble-Wieting and some of the other local samples that we tested as well. However, there was no correlation between the ground stone axes from Noble-Wieting and the geological samples taken from the St. Francois Mountains in Missouri. There was, however, a wide range within the samples from Noble-Wieting. This could mean that there were other locations that the people from Noble-Wieting were getting their materials from. The results may change based on future determining research and available artifacts and are thus, left for review.

## IDENTIFYING HANDSAWS FROM CUT MARKS ON BONE: A MICROSCOPIC CUT MARK ANALYSIS

Presenter: Patterson, Sarah  
Graduate, Sociology/Anthropology

Mentor: Prof. Shelby Putt

In New York City, it is estimated that for every 224 homicide cases, one will involve human dismemberment. These cases can be difficult to solve, as dismemberment is often used by the criminal to conceal other forms of forensic evidence. In dismemberment cases involving a handsaw, the saw leaves behind characteristic traces on the bone, such as saw marks (kerfs), bone islands, harmonics, and exit chipping, which we hypothesize can be used to identify the type of saw used by the perpetrator. The current study expands on previous research into saw blade cut mark characteristics by examining features on limbs that were fully fleshed when cut. Using microscopy, we tested whether the cut marks (N=54) on mature white-tailed deer (*Odocoileus virginianus*) long bones could be traced back to one of nine handsaws of different brands and blade set types used to make the cuts. Measurements of kerfs, including cut width, blade width, teeth per inch, tooth width, and tooth height, were obtained from photographs taken under an Olympus model BX51M metallurgical microscope. The presence and frequency of blade harmonics, bone islands, and exit chipping were also noted. ANOVA and Tukey post-hoc tests revealed a significant difference between the kerf dimensions produced by different blades. Combined with our qualitative assessment, these results demonstrate that cut mark characteristics can be used to determine the blade that created them. If applied in forensic cases, this technique may aid in identifying the dismemberment tool used in the crime and will generate more reliable convictions.

## **COMBINATORIAL CAPABILITIES IN NON-HUMAN PRIMATE TOOL USE BEHAVIORS: AN ANALYSIS OF KANZI**

Presenter: Schroeder, Michaela  
Undergraduate, Sociology/Anthropology

Mentor: Prof. Shelby Putt

Authorship: Michaela Schroeder

Determining if non-human animals exhibit compositionality, a feature described as the cognitive ability to combine smaller meaningful units into a complex and hierarchical structure with novel meaning, is necessary for ascertaining the timing regarding the origin of human language. While various claims of non-human compositionality have been made, the dominant viewpoint is currently that compositionality is unique to humans. Evidence for overlap in neural bases between tool-use behaviors and language production allows for a direct comparison between combinatorial tool-use behaviors and combinatorial linguistic capabilities. It is inferred that the archaeological record may be utilized to determine the origin of compositional capabilities, and as such, the origin of compositional language. This study uses a gradational scale to determine the hierarchical complexity of stone-knapping behaviors exhibited by the bonobo Kanzi. According to this analysis, the bonobo's actions failed to meet the requirements of compositionality, supporting claims that compositionality is a uniquely human trait that evolved after the Pan/Homo divergence.

## TEACHING AND LEARNING

### **STUDENTS' INTEREST IN A VARIETY OF TOPICS UNDER CONSIDERATION FOR INCLUSION IN A FIRST-YEAR EXPERIENCE SEMINAR FOR NATURAL SCIENCE, MATHEMATICS, AND ENGINEERING MAJORS**

Presenter:           Dutmer, Brendan  
                          Graduate, Chemistry

Mentor:             Prof. Amanda Quesenberry

A survey was implemented gauging student interest in a variety of topics that can be covered in a First-Year Experience Seminar (FYES) course focused on a student population composed of Natural Science, Mathematics, and Engineering majors. The survey was a six-point Likert-type survey of unipolar scale concerning agreement responses. The responses were evaluated utilizing appropriate quantitative methods of analysis. The findings will be used to inform the implementation of an FYES Science and Mathematics cohort course at Highland Community College (HCC) in Freeport, Illinois. Cohort models of students in FYES courses are intended to help students in areas such as persistence, student grade point average (GPA), and retention. Previous research has suggested some of the most effective methods in FYES courses for science, technology, engineering, and mathematics (STEM) cohorts include authentic workplace experiences and STEM community socialization.

## **APPLICATION FOR GRAMMAR SKILLS: A CASE STUDY OF THAI UNDERGRADUATE STUDENTS**

Presenter:           Kaosayapandhu, Munchuree  
                          Graduate, Teaching and Learning

Mentor:             Prof. Miranda Lin

The objective of this study was to investigate the influence of the popular language application Duolingo on English learning. The study was designed as a quasi-experiment. This approach was selected to compare the outcomes for students who used Duolingo to those who did not. The learners were split into groups of users (n = 65) and non-user (n = 63). Data were collected using a pre-test/post-test structure, which allows the researcher to investigate outcomes during the test period. In addition, data were collected using a combination of a previously defined English verb tense assessment and a supplementary questionnaire that examined Duolingo use frequency, completion, achievement, and enjoyment. Data analysis took place in two stages. First, mean differences in Duolingo users and non-users were investigated using paired t-tests ( $p < .05$ ). This determined whether student verb tense management improved over the term and whether Duolingo users achieved a higher mean difference than non-Duolingo users. The next stage of analysis focused on the Duolingo user group. It examined whether the self-reported frequency of use, completion of levels, goal achievement, and enjoyment significantly affected the mean of pre- and post-scores using multiple regression analysis. It also compared regressions between the user and non-user groups to determine whether there was a moderating effect of prior use. This method helped determine which characteristics of Duolingo attainment were significant in verb tense improvement. The results showed that the Duolingo users had a more significant mean improvement in verb tense knowledge. Multiple regression showed that the frequency of Duolingo use, perceived achievement, and enjoyment positively influenced the user group's performance. Moderation analysis also showed that prior use of Duolingo partially moderated the relationships of level completion and achievement on score improvement. The implication is that Duolingo is a potentially useful supplement to classroom learning, although its effects may change over time as users become habituated.

## **BECOMING A REFLECTIVE PRACTITIONER: AN ANALYSIS OF STUDENT TEACHER REFLECTION**

Presenter: Muangthong, Thunsinee  
Graduate, Teaching and Learning

Mentor: Prof. Deborah MacPhee

This qualitative study aimed to understand how student teachers reflected on their teaching practice during their student teaching semester and their perceptions on using reflection as a tool to develop their teaching practices. One hundred and twenty-four written and oral reflections by fifteen student teachers were analyzed to categorize their reflections. In addition, semi-structured interviews were conducted with four participants to gain an in-depth understanding of their perceptions on reflection. The findings showed that student teachers' reflections addressed five main themes (instruction, management, relationships, learning experiences, and characteristics of effective teachers), spanned four types (summary, descriptive, comparative, and transformative), and that student teachers structured their written and oral reflection in various ways, including (multiple types and multiple themes, one type with multiple themes, multiple types with one theme, and one type and one theme). Student teachers' perceptions on reflection focused on process and outcome. It is important to note that even though student teachers reflect in different themes, types, or structures, they see reflective thinking assignments as a useful tool to help them develop their teaching practices. Reflection on their own practice helped student teachers look back to see if there was any problem happened so that they could connect to their knowledge and take action to develop their teaching practices. The study has important implications for teacher educators, teacher preparation programs, cooperating teachers, and student teachers. Teacher educators can encourage student teachers to recognize that reflective thinking is a common process for learning from their own experiences. The knowledge of themes, types, structures, and perceptions of reflection can be used to inform how teacher educators should assign reflection assignments to student teachers. Future research can be done on various factors such as types of reflection assignments, duration of time to collect the data, groups of participants, or the use of contemplative practices to help student teachers focus more on their reflective practices.

## TECHNOLOGY

### **TECHNO-ECONOMIC ANALYSIS TO OPTIMIZE SOLAR PHOTOVOLTAIC SYSTEM IMPLEMENTATION ON ILLINOIS STATE UNIVERSITY CAMPUS**

Group Leader: Duncan, Michael  
Undergraduate, Technology

Group Member: Melker Isaksson, Undergraduate, Technology

Mentor: Prof. Jin Jo

Authorship: Melker Isaksson, Michael Duncan

Academic institutions in the US are massive consumers of energy. The population density of these institutions is a crucial factor in why there is such energy consumption. With many corporations and even the federal government beginning to divest fossil fuel sources and promote renewable energy sources, academic institutions should support such efforts. In this case study, we perform techno-economic analyses of two commercial-scale solar PV systems on top of the Bone Student Center and Milner Library at Illinois State University using HelioScope and the System Advisory Model. With these proposed designs, we determined financial parameters such as the upfront cost and payback period of the system. We also evaluated different financial plans by comparing direct ownership, roof leasing, and a PPA agreement to suggest the most cost-effective option for ISU when incorporating these system designs.



## **ASSESSING ECONOMIC BENEFITS OF COMMERCIAL-SCALE PHOTOVOLTAIC INTERCONNECTIONS FOR NORTH CAROLINA STATE UNIVERSITY'S SUSTAINABILITY GOALS**

Group Leader: Gibson, Daniel  
Undergraduate, Technology

Group Members: Gabe Anderson, Undergraduate, Technology; Cheron Elms,  
Undergraduate, Technology; David Bilger, Undergraduate, Technology

Mentor: Prof. Jin Jo

Authorship: Gabe Anderson, David Bilger, Cheron Elms, Daniel Gibson

North Carolina State University (NCSU) is considering investing in commercial-scale photovoltaic (PV) interconnection to contribute to its sustainability goals, improve student welfare, and reduce future expenses. Currently, NCSU's campus has a few buildings equipped with small educational solar PV systems, but they are mostly outdated. Solar District Cup is challenging us to help bring NCSU to a new standard. We utilize research tools such as Aurora Solar, Open Distribution System Simulator, and System Advisor Model to analyze system sizes and load data to perform cost-benefit analyses for proposed installation sites that range from a floating solar system and battery storage to ground-mount systems and solar carports. Based on comprehensive analyses, the research team proposes a solar PV system that delivers at least 300kW-400kW to achieve a cumulative offset of campus buildings by approximately 10%. Being mindful of improving their quality of life, students can charge electric vehicles and enjoy outdoor recreation enhancements such as solar-powered gazebos. This strategic plan equips NCSU with the solutions necessary to achieve its dream of growing its photovoltaic portfolio.

## REDUCING CYBERSICKNESS IN VIRTUAL REALITY DRIVING SIMULATION

Presenter: Kinney, Savannah  
Graduate, Technology

Mentor: Prof. Isaac Chang

Cybersickness is a cluster of physical discomforts that often appear in motion-based simulations. These symptoms may include nausea, oculomotor problems, and general disorientation. Studies of sensory conflict theory suggest that the discrepancy between the individual's perceived motion and actual physical movements may be the root cause of motion sickness or cybersickness. Matching body movements with the visual stimulus in motion-based simulations such as driving a car may reduce or eliminate the effects of such sensory conflicts.

With the introduction of virtual reality (VR) in research and education, the issue of cybersickness could negatively affect the quality of the data collected to study learning outcomes, task performance, or user experience. This research project aims to understand whether introducing body movement or haptic feedback through a Stewart platform could reduce the likelihood of cybersickness. By adjusting the position of its six linkages, this platform can let the user move physically with six degrees of freedom. Although the Stewart platform has been used in flight simulators, there is a shortage of literature on whether it could significantly reduce cybersickness in VR-based simulations.

This presentation will discuss a research project that aims to address this problem. Instead of placing the user in a static driving position, a VR simulator that rides on a Stewart platform is being developed to move the user in relation to the motion of the virtual vehicle. The platform's design will be discussed, including its mechanism, control schematics, and algorithms. A scaled-down prototype for verification will be illustrated along with the preliminary test result.

Keywords: Cybersickness, Sensory Conflicts, Virtual Reality

## **COST AND ENVIRONMENTAL BENEFIT ANALYSES FOR MID-SIZED BUSINESSES LOCATED IN BLOOMINGTON/NORMAL UTILIZING LIGHTING RETROFIT, SOLAR PV, AND BATTERY STORAGE SYSTEMS**

Group Leader: Lopez, Ashley  
Undergraduate, Technology

Group Members: Jakell Sharkey, Undergraduate, Technology, Darrell Buchanan,  
Undergraduate, Technology

Mentor: Prof. Jin Jo

In this study, we analyze the cost and environmental benefits of utilizing energy efficiency through lighting retrofitting, solar photovoltaic systems, and battery storage. Through these methods, we hope to reduce high energy consumption by investing in better alternatives to lighting and more sustainable electricity production. We begin in the Bloomington-Normal area, where we conduct our study on allowing midsize businesses to save energy and money through progressing from LED lighting installations to a tailored Solar PV system, that will eventually generate enough profit to complete with a battery storage system. We have based our model around realistic feasibility, as we provide the customer with rebates and incentives that are offered on various levels based on our proposed modifications. A proposal is then generated to provide business owners an understanding of the differences they are making by choosing better energy alternatives and the profit they are generating with lighting retrofit and renewable energy systems. Our model starts with personalizing each proposal according to their business infrastructure's electricity needs and utility rates. Once we find out the 'true cost' of the installation of each of the energy source alternatives, we compare this cost to the funds and resources that are available to help alleviate this cost and reduce the overall payback period for each installation. Thus, with the money saved from retrofitting, the next step would be to use it to add a PV system, that would continue to offset the electrical load and make it possible to receive net metering credits for the customer. Lastly, the profit generated from each previous step will eventually allow the installation of a battery system that will support the existing PV system. Our overall goal of this study is to present different methods of energy efficiency and sustainability at a feasible cost that can benefit both the customer and our environment!

## **ASSESSING THE TECHNICAL AND ECONOMIC FEASIBILITY OF REPOWERING OUTDATED WIND FARMS IN ILLINOIS**

Group Leader: Tiffany, Will  
Undergraduate, Technology

Group Member: Thomas Savage, Undergraduate, Technology

Mentor: Prof. Jin Jo

Authorship: Will Tiffany, Thomas Savage

In the years to come, many wind farms will become outdated and they will undergo a repowering process to keep up with current energy demands. The primary focus of our research project is to assess the technical and economic feasibility of repowering outdated wind farms in Illinois. To accomplish this goal, we investigated the initial costs of upgrading wind farms, the potential size of the upgraded wind turbines, and the increased electricity production. Consulting with wind industry experts provided practical information on the repowering processes in the project case study sites, along with an extensive literature review on wind farm repowering projects. The US Wind Turbine Database was used to determine the suitable wind farms for the repowering project by reviewing the rated capacity, manufacturer, and model of the turbines. After selecting the targeted wind farms, we simulated the current production of electrical generation from these wind turbines using the Windographer software. Subsequently, we assessed feasible features to change, such as nacelle replacement or complete turbine replacement. Determining these features will depend directly on the location and local wind resources of the area. After comparing the original turbines' energy production and economic feasibility to the repowered turbines, we determined whether a repowering for the wind farm should be performed or not.

# E-POSTER ABSTRACTS

## BIOLOGICAL SCIENCES

### HUMAN IMPACT ON SQUIRREL VIGILANCE

Group Leader: Kornatowski, Madlyn  
Undergraduate, Biological Sciences

Group Member: Joe Boyer, Undergraduate, Biological Sciences

Mentor: Prof. Rebekka Darner

Authorship: Joe Boyer, Madlyn Kornatowski

The purpose of this research project is to examine the alertness of Eastern fox squirrels (*Sciurus niger*). We investigated four research questions related to this main idea. Our first question we are seeking to address is, is there a relationship between the alertness of Eastern fox squirrels and how many other Eastern fox squirrels are present? Our next question is, is there a relationship in the amount of time an Eastern fox squirrel is vigilant is there a relation between eastern fox squirrel alertness and the presence of dogs? Fourth, is there a relation between Eastern fox squirrel vigilant safety? We believe this study is important because it gives us more insight into understanding how habitat alterations can possibly impact squirrel behavior. The activity of humans can impact the environment of squirrels, so it is important to understand how such impacts can possibly impact squirrel behavior. The most common pet in the world is the dog; therefore, this study is also important to determine how the presence of dogs can impact squirrels' behavior.

## CREATIVE TECHNOLOGIES

### ANALYSIS AND CRITIQUE OF CHARACTER CREATORS IN ROLE-PLAYING VIDEO GAMES TOWARDS A MORE INCLUSIVE GAMING ENVIRONMENT

Presenter: Parvin, Ellie  
Graduate, Creative Technologies

Mentor: Prof. Kristin Carlson

Co-Mentor: Prof. Sercan Sengun

Authorship: Ellie Parvin

Despite the social progress seen across the United States, video games still cater to white<sup>1</sup> cisgender men<sup>2</sup> ages 18-34<sup>3</sup>. Since the release of *Ultima I* and *Wizardry*, the first games that popularized role-playing video games (RPVGs)<sup>4</sup>, in 1981<sup>5</sup>, the genders players have to choose from are typically limited to the extremes of the gender spectrum, man and woman. The first RPVG to include a character creator with options outside the gender spectrum extremes was *7th Dragon III Code: VFD*<sup>6</sup>, an RPG for the Nintendo 3DS, released in the United States in 2016<sup>7</sup>. With 1.6% of adults in the US identifying as transgender or nonbinary, and 5.1% of those adults between the ages of 18 and 29, according to a study done by the Pew Research Center in 2022<sup>8</sup>, the number of trans-inclusive RPVGs doesn't reflect the number of trans people playing video games. In a time where more people are coming out as trans/nonbinary, video games need to reflect that by becoming more inclusive, not less. Video game character creators are a safe environment to try out a new look, a new name, new pronouns, perhaps even a new gender. The great thing about character creators is that nothing is permanent, so players have the option to go back and further customize their characters if they so choose. As Caleb Wysor, a writer for *Gayming* magazine, quotes Niamh Williams, a non-binary trans woman, in their article "How character creators help us explore gender identity and expression," 'the lack of real-life social stakes [makes] games a really inviting environment for personal experimentation.' They conclude their article by saying, "It is not only about reflecting the real self-image of players. It's also about new formations of the existing image... [and] about the open exploration, creation, and dismissal of the self. The way we relate to the idea of the character mirrors the way we relate to our own identity..."<sup>9</sup> The scope of this research will analyze and critique the current status of RPVG character creators and provide suggestions on how the character creators might be improved.

## CRIMINAL JUSTICE SCIENCES

### TO BLAME OR NOT TO BLAME: BELIEFS ON WHY CRIME OCCURS

Presenter: Ingold, Kimberly  
Graduate, Criminal Justice Sciences

Mentor: Prof. Jessie Krienert

Americans tend to hold both a punitive and progressive view of criminality. However, those who identify as conservative on the political spectrum are more likely to endorse punitive views than those of other political parties. Despite this, Americans are much less likely to support punitive criminal justice policies than in the past several decades, showing that growth and education on the general topic of criminal justice among U.S. citizens is possible. The purpose of this research is to determine why people believe that crime occurs. Specifically, differences in people's gender, race, religion, and political affiliation will be examined to determine if there are notable differences between beliefs among certain groups. It is hypothesized that participants who identify as white, religious, or conservative will be more likely to blame offenders for committing crimes instead of offering sympathetic reasoning for said behavior.

After receiving IRB approval, a total of 221 participants from a mid-sized Midwestern university were collected. Participant responses to the open-ended question asking why people commit crimes were analyzed using a content analysis approach. Eight themes were identified, four placing blame on the offender for committing the crime and four acknowledging that the criminal behavior was not at the fault of the offender. Consistent with the research design, chi-squared tests were run to determine if there were any demographic differences in participants' beliefs on why crime occurs. The analyses found that individuals of different genders, races, and political affiliations had significant differences on why they think crime occurs with females, males, whites, and conservatives being more likely to mention one of the blameful reasons than non-binary individuals, people of color, and liberals. However, there were no religious differences to be found, meaning religious individuals and non-religious individuals were equally likely to report one of the blameful reasons.

Limitations of this research include that participants were primarily white, female, and liberal college students. Future research should use a more diverse sample to gather findings that may be more generalizable to the U.S. population. Findings are relevant to criminologists because learning to what extent people believe offenders are at fault for the crimes committed occurs can lead to greater opportunities to educate others.

## FAMILY AND CONSUMER SCIENCES

### ARE SMART MIRRORS EFFECTIVE IN CONSUMER RETENTION? A CONCEPTUAL FRAMEWORK OF SMART MIRRORS IN RETAIL STORES

Presenter: Olson, Morgan  
Undergraduate, Family and Consumer Sciences

Group Members: Mia Middleton, Undergraduate, Family and Consumer Sciences  
Lauren O'Donnell, Undergraduate, Marketing

Mentor: Prof. Christina Soyoung Song

Authorship: Morgan Olson, Mia Middleton, Lauren O'Donnell, Christina Soyoung Song

**Introduction:** Technology is essential to navigating the world with ease. After the unexpected hit of the COVID-19 pandemic, consumers have leaned into the widely expanding behavior of purchasing goods through online channels, especially in the fashion industry. This study aims to look into the fashion industry's technological innovation: smart mirrors. Smart mirrors are the way of the future concerning in-person shopping and creating an immersive try-on experience for the consumer. Before smart mirror technology, customers were limited to either having to shop in-store or online. The introduction of smart mirrors closes the gap and adds a new way to look at clothes with technology (Ogunjimi et al., 2021). Stores such as Neiman Marcus have tested out this technology. Neiman Marcus put smart mirrors in three of its store locations to see how customers react (D'Innocenzio, 2015). Smart mirror technology is a concept that is newer to the retail space, yet it would be a beneficial tool to have in all retail stores and for at-home usage as well.

**Conceptual Framework:** The foundation for our study was derived from the creation of our own conceptual model below. Our model was created with four key components we believe the implementation of smart mirrors within retail stores will cause, leading to an overall increase in consumers' intention to revisit stores. Figure 1 proposes, by installing smart mirror technology, retail stores will see a positive increase in an interactive shopping experience, attractive store atmosphere, accurate apparel fitting, and amplified consumer engagement, which will lead to an increase in consumers' intention to revisit stores.

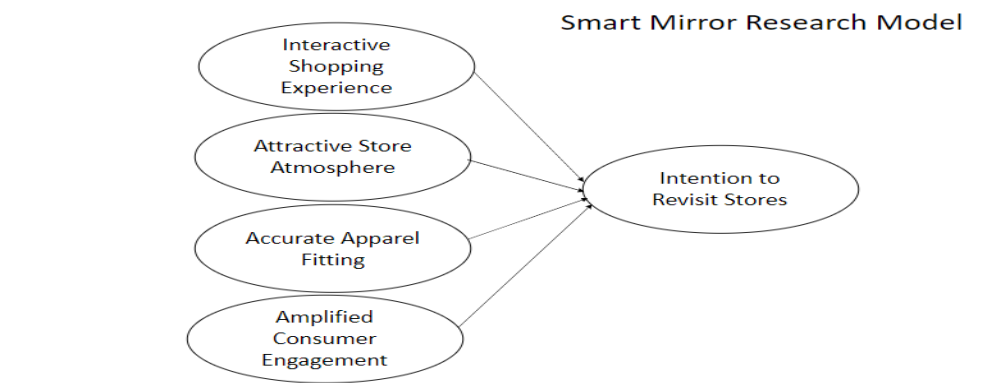


Figure 1. Proposed Framework



**Conclusion/Discussion:** Our study aims to look at how technology can be used as a tool to enhance in-store customer experience. Overall, our research allowed us to achieve the findings that the smart mirror is useful in numerous ways being beneficial to both consumers and retailers. This revolutionary technology will establish benefits for the consumer, making it a driving force in fashion technology.

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transformation. *Technological Forecasting and Social Change*, 173, 121118.

## **PARENTS' (LACK OF) DISCUSSION ON RACE AND RACISM: A LONGITUDINAL QUALITATIVE INVESTIGATION**

Presenter: Michaels, Christina  
Graduate, Psychology

Mentor: Prof. Chang Su-Russell, Family and consumer Sciences

Co-Mentor: Prof. Adena Meyers, Psychology

Authorship: Christina Michaels, Chang Su-Russell, Luke Russell, Adena Meyers

Children as young as 3 start developing a sense of color consciousness by identifying people according to racial characteristics (Derman-Sparks, 2012). However, our knowledge of how parents have discussions with their young children about race and racism is still limited, especially among White families. Research on racial socialization is mostly targeted towards minoritized groups. (Hughes & Chen, 1997; Hughes et al., 2006; Winkler, 2012). To address Children as young as 3 start developing a sense of color consciousness by identifying people according to racial characteristics (Derman-Sparks, 2012). However, our knowledge of how parents have discussions with their young children about race and racism is still limited, especially among White families. Research on racial socialization is mostly targeted towards minoritized groups. (Hughes & Chen, 1997; Hughes et al., 2006; Winkler, 2012). To address the gap in the literature, we interviewed 24 parents of young children (ages 3-6) about their experiences of discussing race and racism with their children in 2019 (wave 1). Then in the early summer of 2020 (wave 2), we conducted a second interview with 20 parents regarding whether and how they discussed the death of George Floyd and the Black Lives Matter movement with their young children. Each interview was recorded and then transcribed verbatim for analysis. Using the constant comparison approach (Corbin & Strauss, 2015), 40 transcripts were coded via independent coding and peer debriefing to generate codes (Phase 1 coding). Then codes from both waves were compared in a spreadsheet to capture changes, during which researchers also generated theoretical concepts in the memos. The two-phase coding resulted in four themes: (1) Parents were engaged in socialization by talking about race with the focus on treating people similarly and equally. (2) Given the high-profile case and media exposure, parents in wave 2 revealed a stronger need to discuss with their children about race and racism, and a few discussed police brutality. (3) Given the local community context that witnessed both peaceful protesting and unsettling demonstrations that destroyed businesses, parents in wave 2 varied in the extent to which they focused on peaceful protesting vs. fearful feelings about demonstrations. (4) Parents' social locations may shape beliefs about what race is and the importance of discussing race, as well as accumulated tools for applying a color conscious approach to racial socialization efforts. This two-wave study also revealed changes in how and if parents discussed race and racism in a non-high-profile context and in the aftermath of George Floyd. Other factors such as the parents' reflections, awareness of children's conditions (developmental level, exposure to diversity, and color consciousness), and parents' social locations were also discussed as impacting whether and how parents racially socialize their children.

## NURSING

### EXPLORING WELL-BEING OF PEDIATRIC NURSES WHO CARE FOR CHRONICALLY ILL PEDIATRIC PATIENTS

Presenter: Peterson, Kate  
Graduate, Nursing

Mentor: Prof. Sherrill Stockmann

Authorship: Kate Peterson

**Problem:** Pediatric nurses are uniquely positioned to provide care to chronically ill children. Pediatric nurses may experience increased stress, burnout, and emotional exhaustion, which may negatively affect pediatric nurse well-being (PNWB). Despite the abundance of research directly related to burnout and stress, research is limited concerning PNWB.

**Purpose:** This literature review was conducted to appraise and synthesize research examining the well-being of pediatric nurses who care for chronically ill patients.

**Search Strategy:** The electronic search strategy included 21 articles from the databases Cumulative Index of Nursing and Allied Health Literature, Joanna Briggs Institute, PubMed, and PyschInfo. Keywords used in the search included: nurse well-being, pediatric nursing, emotional well-being, and nurse caring. Inclusion criteria were articles dated within the past 15 years, publication available in the English language, and peer-reviewed texts. Articles focused on pediatric nurses caring for chronically ill children were prioritized. Studies were excluded if the group of pediatric nurses were not independently reported.

**Results:** Themes emerging with this review include workplace stress, burnout, emotional exhaustion, and job satisfaction in relation to PNWB. Stress and burnout negatively affected PNWB. Emotional exhaustion was related to the shorter lifespans of many chronically ill patients. Decreased job satisfaction was related to high workplace stress and burnout. Work experience directly influenced PNWB.

**Synthesis of Evidence:** Decreased PNWB may lead to decreased role function and quality care for pediatric patients and their families. Research addressing PNWB is needed.

**Implications for Practice:** This literature review suggests the importance of PNWB due to the negative impact of workplace stress, burnout, emotional exhaustion, and job satisfaction. Study findings emphasized opportunities for nurses to meaningfully engage within this area as clinicians.

## PHYSICS

### ATTOSECOND STREAKING USING SCULPTED LASER PULSES

Presenter: Yaacoub, Dany  
Undergraduate, Physics

Mentor: Prof. Allison Harris

Authorship: Dany Yaacoub, Allison Harris

Electron-molecule collision cross sections play a pivotal role in many areas of applied physics, notably plasma physics, biophysics, and astrophysics. In these fields, electron-molecule cross sections are essential fundamental inputs for modeling complex problems. However, detailed measurements and state-of-the-art theoretical calculations are often too difficult to perform for highly complex molecules or for a wide variety of different molecular targets. As a result, only limited data sets are available. Machine learning algorithms offer the opportunity to estimate these cross sections for molecular targets that are beyond the reach of theoretical models and experimental measurements. We present a feed-forward neural network trained on existing experimental data that provides reasonable estimates of electron-molecule collision cross sections for molecular targets beyond those in its training set. The network's training set included experimental cross sections for diatomic molecules and hydrocarbons with up to 18 atoms. Our results demonstrate that with training on as a few as 15 molecular targets, the algorithm is able to provide predictions within 10% of measured cross sections for most hydrocarbon targets but struggles to predict the correct magnitude of the diatomic molecule cross sections. We also compare the predictions from a second neural network that uses additional input parameters in order to examine whether this improves the network's predictions.

## PSYCHOLOGY

### **STRATEGIES USED BY ADOLESCENTS TO COMBAT MICROAGGRESSIONS ON SOCIAL MEDIA**

Group Leader: Hynes, Keeley  
Graduate, Psychology

Group Members: Michelle Santana, Graduate Psychology; Hailey Storm, Graduate,  
Psychology

Mentor: Prof. Brea Banks

Authorship: Keeley Hynes, Michelle Santana, Hailey Storm, Brea Banks

Little is known about adolescents' experiences with microaggressions (i.e., identity-based insults) on social media. We qualitatively explored adolescents' reactions to microaggressive Instagram posts and the strategies participants use to respond.

## SOCIOLOGY/ANTHROPOLOGY

### HIGH-RISK FERTILITY BEHAVIORS: IMPACT ON CHILD AND MATERNAL MORTALITIES IN KENYA

Presenter: Chepkosgei-Mercy, Kiprop  
Graduate, Sociology/Anthropology

Mentor: Prof. Winfred Avogo

Authorship: Mercy Chepkosgei-Kiprop, Winfred Avogo

Rapid population increase in Sub-Saharan Africa (SSA) over the last several decades, along with limited healthcare interventions has exacerbated child and maternal mortality. The maternal mortality ratio in Sub-Saharan Africa accounts for at least 50 percent of maternal deaths globally. In 2020 alone, 5 million children under 5 years of age died in Kenya. Research also points out that, tragically, many of the mothers and children died of preventable or treatable conditions. Previous research has focused on either biological or socioeconomic determinants of child mortality, rather than the interaction between the two. In this study, we investigate the premise that all social and economic determinants of child and maternal mortality operate through a set of biological mechanisms and proximate determinants to influence mortality. Using data from the 2014 Kenya Demographic and Health Surveys (KDHS) drawn from women aged 15-49, we find that children born to women with primary education or lower were more likely to die before reaching the age of five compared to women with secondary education and higher. Younger women (18 years and below) were also more likely to experience higher rates of child and maternal mortality compared to older women. In addition, women with higher-order birth were more likely to experience higher rates of infant and maternal mortality than those with lower-order births. These results support much of the previous literature on high-risk fertility behaviors and child mortality which showed that younger or older maternal age and short preceding birth interval significantly increase the risk of child and maternal mortality. Furthermore, mothers and children born in health facilities have a lower relative risk of dying than those born at home. Thus, using the Mosley and Chen analytical framework (1984) for determinants of child and maternal survival, I incorporated socio-economic and biological variables to examine the relationship between high-risk fertility behaviors and child and maternal mortality. We discuss the findings in the context of frameworks intended to advance research and influence health policy and medical interventions to improve child survival.

## TEACHING AND LEARNING

### DUAL LANGUAGE EDUCATION

Presenter: Carrillo, Lilliana  
Graduate, Teaching and Learning

Mentor: Prof. Amanda Quesenberry

Authorship: Lilliana Carrillo

What really makes a two-way immersion program successful? I am looking for the elements in a two-way immersion program that help dual language students learn a second language. Students who are in the program usually show minimal growth in the target language throughout the years. My goal is to find essential strategies and elements needed in a dual language classroom to help students learn in the target language. I want the results of the study to help two-way immersion teachers and students. I know teachers are always looking for ways to help students learn in the target language to help students. I also want these strategies and elements to help students grow in the target language. I will be conducting teacher interviews where I will ask dual language teachers different questions about the program. I have chosen K-5 dual language teachers at Elmwood Elementary School (District 203). I have selected these educators because they are part of the same two-way immersion program because they are working for District 203. The teachers also have a variety of knowledge and experience that is beneficial to the study. At the end of the research, I will have a better understanding on how to help my dual language students and will allow me to grow as an educator.

## **ADDRESSING MUSIC PERFORMANCE ANXIETY IN YOUNG MUSICIANS**

Presenter: Halt, Amy  
Graduate, Educational Administration & Foundations

Mentor: Prof. Amanda Quesenberry, Teaching and Learning

Authorship: Amy Halt

Anxiety in the elementary classroom seems to be on the rise with self-efficacy falling. This has been noted in the music classroom, especially pertaining to musical performance opportunities. The research is designed to answer if music educators can use positive factors to help prevent elevated anxiety and promote positive self-efficacy in multiple performance settings. It will also answer what strategies and interventions can build proactive social emotional learning through music performance. This study researches attitudes and feelings of 4th grade participants concerning anxiety, self-efficacy and the use of interventions. The research proposal is designed with a small sample group of convenience with self-reporting surveys on musical performance anxiety, self-efficacy, and useful tools. This study is significant to the growth of elementary musicians and to teachers desiring students' longevity in music education.



## **THE EFFECT OF STUDENT GENERATED QUESTIONS ON STUDENT ENGAGEMENT AND LEARNING**

Presenter: Hargis, Jen  
Graduate, Teaching and Learning

Mentor: Prof. Amanda Quesenberry

Authorship: Jen Hargis

This mixed methods study looks at the effect of questions created solely by a student's perspective about a phenomenon or topic on their engagement during lessons and overall performance on a unit assessment. These questions were then incorporated into proceeding lessons as students' behaviors in class were monitored. A control group was used for comparison in addition to a pre-test to analyze whether knowledge of the subject matter improved with the implementation of the questions into lessons. Results will be analyzed at the conclusion of the study and a conclusion will be made.

## **CELL PHONE PERCEPTION AMONGST MIDDLE SCHOOL STUDENTS AND TEACHERS**

Group Leader: Haws, Ashley  
Graduate, Teaching and Learning

Group Member: Rodney Woodward, Graduate, Teaching and Learning

Mentor: Prof. Amanda Quesenberry

Authorship: Ashley Haws, Rodney Woodward

Cell phone usage in school has become more prominent than ever, with 84% of teenagers having their own cell phone (Kamenetz, 2019). Texting was the first big use of cell phones, that could fit in a pocket. But as cell phones have evolved into smart phones, their ability to connect students to people and the internet has increased the desire to use them in school. This study will focus on the opinions of both teachers and students when it comes to cell phone use in the classroom. Our participants will be from two middle schools, in two separate districts. Anonymous data collected will be analyzed and then teacher data and student data will be compared.

## **THE EFFECT OF CLASS-WIDE SELF-MANAGEMENT INTERVENTION ON LEARNING OUTCOMES IN A 9<sup>TH</sup> GRADE CLASS WITH STUDENTS AT-RISK FOR FAILURE**

Presenter: Homan, Susan  
Graduate, Teaching and Learning

Mentor: Prof. Amanda Quesenberry

Authorship: Susan Homan

The purpose of this study is to analyze the effectiveness of self-management intervention with group contingency on learning outcomes by collecting and analyzing assessment data before and after intervention. Review of the current existing literature found that though there were studies that analyzed the effect of student self-management with various reinforcements on on-task behavior, engagement, disruptive behavior, classroom preparedness, and homework completion, there were no studies found that collected assessment data to determine the effect on learning outcomes. This study is a quantitative research study with a baseline and changing criterion design. The study will be conducted in a 9th grade physical science class where 47.6% of the students are on free/reduced lunch and 38% are on individualized education plans (IEPs) and two are on 504 plans. A baseline measurement including two quiz and one test score will be taken for the first phase, student self-management without interdependent group contingency will occur for phase 2, and student self-management with interdependent group contingency will occur in phase 3 where reinforcement is contingent upon student groups reaching weekly goals. Two quizzes and one test will be collected during phase 3. Data analysis will compare baseline measures of student learning outcomes to measures taken during phase 3 of the study using mean class test and quiz scores and a t-test for paired samples will be performed to compare baseline data to the treatment phase data. An acceptability rating will also be administered after the study is completed and reported in cross-tabulated form.

## **USING GUIDED INQUIRY LABORATORY EXPERIMENTS TO INCREASE STUDENT LEARNING IN HIGH SCHOOL CHEMISTRY**

Presenter: Johnson, Lauri  
Graduate, Chemistry

Mentor: Prof. Amanda Quesenberry, Teaching and Learning

Authorship: Lauri Johnson

The purpose of this quantitative study is to determine if the use of guided inquiry laboratory experiments (GILE) in high school chemistry can improve student learning, motivation, engagement, and teamwork. Reviewed literature indicates that the U.S. needs more students to enter STEM fields and increased interest and success in high school chemistry can lead high-achieving students in that direction. Literature also shows that the use of labs and inquiry activities are crucial for teaching chemistry effectively, resulting in more successful students. By comparing the performance of students in one chemistry class where a traditional lab is implemented to students in another section of the same course where a GILE is implemented, the effectiveness of using a GILE will be evaluated. This research will help teachers determine if GILEs are superior tools that should be used in high school chemistry. Furthermore, this research can help school administrators and other stakeholders make decisions about the support chemistry teachers need to make those courses more successful, and possibly increase the number of students entering STEM fields after graduation.

## **IMPACTS OF SOCIAL EMOTIONAL LEARNING (SEL) INTERVENTION ON MENTAL HEALTH AND SCIENCE ATTITUDES**

Presenter: Lieberum, Kyle  
Graduate, Chemistry

Mentor: Prof. Amanda Quesenberry, Teaching and Learning

Authorship: Kyle Lieberum, Amanda Quesenberry

As the COVID-19 pandemic upended society, many students' mental health was negatively affected. Teachers have been tasked with alleviating this issue using Social Emotional Learning (techniques). The implementation and availability of resources for these techniques varies across the grade bands. One specific area in the literature that is lacking connections is between secondary science education and SEL practices. In this study, the effects of a SEL intervention in a secondary chemistry classroom will be evaluated. The two variables assessed will be students' current mental health and their attitudes towards the subject of science as a whole. Data will be collected using a mixed methods approach via a questionnaire containing both open ended and Likert scale questions.

## **TECHNOLOGY INTEGRATION IN POST COVID-19 CLASSROOMS**

Presenter: McMath, Kelbey  
Graduate, Teaching and Learning

Mentor: Prof. Amanda Quesenberry

Authorship: Kelbey McMath

The purpose of this study is to conduct a quantitative study on how teachers' integration of technology in the classroom has changed since the COVID-19 Pandemic. This study is relevant as teachers have been thrust into using technology without guidance in many cases. As technology changes, teachers need to be prepared to adequately prepare students for their future. The literature suggests that teachers are often not provided adequate professional development on technology usage and intrinsic beliefs regarding technology play a role as well. This study will be conducted at a junior high school serving students in 6th-8th grade and will include certified staff from there. The results of the survey given will be analyzed to look for common themes relating to the research questions. By conducting this survey, districts, administration and teachers will have a better understanding of how technology integration has changed since the COVID-19 Pandemic and what kind of support is still needed.

## **POVERTY AND THE ACHIEVEMENT GAP**

Presenter: Miller, Emily  
Graduate, Teaching and Learning

Mentor: Prof. Amanda Quesenberry

Authorship: Emily Miller

This research proposal will focus on students living in poverty and the achievement gap. Education is perceived as a weapon against poverty and social inequality (Lee & Bowen, 2006). Unfortunately, there are many inequalities when it comes to education in the United States. Research shows that for decades students who live in poverty fall significantly academically behind their peers that are not living in poverty. Many factors contribute to this gap, but paternal involvement and lack of resources tend to be the main causes for the gap. Teachers can use strategies and certain mindsets to help close the achievement gap for these students living in poverty.

## **ACADEMIC ACHIEVEMENT AND ATTENDANCE**

Presenter: Olsen, Jessica  
Graduate, Teaching and Learning

Mentor: Prof. Amanda Quesenberry

Authorship: Jessica Olsen

The purpose of this quantitative study is to evaluate the relationship between attendance and academic performance. This topic is currently being evaluated to improve attendance and academics at Lake Park High School. This study will look at data from the gradebook system in order to evaluate the correlation between the two. This data will look at students that have missed five or more school days and their grade for their course. This study is looking to see if students who miss more school get lower grades (d's and f's). This will help administrators better understand what they can do to improve attendance and academic performance, which the district has set as our school wide goals for the year.



## **THE IMPACTS OF THE MIDDLE SCHOOL MODEL ON TEACHERS**

Presenter: Pasterz, Melissa  
Graduate, Teaching and Learning

Mentor: Prof. Amanda Quesenberry

Authorship: Melissa Pasterz

The purpose of this study is to explore the impacts that the Middle School Model (MSM) has on teachers and school culture. This topic is important as the existing literature stresses the importance of middle grades school supporting students through critical changes they experience through young adolescents, however, the research is lacking in how these school structure models impact teachers. The opinions of middle grades teachers are significant as they are also directly impacted by the school structures and the impacts these teachers face will directly impact their students as well. This study will survey teachers at one middle grades school (6-8). This school is currently using a hybrid school structure model that contains elements of the MSM without fully adopting this model, but has used the MSM in the past. Teachers from this school that have used both school structure models will also be asked to partake in a follow-up interview. Common themes in the surveys and interviews will be reported to show the teachers' experiences in the various models. As a result of this research, school districts can make informed decisions on what types of school model can best support teachers, leading to a better education for students.

## **HOMEWORK DEADLINES & LATE PENALTIES: DO GRADES REFLECT STUDENT LEARNING?**

Presenter: Pyle, Scott  
Graduate, Teaching and Learning

Mentor: Prof. Amanda Quesenberry

Authorship: Scott Pyle

Homework is an integral part of education as it provides students with the practice and repetition needed to master various skills. But, when students submit their homework after the deadline, grades can often become compromised based on whether a teacher enforces late penalties. This study seeks to understand the impact that deadlines and late penalties can have on students and whether their grades are representative of learning. Two sections of a senior-level high school introductory Speech course were examined. One section received rigorous deadlines and late penalties for all homework assignments while the other had none. After two weeks, the sections switched grading policies and were observed for another two weeks (four in total). Data (homework assignments) were collected for both sections to determine whether there was a significant relationship between deadlines/late penalties and the grades students received. This study hopes to identify the impact that deadlines and late penalties can have on student learning and help teachers determine whether or not to implement them in their classrooms.

## **MATH AND TEST ANXIETY AND THE IMPACT ON OVERALL MATH PERFORMANCE**

Presenter: Rasmuson, Alyssa  
Graduate, Teaching and Learning

Mentor: Prof. Amanda Quesenberry

Authorship: Alyssa Rasmuson

The purpose of this study is to gather quantitative data on participants math anxiety, test anxiety, and overall math performance to determine if relationships exist. This topic is important because math and test anxiety are on a rise. As related literature suggests, math anxiety affects our working memory and self-concept, which in turn causes an impact on performance level. Related literature also suggests that math anxiety at a young age can predict future outcomes on performance level. The impact anxiety is having on kids earlier in life is why this research is surveying second through fourth grade students. Student participants will be chosen based on voluntary agreement to participate in the study. Participants will be given two self-questionnaires, one for math anxiety and one for test anxiety, as well as an academic performance assessment that is grade level appropriate. These items will be scored and quantified, and a correlation will be ran to determine the relationship. The correlations will be between math anxiety and math performance, test anxiety and math performance, math anxiety and test anxiety, and the combination of all three. This research will help teachers better understand the impact of anxiety, allow them to help with reducing anxiety, and provide test taking tips. It will help administrators realize they need to tone down the emphasis on test taking. Lastly, it will help parents understand their child's feelings and emotions in both math and test taking, and hopefully encourage them to help at home.

## **STUDENT CHOICE AND MOTIVATION**

Presenter: Ruppert, Kyle  
Graduate, Teaching and Learning

Mentor: Prof. Amanda Quesenberry

Authorship: Kyle Ruppert

The objective of the research conducted is to gain a better understanding of how students view being afforded choice in the classroom. The emphasis being placed on what type of choice in learning do students prefer, if any, and if that choice corresponds with greater levels of motivation. Sixth grade students that attend a middle school in rural Central Illinois were given a survey in which they expressed their perceptions of school, what motivates them, and how being provided choice in their learning makes them feel.

## **EXAMINING STUDENT AND TEACHER PERCEPTIONS OF CANVAS IN ROUND LAKE SENIOR HIGH SCHOOL**

Presenter: Sanchez, Brandon  
Graduate, Chemistry

Mentor: Prof. Amanda Quesenberry, Teaching and Learning

Authorship: Brandon Sanchez

Students and teachers have spent the better part of two years trying to adjust to remote learning and COVID-19; with most of us returning to the classroom we again have to adjust and adapt to all the information we've gathered to help us grow. The aim of this study is to address the difference between students' and teachers' perceptions of a centralized learning management system, Canvas. Students and teachers will both be surveyed through a school found in Northeastern Illinois; teachers will vary in years served, while students will be juniors and seniors between the ages of 16 and 18. The information gathered between these two groups will be compared to make adjustments and decisions based on both parties.

## **AN APPLIED PHONICS STUDY FOCUSING ON ELEMENTARY STUDENTS DIAGNOSED WITH SPECIFIC LEARNING DISABILITIES**

Presenter: Shields, Carly  
Graduate, Teaching and Learning

Mentor: Prof. Amanda Quesenberry

Authorship: Carly Shields

The purpose of this study is to explore how Elementary aged students diagnosed with Specific Learning Disabilities are able to apply phonics to reading. This topic is important due to the lack of representation of students with Specific Learning Disabilities in phonics studies. The literature related to this topic provides support for students who are receiving special education services to receive specialized phonics instruction. The studies that have previously been conducted include disabilities groups that do not represent special education students receiving education in the general classroom setting. Due to this, this study will take place in an elementary school in Central Illinois. Students in First, Second, and Third grade, who have the diagnosis of Specific Learning Disabilities and are receiving special education services, will be eligible to participate. Students will be observed to meet certain criteria, prior to participating in the study. Selected students will be working in small groups and be receiving specialized phonics instruction. This research will allow for special education teachers to be given more support as to what instructional strategies and methods can work when teaching students with Specific Learning Disabilities to read.

## **EXPLORING THE ISSUE OF TEACHER QUALITY AMONGST STUDENT ACHIEVEMENT WITH DIFFERING TEACHERS**

Presenter: Sweet, Kaitlyn  
Graduate, Teaching and Learning

Mentor: Prof. Amanda Quesenberry

Authorship: Kaitlyn Sweet

In today's society education is a huge topic. Politicians and educators are constantly debating the best practices that will push the United States further up on the rank of nations in the world. Many of these practices, ideas, and responsibilities fall on the shoulders of our nation's teachers. And while teachers cannot control all that happens in the classroom, their quality does play a major role in the success of the students. This study will explore this correlation between teacher quality and student achievement.

## **THE EFFECTS OF MATH HOMEWORK ON ACADEMIC ACHIEVEMENT IN AN ELEMENTARY CLASSROOM**

Presenter: Wilk, Angelica  
Graduate, Teaching and Learning

Mentor: Prof. Amanda Quesenberry

Authorship: Angelica Wilk

This study will explore the effects of math homework on academic achievement in an elementary classroom. The questions that will be answered within this study are: what are the effects of homework on math achievement and what are the views of the stakeholders regarding math homework? To complete this research, 25 third-graders have been asked to participate in the study. Both quantitative and qualitative data will be collected from pre- and post-tests, as well as student surveys. During this study, participants will begin by completing pre-tests for each topic covered. Participants then will receive math homework correlating to the topics studied in class for some time. Throughout a course of two topics, participants will not engage with math homework. After each topic is taught, students will complete a post-test and survey discussing their thoughts regarding the homework or lack of homework provided.



# ORAL PRESENTATION ABSTRACTS

## PHYSICS

### THE BIRTH PLACE OF ELEMENTARY PARTICLES?

Presenter: Czajka, Brendan  
Undergraduate, Physics

Mentor: Prof. Rainer Grobe

Co-mentor: Prof. Q. Su

When enough energy is gathered by focusing laser beams such that the corresponding electromagnetic field reaches a sufficiently large field strength, called supercritical, it is possible to break down the quantum vacuum. When the vacuum breakdown occurs, energy of light photons may be converted into particle pairs in the form of electrons and positrons. While the theoretical predication of created particle pairs may be obtained through the newly developed procedure called computational quantum field theory, the detailed mechanisms inside the interaction zone are not fully explored up to now. The challenge may be traced back to the very definition of what constitutes an electron or positron inside the supercritical fields. In this work we outline a first attempt to resolve such a challenge and offer for the first time an algorithm to define particles and trace them during the creation process.

## **DISTILLATION OF $^{56}\text{Fe}$ IN ULTRAMASSIVE O-NE WHITE DWARFS**

Presenter: Freeman, Ian  
Undergraduate, Physics

Mentor: Prof. Matt Caplan

When white dwarfs freeze the plasma mixtures inside them undergo separation processes which can produce radical changes in the composition profile of the star. The abundance of neutron rich elements, such as  $^{22}\text{Ne}$  or  $^{56}\text{Fe}$ , determines whether or not the first crystals are more or less dense than the surrounding fluid and thus whether they sink or float. These processes have now been studied for C-O-Ne and C-O-Fe mixtures, finding that distillation and precipitation processes are possible in white dwarfs. In this work, we calculate the phase diagram of more complicated O-Ne-Fe mixtures and make predictions for the internal structure of the separated white dwarf. There are two possible outcomes determined by a complicated interplay between the Ne abundance, the  $^{22}\text{Ne}$  fraction, and the  $^{56}\text{Fe}$  abundance. Either Fe distills to form an inner core because the first O-Ne solids are buoyant, or an O-Ne inner core forms and Fe accumulates in the liquid until Fe distillation begins and forms a Fe shell. In the case of an Fe shell, a Rayleigh-Taylor instability may arise and overturn the core. In either case, Fe distillation may only produce a cooling delay of order 0.1 Gyr as these processes occur early at high white dwarf luminosities. Fe inner cores and shells may be detectable through asteroseismology and could enhance the yield of neutron rich elements such as  $^{55}\text{Mn}$  and  $^{58}\text{Ni}$  in supernovae.

## **SYMBOLIC REGRESSION AND ITS USE IN ITERATIVE MAPS**

Presenter: Furcoiu, Alex  
Undergraduate, Physics

Mentor: Prof. Rainer Grobe

Co-mentor: Prof. Q. Su

Physical processes such as spring-mass motion may be described in terms of continuous variation of relevant quantities such position or momentum with respect to time. The same process may also be described in terms of maps that relate quantity such as position or momentum at a time with position or momentum of a fixed interval in the past. It turns out only in very limited number of cases the construction of such maps may be obtained. In the case of a linear spring, the position is a linear combination of position and momentum one time step in the past. However, when force and spring compression are nonlinearly related, the corresponding map becomes nontrivial. In this work, we employ the symbolic regression technique to systematically obtain a map that describes a nonlinear spring-mass system with better and better accuracy. Such an approach may help us to speed up the construction of maps of complicated non-linear interactions.

## **SOLVING ORDINARY DIFFERENTIAL EQUATIONS USING NEURAL NETWORKS**

Presenter: Rizo, Luis  
Undergraduate, Physics

Mentor: Prof. Rainer Grobe

Co-mentor: Prof. Q. Su

Theoretical analysis of physical processes are usually related to the solution of differential equations. The solution of these equations would usually be represented by the quantity of interest and its precise functional dependence with time (in the case of ordinary differential equation, ODE) or with space and time (in the case of partial differential equation, PDE). While there are many solution methods existing in mathematics, the analytical solutions that correspond to only small number of physical interactions are available. To overcome such an obstacle, numerical procedures have been developed. However, construction of the solution functions usually become increasingly computing time consuming as we include more and more realistic descriptions with regard to the spatial dimensions as well as one temporal dimension. In this work, we introduce a new numerical algorithm based on neural networks whose ability to construct the solution of ODE may require less computing time than other existing algorithms with similar numerical accuracy.

## **COLLISION RATE OF SOLAR SYSTEM BODIES WITH PRIMORDIAL BLACK HOLES**

Presenter: Santarelli, Andy  
Undergraduate, Physics

Mentor: Prof. Matt Caplan

Primordial black holes (PBH), which may have formed in the early universe, are a dark matter (DM) candidate. If PBHs have low masses ( $10^{17}$  to  $10^{19}$  g) comparable to asteroids, they would be abundant in the solar system and could strike bodies like the earth and moon. In this work, we calculate the DM flux through solar system bodies from both the galactic halo and dark disk models to determine the rate and probability of PBH encounters.

## **SUBSTRUCTURE AT PHASE BOUNDARIES IN O/NE/FE COULOMB CRYSTALS**

Presenter:           Smith, Nevin  
                          Undergraduate, Physics

Mentor:             Prof. Matt Caplan

At high densities in the cores of white dwarf stars, plasma mixtures freeze. This crystallization process is known to involve complex separation of in mixtures, where heavy and light nuclei (with large and small charges respectively) separate into distinct solid and liquid phases. Molecular dynamics simulations of oxygen-neon-iron mixtures in white dwarfs find that the interfaces between these solids and liquids are especially complex, with a thin film forming between the solid and liquid. This talk will discuss these simulations and our calculations to characterize these interfaces as well as their implications for white dwarf astrophysics.

## **QUANTUM THERMOELECTRIC ENHANCEMENT OF ACYCLIC CROSS-CONJUGATED POLYMERS**

Presenter: Wasler, Riley  
Undergraduate, Physics

Mentor: Prof. Justin Bergfield

We investigate the thermoelectric response of single-molecule junctions based on acyclic cross-conjugated polymers. Owing to their unique physical properties, we find that they can give rise to scalable thermoelectric energy conversion with a quantum enhancement which is significantly larger than other series connected aromatic structures. Using an effective model for the low-energy physics, we derive the optimal length molecule and discuss its relevance for high-impedance thermoelectric applications.

## THEATRE AND DANCE

### PERFORMATIVE LIVING OF HOLLY GOLIGHTLY, "REAL PHONY"

Presenter: Denning, Jessie  
Graduate, Theatre and Dance

Mentor: Prof. Kee-Yoon Nahm

Authorship: Jessie Denning

The character of Holly Golightly, specifically within the film-story world of *Breakfast at Tiffany's*, lives a remarkably performative lifestyle. This is important because many studies on *Breakfast at Tiffany's* focus on the actors' performances (especially that of Audrey Hepburn's), on comparing the film to the original novel by Truman Capote, or on other elements that went into the movie-making (or book-writing) process. Few scholars seem to be bringing in the lens of performance studies for their related analyses, and even fewer seem to specially address this iconic woman with her classic black dress running around New York City going by the name of Holly Golightly. This addition to the field of performance studies is relevant because exploring dynamics of performative selves through a key pop culture example such as Miss Golightly will assist in filling gaps not only from performance studies to identity presentations, but also from academic theories to practical, every-day understandings of the self. Learning to analyze one's own 'character' or others in the outside world through first analyzing a character like Holly is likely to make the entire process more accessible to scholars, artists, and audiences alike.



## **COLOR THEORY, CHAKRAS, AND CHARACTER DEVELOPMENT**

Presenter: Feger, Ashleigh Rae-Lynn  
Graduate, Theatre and Dance

Mentor: Prof. Kee-Yoon Nahm

This research will discuss the basics of color theory and color auras and how they can be implemented into the world of meditation and chakras, to look at a new step in theatre methodology pertaining to the actor, that is already being used in the industry through lighting design.

This strategy will help to combine the physical and psychological elements in techniques developed by Stanislavski, Strasberg, Meisner, and Laban that can have negative implications pertaining to mental health and trauma or physical injury when not trained in the craft properly or the appropriate research has not been done.

The idea for this strategy stems from work as a community theatre and high school director and working with untrained actors. This new methodology is being researched and developed as an educational tool and building block to assist in creating an authentic and strong actor and character.

## **'NO PAGE IN PETTY-COAT': WOMEN AS PART OF THE RESTORATION STAGE**

Presenter: Genardo, Gillian  
Graduate, Theatre and Dance

Mentor: Prof. Kee-Yoon Nahm

The late seventeenth century brought forth a significant change that would forever alter theatre from that point forward—the inclusion of women in both writing and performing drama in England. With the reinstatement of the monarchy, came not only the lifting of the theatrical ban but the emergence of women making a living off of theatre. Finally, more agency for women...possibly. My paper seeks to understand the precarious position that women of the Restoration Era found themselves in regarding theatre. On one hand, women's voices were finally allowed in English theatre prompting an evolution of female characters both in script and on stage. On the other hand, sex sells. Were English actresses really allowed personal and economic agency through this new profession or were they merely meant to exist for the sexual pleasure of men? In Restoration England, women were inferior, so having the ability to become commercially successful in the theatre brings merit to the notion of a more equitable industry during this time. However, in all the supposed good happening, women were still majorly seen as merely sexual images on stage, and rape scenes and breeches roles became increasingly popular. Ultimately, through an analysis of the sexualization of the Restoration actress, my paper examines whether or not women in Restoration era theatre actually had the agency that history may lead one to believe they had.

## **SEEING THE IMPOSSIBLE SEAMS: FINDING THE STRINGS THAT CONNECT PUPPET ARTISTRY AND DRAG PERFORMANCE WITH THE LENS OF THE FOOL ARCHETYPE**

Presenter: Graves, Michael  
Graduate, Theatre and Dance

Mentor: Prof. Kee-Yoon Nahm

This presentation will discuss the several ways that drag performance and puppet artistry are connected in approach, in performance, and in audience perception. These connections are even more visible when seen through the lens of the Fool Archetype. One perspective of this presentation will be to understand how the archetype of the Fool has moved across history and into modern theatre as both a truth-telling device to the audience and a form of self-expression for the artist. Peering through this lens at drag performances in modern theatre and media, this presentation will also explore the impact of various approaches to creation of their identity when embodying a persona, and how performers set their own boundaries when donning the role. I will also expose those connective strings of performance psychology with a drag performer and of a puppetry artist. In summary, I believe that there is correlation between puppetry, performance art psychology, and comedic drag personas that are tied together with impossibly visible strings that are all related to the Fool archetype. This presentation will show historical and analytical research to support my idea of where the many tiers of perceived humor are in modern theatre and various media, how they are methodically approached to bridge together these similarities within the lens of the Fool archetype.

## **BILLIE EILISH'S "HAPPIER THAN EVER" AS A CONCEPT ALBUM AND THE USAGE OF "OLD HOLLYWOOD" TO PROMOTE ITS THEMES**

Presenter: Guedes, Gustavo Nery Dutra  
Graduate, Theatre and Dance

Mentor: Prof. Kee-Yoon Nahm

Authorship: Gustavo Nery Dutra Guedes

Released in 2021, "Happier Than Ever" is the Grammy-nominated second album by American singer-songwriter Billie Eilish, which was 19 years old by the time it came out. Born and raised in Los Angeles, the artist defines this work as a "love letter" to the city and a turning point in her rising career, on which she deals with mature themes and concepts of "timelessness" and "fame". This research investigates how Eilish incorporates "old Hollywood" imagery and elements from the mid-20th century entertainment industry to promote the album. To conduct this case study, the author draws sources that define the idea of a "concept album", and the usage of imagery to support a musician's work. The results help to understand a solid trend in the pop music industry in which artists incorporate various elements to create and promote concepts that match their current music and albums, thus achieving a cohesive meaning to their art.

## **WOMEN'S RIGHTS IN IRANIAN FEMALE FILMMAKERS' FILMS IN POST-REVOLUTION**

Presenter:           Irannezhad, Zahra  
                          Graduate, Theatre and Dance

Mentor:              Prof. Kee-Yoon Nahm

Iranian cinema can be divided into two sections: before and after the revolution. The social situation has influenced the role of women in cinema in Iran. Although women had more freedom before the revolution, their roles were very limited and unnoticeable, and they merely played the role of mother or wife. These films became known as a genre called Filmfarsi, largely regarded as unintellectual appeals to the masses with love stories and singing women. Moreover, there were few female directors before the revolution, confined by Forough Farrokhzad, who made "the house is black" in 1962. This paper provides an insight into the advent of Iranian female filmmakers in the Iranian post-revolutionary and sees how Iran's social condition influenced the content of films at that time. Also, see why most female filmmakers made films around women's issues. This study examines the works of three Iranian women directors, Rakhshan Bani-Etemad, Tamineh Milani, and Poursan Derakhshandeh, with a focus on three films.

## **USING COSTUME DESIGN AS A MEANS OF PROMOTING IDENTITY AND REPRESENTATION IN THEATRE**

Presenter: Okonma, Jenefas  
Graduate, Theatre and Dance

Mentor: Prof. Kee-Yoon Nahm

Authorship: Jenefas Okonma

Men on Boats by Jaclyn Backhaus is a critically acclaimed play that has seen many renditions on stages across the world over the years. It is a favorite of colleges across America and is a part of Illinois State University's School of Theatre and Dance '23 season, directed by Professor Maggie Marlin-Hess. As the title implies, Men on Boats is a satirical retelling of Major John Wesley Powell's 1869 expedition with nine other cis-gendered white men on boats, to chart the course of the Colorado river but in a twist, the script calls for a casting of anyone but cis-gendered white men. The script raises questions of whose history is being told in the American history books and who is allowed to tell said history and gives the audience the opportunity to experience historical events without the historical limitations of who could participate in such events. To me, this play is a celebration of the other, of every kind of other that there is, as it does not place a definition of what that other can be, but only what the other is not; cis-gender white men, in American history and society. It is a celebration of individuality, identity, and representation and in this paper, I will explain how I use my design renderings as costume designer for the show to explore this celebration, not just of the characters in the script but also of the actors in the 2023 production of Men on Boats at Illinois State University. I will be exploring how the identities of these actors are captured in the creation of the looks for their characters which will help address the question of how themes of self-identity and representation can be better enhanced even in the design aspects of storytelling in theatre.

# ORAL PRESENTATIONS

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DEPARTMENT OF PHYSICS

(April 15, 2023)

Moulton Hall 309

Faculty mentors: Dr. J. Bergfield; Dr. M. Caplan; Dr. R. Grobe; and Dr. Q. Su

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9:00-9:15

Brendan Czajka

BIRTH PLACE OF ELEMENTARY PARTICLES?

9:15-9:30

Luis Rizo

SOLVING ORDINARY DIFFERENTIAL EQUATIONS USING NEURAL NETWORKS

9:30-9:45

Alex Furcoiu

SYMBOLIC REGRESSION AND ITS USE IN ITERATIVE MAPS

9:45-10:00

Ian Freeman

DISTILLATION OF 56FE IN ULTRAMASSIVE O-NE WHITE DWARFS

10:00-10:15

Nevin Smith

SUBSTRUCTURE AT PHASE BOUNDARIES IN O/NE/FE COULOMB CRYSTALS

10:15-10:30

Andy Santarelli

COLLISION RATE OF SOLAR SYSTEM BODIES WITH PRIMORDIAL BLACK HOLES

10:30-10:45

Riley Wasler

QUANTUM THERMOELECTRIC ENHANCEMENT OF ACYCLIC  
CROSS-CONJUGATED POLYMERS

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**SCHOOL OF THEATRE & DANCE**  
**(April 20, 2023)**  
**Centennial East, Room 224**  
**3:00 - 5:30 p.m.**  
**Organized by Dr. Kee-Yoon Nahm**

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**Presenters**

**Session 1 (3:00-4:15 p.m.)**  
**(15 minutes for each presenter, 15 minutes of collective Q&A)**

**Jenefas Okonma**  
**(Masters in Theatre Studies and M.F.A. in Costume Design)**

**USING COSTUME DESIGN AS A MEANS OF PROMOTING IDENTITY AND REPRESENTATION IN THEATRE**

**Firozeh Irannezhad**  
**(M.F.A. in Lighting Design)**

**WOMEN'S RIGHTS IN IRANIAN FEMALE FILMMAKERS IN POST-REVOLUTION**

**Jessie Denning**  
**(Masters in Theatre Studies)**

**PERFORMATIVE LIVING OF HOLLY GOLIGHTLY, 'REAL PHONY'**

**Gillian Genardo**  
**(Masters in Theatre Studies)**

**'NO PAGE IN PETTY-COAT': WOMEN AS PART OF THE RESTORATION STAGE**

**4:15-4:30 p.m. Break**



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**Session 2**

**4:30 - 5:30 p.m.**

**(15 minutes for each presenter,15 minutes of collective Q&A)**

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**Presenters**

**Ashleigh Rae-Lynn Feger  
(Masters in Theatre Studies)**

**COLOR THEORY, CHAKRAS, AND DEVELOPMENT**

**Michael D. Graves  
(Masters in Theatre Studies)**

**SEEING THE IMPOSSIBLE SEAMS: FINDING THE STRINGS THAT CONNECT PUPPET ARTISTRY  
AND DRAG PERFORMANCE WITH THE LENS OF THE FOOL ARCHETYPE**

**Gustavo Nery  
(Masters in Theatre Studies)**

**BILLIE EILISH’S ‘HAPPIER THAN EVER’ AS A CONCEPT ALBUM AN THE USAGE OF ‘OLD  
HOLLYWOOD’ TO PROMOTE ITS THEMES**

**ALPHABETICAL BY STUDENTS'S LAST NAME  
MORNING SESSION**

<b>Presenter's Last Name</b>	<b>Presenter's First Name</b>	<b>Page Number</b>	<b>Department/School</b>	<b>Mentor</b>
<b>A</b>				
<b>Abdullah</b>	<b>Abu Habib Md</b>	<b>10</b>	<b>Biological Sciences</b>	<b>Viktor Kirik</b>
<b>Abraham</b>	<b>Melissa</b>	<b>16</b>	<b>Biological Sciences</b>	<b>Dawn McBride</b>
<b>Ackah</b>	<b>Randy</b>	<b>6</b>	<b>Agriculture</b>	<b>Aslihan Spaulding</b>
<b>Adehinmoye</b>	<b>Adewale</b>	<b>33</b>	<b>Chemistry</b>	<b>Jun-Hyun Kim</b>
<b>Agbasiere</b>	<b>Chinyere</b>	<b>49</b>	<b>Communication</b>	<b>John Baldwin</b>
<b>Aidoo</b>	<b>Erinda</b>	<b>11</b>	<b>Biological Sciences</b>	<b>Andrés Vidal-Gadea</b>
<b>Akinosho</b>	<b>Aalimah</b>	<b>12</b>	<b>Biological Sciences</b>	<b>Andrés Vidal-Gadea</b>
<b>Akpan</b>	<b>Jessica</b>	<b>113</b>	<b>Psychology</b>	<b>Brea Banks</b>
<b>Al-Ashkar</b>	<b>Connor</b>	<b>115</b>	<b>Psychology</b>	<b>Dawn McBride</b>
<b>Amoakwa</b>	<b>Agnes</b>	<b>50</b>	<b>Communication</b>	<b>John Baldwin</b>
<b>Anggriawan</b>	<b>Robby</b>	<b>154</b>	<b>Teaching and Learning</b>	<b>Do-Yong Park</b>
<b>Angles</b>	<b>Susanna</b>	<b>34</b>	<b>Chemistry</b>	<b>Andy Mitchell</b>
<b>Arndt</b>	<b>Tom</b>	<b>35</b>	<b>Chemistry</b>	<b>Richard Nagorski</b>
<b>B</b>				
<b>Baker</b>	<b>Andie</b>	<b>103</b>	<b>Psychology</b>	<b>Laura J. Finan</b>
<b>Barnes</b>	<b>Andy</b>	<b>36</b>	<b>Chemistry</b>	<b>Andy Mitchell</b>
<b>Barth</b>	<b>Nicolette</b>	<b>54</b>	<b>Communication Sciences and Disorders</b>	<b>Jamie Mahurin-Smith</b>

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<b>Batula</b>	<b>Shadiyat</b>	<b>16</b>	<b>Biological Sciences</b>	<b>Dawn McBride</b>
<b>Beard</b>	<b>Christiana</b>	<b>83</b>	<b>Mathematics</b>	<b>Mehdi Karimi</b>
<b>Beyer</b>	<b>Daniel</b>	<b>82</b>	<b>Mathematics</b>	<b>Mehdi Karimi</b>
<b>Bosley</b>	<b>Brittany</b>	<b>120</b>	<b>Social Work</b>	<b>Christopher Gjesfeld</b>
<b>Bowen</b>	<b>Thera</b>	<b>16</b>	<b>Biological Sciences</b>	<b>Dawn McBride</b>
<b>Bradley</b>	<b>Brittany</b>	<b>113</b>	<b>Psychology</b>	<b>Brea Banks</b>
<b>Brower</b>	<b>Sara</b>	<b>122</b>	<b>Social Work</b>	<b>Christopher Gjesfeld</b>
<b>Buhr</b>	<b>Jess</b>	<b>66</b>	<b>Family and Consumer Sciences</b>	<b>Ui-Jeen Yu</b>
<b>Burnett</b>	<b>Hailey</b>	<b>13</b>	<b>Biological Sciences</b>	<b>Pirmin Nietlisbach</b>
<b>Burnett</b>	<b>Sophie</b>	<b>123</b>	<b>Social Work</b>	<b>Christopher Gjesfeld</b>
<b>Bush</b>	<b>Morgan</b>	<b>124</b>	<b>Social Work</b>	<b>Kate Sheridan</b>
<b>C</b>				
<b>Calhoun</b>	<b>Austin</b>	<b>14</b>	<b>Biological Sciences</b>	<b>Ben Sadd</b>
<b>Carter</b>	<b>Austin</b>	<b>37</b>	<b>Chemistry</b>	<b>Shawn Hitchcock</b>
<b>Casteel</b>	<b>Cody</b>	<b>115</b>	<b>Psychology</b>	<b>Dawn McBride</b>
<b>Castino</b>	<b>Maddie</b>	<b>62</b>	<b>Family and Consumer Sciences</b>	<b>Christina Soyoung Song</b>
<b>Chall</b>	<b>Autumn</b>	<b>89</b>	<b>Psychology</b>	<b>Jef Kahn</b>
<b>Chambers</b>	<b>Dylan</b>	<b>87</b>	<b>Physics</b>	<b>Epaminondas Rosa</b>

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<b>Charles</b>	<b>Mahika</b>	<b>108</b>	<b>Psychology</b>	<b>Alycia Hund</b>
<b>Coil</b>	<b>TJ</b>	<b>38</b>	<b>Chemistry</b>	<b>Lisa Szczepura</b>
<b>Colwell</b>	<b>Alexis</b>	<b>91</b>	<b>Psychology</b>	<b>Alycia Hund</b>
<b>Colwell</b>	<b>Alexis</b>	<b>108</b>	<b>Psychology</b>	<b>Alycia Hund</b>
<b>Corea-Dubon</b>	<b>Maria</b>	<b>92</b>	<b>Psychology</b>	<b>Dawn McBride</b>
<b>Corrie</b>	<b>Seth</b>	<b>39</b>	<b>Chemistry</b>	<b>Andrew Mitchell</b>
<b>D</b>				
<b>Daniels</b>	<b>Kierra</b>	<b>125</b>	<b>Social Work</b>	<b>Kate Sheridan</b>
<b>Dart</b>	<b>Avery</b>	<b>15</b>	<b>Biological Sciences</b>	<b>Pirmin Nietlisbach</b>
<b>Dettmann</b>	<b>Will</b>	<b>103</b>	<b>Psychology</b>	<b>Laura J. Finan</b>
<b>Dooley</b>	<b>Andrew</b>	<b>71</b>	<b>Geography, Geology, and the Environment</b>	<b>Wondy Seyoum</b>
<b>Draper</b>	<b>Katelyn Olivia</b>	<b>16</b>	<b>Biological Sciences</b>	<b>Tom Hammond</b>
<b>Driskell</b>	<b>Nicklaus</b>	<b>75</b>	<b>Kinesiology and Recreation</b>	<b>Kelly Laurson</b>
<b>Duffrin</b>	<b>Tyler</b>	<b>93</b>	<b>Psychology</b>	<b>Jeffrey Wagman</b>
<b>Duncan</b>	<b>Mackenna</b>	<b>17</b>	<b>Biological Sciences</b>	<b>Jan-Ulrik Dahl</b>
<b>Duong</b>	<b>Michelle</b>	<b>119</b>	<b>Psychology</b>	<b>Laura J. Finan</b>
<b>E</b>				
<b>Erzuah</b>	<b>Marymoud</b>	<b>40</b>	<b>Chemistry</b>	<b>Andy Mitchell</b>
<b>Eyimegwu</b>	<b>Faith</b>	<b>41</b>	<b>Chemistry</b>	<b>Jun-Hyun Kim</b>

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F				
Faires	Jared	126	Social Work	Kate Sheridan
Fairow	Christen	18	Biological Sciences	Laura Vogel
Fedorchak	Micah	19	Biological Sciences	Diane Byers
Fisher	Carly	58	Family and Consumer Sciences	Christina Soyoung Song
Fleming	Fiona	147	Sociology/Anthropology	Susan Sprecher
Flint	Arielle	113	Psychology	Brea Banks
Freeman	Rebecca	127	Social Work	Christopher Gjesfjeld
Freko	Justin	20	Biological Sciences	Rebekka Darner
Frere	Wyatt	70	Finance, Insurance, and Law	Vladimir Kotomin
G				
Galvan	Pedro	16	Biological Sciences	Tom Hammond
Gary	Zari	128	Social Work	Kate Sheridan
Gentry	Ashten	42	Chemistry	Richard Nagorski
Gill	Helena	129	Social Work	Christopher Gjesfjeld
Gomez	Lylia	87	Physics	Epaminondas Rosa
Gomez Hernandez	Estrella	102	Psychology	Suejung Han
Graybill	Susan	7	Agriculture	Aslihan Spaulding
Green	Toni	21	Biological Sciences	Rebekka Darner

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<b>Greer</b>	<b>Jessica</b>	<b>22</b>	<b>Biological Sciences</b>	<b>Rebekka Darner</b>
<b>Gromov</b>	<b>Dennis</b>	<b>91</b>	<b>Psychology</b>	<b>Alycia Hund</b>
<b>Guzman</b>	<b>Melanie</b>	<b>60</b>	<b>Family and Consumer Sciences</b>	<b>Christina Soyoung Song</b>
<b>H</b>				
<b>Halvorsen</b>	<b>Boden</b>	<b>23</b>	<b>Biological Sciences</b>	<b>Rebekka Darner</b>
<b>Hanson</b>	<b>Mary-Kate</b>	<b>150</b>	<b>Special Education</b>	<b>Jeongae Kang</b>
<b>Harris</b>	<b>Emily</b>	<b>43</b>	<b>Health Sciences</b>	<b>Timothy Lash</b>
<b>Hayes</b>	<b>Michaela</b>	<b>104</b>	<b>Psychology</b>	<b>Laura J. Finan</b>
<b>Hennessy</b>	<b>Erin</b>	<b>146</b>	<b>Sociology/Anthropology</b>	<b>Susan Sprecher</b>
<b>Henning</b>	<b>James</b>	<b>62</b>	<b>Family and Consumer Sciences</b>	<b>Christina Soyoung Song</b>
<b>Henry</b>	<b>Ashton</b>	<b>97</b>	<b>Psychology</b>	<b>Julie Campbell</b>
<b>Henslick</b>	<b>James</b>	<b>130</b>	<b>Social Work</b>	<b>Kate Sheridan</b>
<b>Hicks</b>	<b>Travis</b>	<b>94</b>	<b>Psychology</b>	<b>Jordan Arellanes</b>
<b>Hicks</b>	<b>Travis</b>	<b>98</b>	<b>Psychology</b>	<b>Eric D. Wesselman</b>
<b>Hines</b>	<b>Shannon</b>	<b>131</b>	<b>Social Work</b>	<b>Kate Sheridan</b>
<b>Hudomiet</b>	<b>Emily</b>	<b>132</b>	<b>Social Work</b>	<b>Christopher Gjesfjeld</b>
<b>Hudson</b>	<b>Gabi</b>	<b>8</b>	<b>Agriculture</b>	<b>Maria Boerngen</b>
<b>Hulett</b>	<b>Joshua</b>	<b>133</b>	<b>Social Work</b>	<b>Kate Sheridan</b>

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<b>Humphrey</b>	<b>Taylor</b>	<b>92</b>	<b>Psychology</b>	<b>Dawn McBride</b>
<b>Hunter Laney</b>	<b>Mackenzie</b>	<b>21</b>	<b>Biological Sciences</b>	<b>Rebekka Darner</b>
<b>J</b>				
<b>Jackson</b>	<b>Tyra</b>	<b>113</b>	<b>Psychology</b>	<b>Brea Banks</b>
<b>Jacobsen</b>	<b>Sarah</b>	<b>146</b>	<b>Sociology/Anthropology</b>	<b>Susan Sprecher</b>
<b>Jezowit</b>	<b>Caitlyn</b>	<b>96</b>	<b>Psychology</b>	<b>Adena Meyers</b>
<b>Johnson</b>	<b>Miranda</b>	<b>64</b>	<b>Family and Consumer Sciences</b>	<b>Ui-Jeen Yu</b>
<b>Jones</b>	<b>Kaila</b>	<b>108</b>	<b>Psychology</b>	<b>Alycia Hund</b>
<b>K</b>				
<b>Kant</b>	<b>Caitlyn</b>	<b>44</b>	<b>Chemistry</b>	<b>Shawn Hitchcock</b>
<b>Kastar</b>	<b>Katie</b>	<b>108</b>	<b>Psychology</b>	<b>Alycia Hund</b>
<b>Kaur</b>	<b>Mankirat</b>	<b>65</b>	<b>Family and Consumer Sciences</b>	<b>Christina Soyoung Song</b>
<b>Kayani</b>	<b>Taimoor</b>	<b>156</b>	<b>Technology</b>	<b>Pranshoo Solanki</b>
<b>Koehn</b>	<b>Kristin</b>	<b>25</b>	<b>Kinesiology and Recreation</b>	<b>Rebekka Darner</b>
<b>Kremer</b>	<b>Jack</b>	<b>30</b>	<b>Biological Sciences</b>	<b>Rebekka Darner</b>
<b>Krivograd</b>	<b>Sophie</b>	<b>16</b>	<b>Biological Sciences</b>	<b>Dawn McBride</b>
<b>Kroehnke</b>	<b>Megan</b>	<b>97</b>	<b>Psychology</b>	<b>Julie Campbell</b>
<b>Kubiatowicz</b>	<b>Erik</b>	<b>22</b>	<b>Biological Sciences</b>	<b>Rebekka Darner</b>
<b>Kuehn</b>	<b>Kelsey</b>	<b>76</b>	<b>Kinesiology and Recreation</b>	<b>Karen Dennis</b>

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L				
<b>Lafayette</b>	<b>Sarah</b>	<b>79</b>	<b>Kinesiology and Recreation</b>	<b>Kristen Legally</b>
<b>LaRocco</b>	<b>Abigail</b>	<b>134</b>	<b>Social Work</b>	<b>Christopher Gjesfjeld</b>
<b>Larson</b>	<b>Sophia</b>	<b>146</b>	<b>Sociology/Anthropology</b>	<b>Susan Sprecher</b>
<b>Lasisi</b>	<b>Omolola</b>	<b>51</b>	<b>Communication</b>	<b>John Baldwin</b>
<b>Lee</b>	<b>Jalen</b>	<b>16</b>	<b>Biological Sciences</b>	<b>Dawn McBride</b>
<b>Lemp</b>	<b>Haley</b>	<b>73</b>	<b>Health Sciences</b>	<b>Alicia Wodika</b>
<b>Leppert</b>	<b>Jonathan</b>	<b>20</b>	<b>Biological Sciences</b>	<b>Rebekka Darner</b>
<b>Liew</b>	<b>Ryan</b>	<b>115</b>	<b>Psychology</b>	<b>Dawn McBride</b>
<b>Lim</b>	<b>Zhi Quan</b>	<b>98</b>	<b>Psychology</b>	<b>Eric D. Wesselman</b>
<b>Lindenmeyer</b>	<b>Isabelle</b>	<b>158</b>	<b>Politics and Government</b>	<b>Julie Webber</b>
<b>Lomelino</b>	<b>Tori</b>	<b>99</b>	<b>Psychology</b>	<b>Dawn McBride</b>
<b>Long</b>	<b>Gavin</b>	<b>24</b>	<b>Geography, Geology, and the Environment</b>	<b>Rebekka Darner</b>
<b>Loth</b>	<b>Megan</b>	<b>66</b>	<b>Family and Consumer Sciences</b>	<b>Ui-Jeen Yu</b>
<b>Lough</b>	<b>Derek</b>	<b>155</b>	<b>Teaching and Learning</b>	<b>Lara Handsfield</b>
<b>Lowe</b>	<b>Megan</b>	<b>67</b>	<b>Sociology/Anthropology</b>	<b>Cristina Prestin-Beard</b>
M				
<b>Mahoney</b>	<b>Megan</b>	<b>100</b>	<b>Psychology</b>	<b>Adena Meyers</b>



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<b>Manisco</b>	<b>Mia</b>	<b>25</b>	<b>Kinesiology and Recreation</b>	<b>Rebekka Darner</b>
<b>Marcheschi</b>	<b>Michael</b>	<b>16</b>	<b>Biological Sciences</b>	<b>Dawn McBride</b>
<b>Markley</b>	<b>Charlotte</b>	<b>135</b>	<b>Social Work</b>	<b>Kate Sheridan</b>
<b>Martin</b>	<b>Sommer</b>	<b>145</b>	<b>Sociology/Anthropology</b>	<b>Shelby Putt</b>
<b>McAuley</b>	<b>Melissa</b>	<b>136</b>	<b>Social Work</b>	<b>Kate Sheridan</b>
<b>McGinnis</b>	<b>Cassie</b>	<b>86</b>	<b>Physics</b>	<b>Epaminondas Rosa</b>
<b>McKinley</b>	<b>Jessica</b>	<b>101</b>	<b>Psychology</b>	<b>Adena Meyers</b>
<b>McLarty</b>	<b>Allie</b>	<b>102</b>	<b>Psychology</b>	<b>Suejung Han</b>
<b>Meister</b>	<b>Rachel</b>	<b>103</b>	<b>Psychology</b>	<b>Laura J. Finan</b>
<b>Meister</b>	<b>Rachel</b>	<b>104</b>	<b>Psychology</b>	<b>Laura J. Finan</b>
<b>Miller</b>	<b>Grant</b>	<b>157</b>	<b>Technology</b>	<b>Isaac Chang</b>
<b>Monroe</b>	<b>Emily</b>	<b>108</b>	<b>Psychology</b>	<b>Alycia Hund</b>
<b>Montalbano</b>	<b>Caitlin</b>	<b>26</b>	<b>Biological Sciences</b>	<b>Ryan Paitz</b>
<b>Moran</b>	<b>Cory</b>	<b>29</b>	<b>Biological Sciences</b>	<b>Rebekka Darner</b>
<b>Morn-Toro</b>	<b>Carlos</b>	<b>146</b>	<b>Sociology/Anthropology</b>	<b>Susan Sprecher</b>
<b>Morr</b>	<b>Rudy</b>	<b>70</b>	<b>Finance, Insurance, and Law</b>	<b>Vladimir Kotomin</b>
<b>Mueller</b>	<b>Hope</b>	<b>108</b>	<b>Psychology</b>	<b>Alycia Hund</b>
<b>Mueller</b>	<b>Zachary</b>	<b>77</b>	<b>Kinesiology and Recreation</b>	<b>Nicky Wu</b>

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<b>Munn</b>	<b>John</b>	<b>16</b>	<b>Biological Sciences</b>	<b>Dawn McBride</b>
<b>Munoz</b>	<b>Mariana</b>	<b>146</b>	<b>Sociology/Anthropology</b>	<b>Susan Sprecher</b>
<b>Munoz</b>	<b>Mariana</b>	<b>147</b>	<b>Sociology/Anthropology</b>	<b>Susan Sprecher</b>
<b>Mutholam</b>	<b>Anjali</b>	<b>55</b>	<b>Communication Sciences and Disorders</b>	<b>Taeok Park</b>
<b>N</b>				
<b>Naugle-Gross</b>	<b>Eric</b>	<b>27</b>	<b>Biological Sciences</b>	<b>Ryan Paitz</b>
<b>Nottke</b>	<b>Nicole</b>	<b>137</b>	<b>Social Work</b>	<b>Christopher Gjesfjeld</b>
<b>O</b>				
<b>Odeh</b>	<b>Yasmin</b>	<b>147</b>	<b>Sociology/Anthropology</b>	<b>Susan Sprecher</b>
<b>O'Dowd</b>	<b>Sara</b>	<b>85</b>	<b>Philosophy</b>	<b>Daniel Breyer</b>
<b>O'Flaherty</b>	<b>Spencer</b>	<b>28</b>	<b>Biological Sciences</b>	<b>John Sedbrook</b>
<b>Okleiteris</b>	<b>Carolina</b>	<b>16</b>	<b>Biological Sciences</b>	<b>Dawn McBride</b>
<b>Oloffson</b>	<b>Kayla</b>	<b>78</b>	<b>Kinesiology and Recreation</b>	<b>Mike Mulvaney</b>
<b>Orthy</b>	<b>Maisha Tahsin</b>	<b>105</b>	<b>Psychology</b>	<b>Jeffrey B. Wagman</b>
<b>Osman</b>	<b>Farhia</b>	<b>106</b>	<b>Psychology</b>	<b>Adena Myers</b>
<b>Osman</b>	<b>Farhia</b>	<b>113</b>	<b>Psychology</b>	<b>Brea Banks</b>
<b>P</b>				
<b>Patel</b>	<b>Princy</b>	<b>16</b>	<b>Biological Sciences</b>	<b>Dawn McBride</b>

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<b>Pedone</b>	<b>Mira</b>	<b>62</b>	<b>Family and Consumer Sciences</b>	<b>Christina Soyoung Song</b>
<b>Pereira Gloor</b>	<b>Rochele</b>	<b>56</b>	<b>Creative Technologies</b>	<b>Greg Corness</b>
<b>Perez</b>	<b>Kimberly</b>	<b>108</b>	<b>Psychology</b>	<b>Alycia Hund</b>
<b>Peterson</b>	<b>Kierra</b>	<b>107</b>	<b>Psychology</b>	<b>Brea Banks</b>
<b>Powell</b>	<b>Autumn</b>	<b>108</b>	<b>Psychology</b>	<b>Alycia Hund</b>
<b>Promise</b>	<b>Ifeanyichukwu</b>	<b>45</b>	<b>Chemistry</b>	<b>Andy Mitchell</b>
<b>R</b>				
<b>Rafael</b>	<b>Julia</b>	<b>79</b>	<b>Kinesiology and Recreation</b>	<b>Kristen Legally</b>
<b>Rahman</b>	<b>Eshrat</b>	<b>52</b>	<b>Communication</b>	<b>John Baldwin</b>
<b>Ramirez</b>	<b>Veronica</b>	<b>138</b>	<b>Social Work</b>	<b>Christopher Gjesfjeld</b>
<b>Redfern</b>	<b>Madie</b>	<b>151</b>	<b>Special Education</b>	<b>Stef Gardiner-Walsh</b>
<b>Reents</b>	<b>Justine</b>	<b>139</b>	<b>Social Work</b>	<b>Kate Sheridan</b>
<b>Reeves</b>	<b>Iyasha</b>	<b>140</b>	<b>Social Work</b>	<b>Kate Sheridan</b>
<b>Retter</b>	<b>Julia</b>	<b>87</b>	<b>Physics</b>	<b>Epaminondas Rosa</b>
<b>Rich</b>	<b>Cole</b>	<b>16</b>	<b>Biological Sciences</b>	<b>Dawn McBride</b>
<b>Richter</b>	<b>Aubrey</b>	<b>74</b>	<b>Health Sciences</b>	<b>Alicia Wodika</b>
<b>Robinson</b>	<b>Indira</b>	<b>72</b>	<b>Geography, Geology, and the Environment</b>	<b>Jonathan Thayn</b>
<b>Rodriguez</b>	<b>Ashley</b>	<b>32</b>	<b>Biological Sciences</b>	<b>Rebekka Darner</b>

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<b>Ruem</b>	<b>Eric</b>	<b>29</b>	<b>Biological Sciences</b>	<b>Rebekka Darner</b>
<b>Ryner</b>	<b>Lilly</b>	<b>109</b>	<b>Psychology</b>	<b>Eros Desouza</b>
<b>S</b>				
<b>Saleh</b>	<b>Eaman</b>	<b>46</b>	<b>Biological Sciences</b>	<b>Marjorie Jones</b>
<b>Saliu</b>	<b>Balikisu</b>	<b>16</b>	<b>Biological Sciences</b>	<b>Dawn McBride</b>
<b>Shabani</b>	<b>Nahid</b>	<b>68</b>	<b>Family and Consumer Sciences</b>	<b>Christina Soyoung Song</b>
<b>Shaver</b>	<b>Brennan</b>	<b>24</b>	<b>Geography, Geology, and the Environment</b>	<b>Rebekka Darner</b>
<b>Shaw</b>	<b>Kyler</b>	<b>110</b>	<b>Psychology</b>	<b>Dawn McBride</b>
<b>Shukla</b>	<b>Richa</b>	<b>47</b>	<b>Chemistry</b>	<b>Richard Nagorski</b>
<b>Simpkins</b>	<b>Tyler</b>	<b>30</b>	<b>Biological Sciences</b>	<b>Rebekka Darner</b>
<b>Solomon</b>	<b>Madison</b>	<b>76</b>	<b>Kinesiology and Recreation</b>	<b>Karen Dennis</b>
<b>Soltermann</b>	<b>Christian</b>	<b>83</b>	<b>Mathematics</b>	<b>Mehdi Karimi</b>
<b>Sponagle</b>	<b>Elizabeth</b>	<b>16</b>	<b>Biological Sciences</b>	<b>Dawn McBride</b>
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<b>Steele</b>	<b>Cassandra</b>	<b>141</b>	<b>Social Work</b>	<b>Christopher Gjesfjeld</b>
<b>Strain</b>	<b>Audrey</b>	<b>111</b>	<b>Psychology</b>	<b>Margaret Nauta</b>
<b>Strong</b>	<b>Morgan</b>	<b>142</b>	<b>Social Work</b>	<b>Christopher Gjesfjeld</b>

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<b>Tate</b>	<b>Samantha</b>	<b>146</b>	<b>Sociology/Anthropology</b>	<b>Susan Sprecher</b>
<b>Tate</b>	<b>Samantha</b>	<b>147</b>	<b>Sociology/Anthropology</b>	<b>Susan Sprecher</b>
<b>Tennent</b>	<b>Blake</b>	<b>112</b>	<b>Psychology</b>	<b>Adena Meyers</b>
<b>Thomas</b>	<b>Arianna</b>	<b>81</b>	<b>Marketing</b>	<b>Tina Williams</b>
<b>Thompson</b>	<b>Erin</b>	<b>143</b>	<b>Social Work</b>	<b>Kate Sheridan</b>
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<b>Tomczewski</b>	<b>Kathleen</b>	<b>144</b>	<b>Social Work</b>	<b>Kate Sheridan</b>
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<b>Vonachen</b>	<b>Anna</b>	<b>66</b>	<b>Family and Consumer Sciences</b>	<b>Ui-Jeen Yu</b>
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<b>Weber</b>	<b>Caitlyn</b>	<b>108</b>	<b>Psychology</b>	<b>Alycia Hund</b>
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<b>Wilder</b>	<b>Bethany</b>	<b>16</b>	<b>Biological Sciences</b>	<b>Dawn McBride</b>
<b>Williams</b>	<b>Courtney</b>	<b>115</b>	<b>Psychology</b>	<b>Dawn McBride</b>
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<b>Wissler</b>	<b>Abby</b>	<b>108</b>	<b>Psychology</b>	<b>Alycia Hund</b>
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<b>Wood</b>	<b>Kyle</b>	<b>80</b>	<b>Kinesiology and Recreation</b>	<b>Michael Torry</b>
<b>Worden</b>	<b>Kara</b>	<b>116</b>	<b>Psychology</b>	<b>Laura J. Finan</b>
<b>Y</b>				
<b>Yang</b>	<b>Wan Ju</b>	<b>117</b>	<b>Psychology</b>	<b>Caitlin Mercier</b>
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**Seungok**

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<b>Abdulsalam</b>	<b>Aminat</b>	<b>235</b>	<b>Geography, Geology, and the Environment</b>	<b>Eric Peterson</b>
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<b>Aguilar</b>	<b>Sarah</b>	<b>264</b>	<b>Psychology</b>	<b>Karla Doepke</b>
<b>Aimone</b>	<b>Madison</b>	<b>225</b>	<b>Communication Sciences and Disorders</b>	<b>Antony Joseph</b>
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<b>Ellis</b>	<b>Marissa</b>	<b>175</b>	<b>Biological Sciences</b>	<b>Rebekka Darner</b>
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<b>M</b>				
<b>Ma</b>	<b>Rebecca</b>	<b>281</b>	<b>Sociology/Anthropology</b>	<b>Nobuko Adachi</b>
<b>Maier</b>	<b>Emma</b>	<b>227</b>	<b>Communication Sciences and Disorders</b>	<b>Ciera Lorio</b>
<b>Mangels</b>	<b>Rebekah</b>	<b>221</b>	<b>Communication</b>	<b>John Baldwin</b>
<b>Marchand</b>	<b>Erin</b>	<b>266</b>	<b>Psychology</b>	<b>Eric Wesselmann</b>
<b>Martin</b>	<b>Emma</b>	<b>256</b>	<b>Mathematics</b>	<b>Mehdi Karimi</b>
<b>Marvel</b>	<b>Julian</b>	<b>282</b>	<b>Sociology/Anthropology</b>	<b>Logan Miller</b>
<b>Masih</b>	<b>Sanaii</b>	<b>271</b>	<b>Psychology</b>	<b>Dawn McBride</b>
<b>McLarty</b>	<b>Allie</b>	<b>188</b>	<b>Psychology</b>	<b>Rebekka Darner</b>

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<b>Meadors</b>	<b>Taylor</b>	<b>228</b>	<b>Communication Sciences and Disorders</b>	<b>Antony Joseph</b>
<b>Meyer</b>	<b>Derek</b>	<b>272</b>	<b>Psychology</b>	<b>Jeffrey Kahn</b>
<b>Meyer</b>	<b>Ryan</b>	<b>189</b>	<b>Biological Sciences</b>	<b>Bill Perry</b>
<b>Mierendorf</b>	<b>James</b>	<b>190</b>	<b>Biological Sciences</b>	<b>Thomas Hammond</b>
<b>Milton</b>	<b>Jillian</b>	<b>229</b>	<b>Communication Sciences and Disorders</b>	<b>Ciera Lorio</b>
<b>Moore</b>	<b>Rachel</b>	<b>188</b>	<b>Psychology</b>	<b>Rebekka Darner</b>
<b>Motuelle</b>	<b>Jake</b>	<b>273</b>	<b>Psychology</b>	<b>Jordan Arellanes</b>
<b>Mozid</b>	<b>Nishat Ara</b>	<b>257</b>	<b>Mathematics</b>	<b>Olcay Akman</b>
<b>Muangthong</b>	<b>Thunsinee</b>	<b>287</b>	<b>Teaching and Learning</b>	<b>Deborah MacPhee</b>
<b>Munoz</b>	<b>Lisette</b>	<b>275</b>	<b>Psychology</b>	<b>Brea Banks</b>
<b>N</b>				
<b>Naeger</b>	<b>Lauren</b>	<b>184</b>	<b>Biological Sciences</b>	<b>Wolfgang Stein</b>
<b>Neuleib</b>	<b>Lauren</b>	<b>161</b>	<b>Agriculture</b>	<b>Michelle Kibler</b>
<b>Nguyen</b>	<b>Kathleen</b>	<b>191</b>	<b>Biological Sciences</b>	<b>Rebekka Darner</b>
<b>Nguyen</b>	<b>Kathleen</b>	<b>199</b>	<b>Chemistry</b>	<b>Craig Gatto</b>
<b>Niha</b>	<b>Shifat</b>	<b>192</b>	<b>Biological Sciences</b>	<b>Andrés Vidal-Gadea</b>
<b>Nsude</b>	<b>Henry</b>	<b>244</b>	<b>Geography, Geology, and the Environment</b>	<b>Wondy Seyoum</b>
<b>Nygren</b>	<b>Rebecca</b>	<b>226</b>	<b>Communication Sciences and Disorders</b>	<b>Jamie Mahurin Smith</b>

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O				
Okoli	Ebuka	222	Communication	John Baldwin
Oliver	Ethan	211	Biological Sciences	Jon Friesen
Orellano	Carl	193	Biological Sciences	Jan-Ulrik Dahl
P				
Panek	MK	245	Geography, Geology, and the Environment	Matt Himley
Parfenova	Daria	220	Communications	John Baldwin
Patra	Sudarshana	263	Chemistry	Mahua Biswas
Patterson	PJ	198	Chemistry	Craig Gatto
Patterson	Sarah	283	Sociology/Anthropology	Shelby Putt
Paul	Scout	271	Psychology	Dawn McBride
Piercy	Emily	280	Social Work	Christopher Gjesfeld
Pranskevicius	Emily	200	Chemistry	Craig Gatto
Pryor	Chloe	175	Biological Sciences	Rebekka Darner
R				
Rand	Stuart	273	Psychology	Jordan Arellanes
Rauwolf	Christina	229	Communication Sciences and Disorders	Ciera Lorio
Rengifo	Laura	194	Biological Sciences	Ben Sadd
Retter	Julia	198	Chemistry	Craig Gatto



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<b>Reyes-Cruz</b>	<b>Kendy</b>	<b>191</b>	<b>Biological Sciences</b>	<b>Rebekka Darner</b>
<b>Riffle</b>	<b>Samuel</b>	<b>231</b>	<b>Economics</b>	<b>Susan Chen</b>
<b>Robinson</b>	<b>Allie</b>	<b>226</b>	<b>Communication Sciences and Disorders</b>	<b>Jamie Mahurin Smith</b>
<b>Roseland</b>	<b>Anna</b>	<b>195</b>	<b>Biological Sciences</b>	<b>Ryan Paitz</b>
<b>Roslewski</b>	<b>Lucas</b>	<b>246</b>	<b>Geography, Geology, and the Environment</b>	<b>Guang Jin</b>
<b>Rouger</b>	<b>Emma</b>	<b>256</b>	<b>Mathematics</b>	<b>Mehdi Karimi</b>
<b>Rudkin</b>	<b>Hannah</b>	<b>229</b>	<b>Communication Sciences and Disorders</b>	<b>Ciera Lorio</b>
<b>Ruske</b>	<b>Jessica</b>	<b>248</b>	<b>History</b>	<b>Taylor Soja</b>
<b>Ryan</b>	<b>Delaney</b>	<b>233</b>	<b>English</b>	<b>Cristina Prestin-Beard</b>
<b>S</b>				
<b>Saavedra</b>	<b>Anthony</b>	<b>274</b>	<b>Psychology</b>	<b>Eric Wesselmann</b>
<b>Sage</b>	<b>Jarrold</b>	<b>212</b>	<b>Chemistry</b>	<b>Bhaskar Chilukuri</b>
<b>Salrin</b>	<b>Jared</b>	<b>213</b>	<b>Chemistry</b>	<b>Timothy Lash</b>
<b>Samake</b>	<b>Oumou</b>	<b>253</b>	<b>Management and Quantitative Methods</b>	<b>Tina Williams</b>
<b>Sanford</b>	<b>Mason</b>	<b>196</b>	<b>Biological Sciences</b>	<b>Wolfgang Stein</b>
<b>Santarelli</b>	<b>Joseph</b>	<b>214</b>	<b>Chemistry</b>	<b>Steven Peters</b>
<b>Savage</b>	<b>Thomas</b>	<b>292</b>	<b>Technology</b>	<b>Jin Jo</b>
<b>Schmid</b>	<b>Julia</b>	<b>162</b>	<b>Agriculture</b>	<b>Michelle Kibler</b>

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<b>Schroeder</b>	<b>Michaela</b>	<b>284</b>	<b>Sociology/Anthropology</b>	<b>Shelby Putt</b>
<b>Shao</b>	<b>Yufang</b>	<b>252</b>	<b>Kinesiology and Recreation</b>	<b>Kelly Laurson</b>
<b>Sharkey</b>	<b>Jakell</b>	<b>291</b>	<b>Technology</b>	<b>Jin Jo</b>
<b>Shosanya</b>	<b>Teni</b>	<b>197</b>	<b>Biological Sciences</b>	<b>Ben Sadd</b>
<b>Signa</b>	<b>Caroline</b>	<b>275</b>	<b>Psychology</b>	<b>Brea Banks</b>
<b>Skudnig</b>	<b>Robert</b>	<b>256</b>	<b>Mathematics</b>	<b>Mehdi Karimi</b>
<b>Smith</b>	<b>Courtney</b>	<b>224</b>	<b>Communication</b>	<b>John Baldwin</b>
<b>Smith</b>	<b>Courtney</b>	<b>223</b>	<b>Communication</b>	<b>Lindsey Thomas</b>
<b>Strain</b>	<b>Audrey</b>	<b>276</b>	<b>Psychology</b>	<b>Suejung Han</b>
<b>Strandquist</b>	<b>Evan</b>	<b>198</b>	<b>Chemistry</b>	<b>Craig Gatto</b>
<b>Strandquist</b>	<b>Evan</b>	<b>199</b>	<b>Chemistry</b>	<b>Craig Gatto</b>
<b>Strandquist</b>	<b>Evan</b>	<b>200</b>	<b>Chemistry</b>	<b>Craig Gatto</b>
<b>Suthaharan</b>	<b>Sivanujan</b>	<b>215</b>	<b>Chemistry</b>	<b>Bhaskar Chilukuri</b>
<b>Swartz</b>	<b>Natalie</b>	<b>227</b>	<b>Communication Sciences and Disorders</b>	<b>Ciera Lorio</b>
<b>T</b>				
<b>Tellez</b>	<b>Damaris</b>	<b>234</b>	<b>Family and Consumer Sciences</b>	<b>Ui-Jeen Yu</b>
<b>Terry</b>	<b>Katelyn</b>	<b>216</b>	<b>Biological Sciences</b>	<b>Marjorie Jones</b>
<b>Thielbar</b>	<b>Savannah</b>	<b>247</b>	<b>Geography, Geology, and the Environment</b>	<b>Lisa Tranel</b>

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<b>Thompson</b>	<b>Margaux</b>	<b>201</b>	<b>Biological Sciences</b>	<b>Victoria Borowicz</b>
<b>Tiffany</b>	<b>Will</b>	<b>292</b>	<b>Technology</b>	<b>Jin Jo</b>
<b>Tillman</b>	<b>Libby</b>	<b>202</b>	<b>Biological Sciences</b>	<b>Ryan Paitz</b>
<b>Toney</b>	<b>Peyten</b>	<b>172</b>	<b>Biological Sciences</b>	<b>Rebekka Darner</b>
<b>Torres González</b>	<b>Nitza</b>	<b>278</b>	<b>Psychology</b>	<b>Brea Banks</b>
<b>Trader</b>	<b>Gracie</b>	<b>199</b>	<b>Chemistry</b>	<b>Craig Gatto</b>
<b>Tyler</b>	<b>Cameron</b>	<b>198</b>	<b>Chemistry</b>	<b>Craig Gatto</b>
<b>U</b>				
<b>Utterback</b>	<b>Madison</b>	<b>258</b>	<b>Mathematics</b>	<b>Oclay Akman</b>
<b>V</b>				
<b>Van Plew</b>	<b>Michael</b>	<b>232</b>	<b>Economics</b>	<b>Susan Chen</b>
<b>Vargas</b>	<b>David</b>	<b>228</b>	<b>Communication Sciences and Disorders</b>	<b>Antony Joseph</b>
<b>W</b>				
<b>Walis</b>	<b>Sara</b>	<b>217</b>	<b>Chemistry</b>	<b>Jon Friesen</b>
<b>Ward</b>	<b>Faith</b>	<b>254</b>	<b>Management and Quantitative Methods</b>	<b>Tina Williams</b>
<b>Warren</b>	<b>Clinton</b>	<b>203</b>	<b>Biological Sciences</b>	<b>Rachel Bowden</b>
<b>Waters</b>	<b>Sara</b>	<b>204</b>	<b>Biological Sciences</b>	<b>Ryan Paitz</b>
<b>Wright</b>	<b>Daniel</b>	<b>218</b>	<b>Chemistry</b>	<b>Shawn Hitchcock</b>
<b>Z</b>				
<b>Zibutis</b>	<b>Maggie</b>	<b>225</b>	<b>Communication Sciences and Disorders</b>	<b>Antony Joseph</b>

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Boyer	Joe	293	Biological Sciences	Rebekka Darner
Carrillo	Lilliana	303	Teaching and Learning	Amanda Quesenberry
Chepkosgei-Kiprop	Mercy	302	Sociology/Anthropology	Winfred Avogo
Halt	Amy	304	Teaching and Learning	Amanda Quesenberry
Hargis	Jen	305	Teaching and Learning	Amanda Quesenberry
Haws	Ashley	306	Teaching and Learning	Amanda Quesenberry
Homan	Susan	307	Teaching and Learning	Amanda Quesenberry
Hynes	Keeley	301	Psychology	Brea Banks
Ingold	Kimberly	295	Criminal Justice	Jessie Krienert
Johnson	Lauri	308	Teaching and Learning	Amanda Quesenberry
Kornatowski	Madlyn	293	Biological Sciences	Rebekka Darner
Lieberum	Kyle	309	Teaching and Learning	Amanda Quesenberry
McMath	Kelbey	310	Teaching and Learning	Amanda Quesenberry
Michaels	Christina	298	Psychology	Chang Su-Russell
Middleton	Mia	296	Family and Consumer Sciences	Christina Soyoung Song
Miller	Emily	311	Teaching and Learning	Amanda Quesenberry

O'Donnell	Lauren	296	Marketing	Christina Soyoung Song
Olsen	Jessica	312	Teaching and Learning	Amanda Quesenberry
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Olson	Morgan	296	Family and Consumer Sciences	Christina Soyoung Song
Parvin	Ellie	294	Creative Technologies	Kristen Carlson
Pasterz	Melissa	313	Teaching and Learning	Amanda Quesenberry
Peterson	Kate	299	Nursing	Cherrill Stockmann
Pyle	Scott	314	Teaching and Learning	Amanda Quesenberry
Rasmuson	Alyssa	315	Teaching and Learning	Amanda Quesenberry
Ruppert	Kyle	316	Teaching and Learning	Amanda Quesenberry
Sanchez	Brandon	317	Teaching and Learning	Amanda Quesenberry
Santana	Michelle	301	Psychology	Brea Banks
Shields	Carly	318	Teaching and Learning	Amanda Quesenberry
Storm	Hailey	301	Psychology	Brea Banks
Sweet	Kaitlyn	319	Teaching and Learning	Amanda Quesenberry
Wilk	Angelica	320	Teaching and Learning	Amanda Quesenberry
Woodward	Rodney	306	Teaching and Learning	Amanda Quesenberry
Yaacoub	Dany	300	Physics	Allison Harris

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PHYSICS				
<i>Presenter Last Name</i>	<i>Presenter First Name</i>	<i>Page Number</i>	<i>Department/School</i>	<i>Faculty Mentor</i>
Czajka	Brendan	321	Physics	R. Grobe & Q. Su
Freeman	Ian	322	Physics	Matt Caplan
Furcoiu	Alex	323	Physics	R. Grobe & Q. Su
Rizo	Luis	324	Physics	R. Grobe & Q. Su
Santarelli	Andy	325	Physics	Matt Caplan
Smith	Nevin	326	Physics	Matt Caplan
Wasler	Riley	327	Physics	Justin Bergfield
THEATRE AND DANCE				
Denning	Jessie	328	Theatre and Dance	Kee-Yoon Nahm
Feger	Ashleigh Rae-Lynn	329	Theatre and Dance	Kee-Yoon Nahm
Genardo	Gillian	330	Theatre and Dance	Kee-Yoon Nahm
Graves	Michael	331	Theatre and Dance	Kee-Yoon Nahm
Guedes	Gustavo Nery Dutra	332	Theatre and Dance	Kee-Yoon Nahm
Irannezhad	Zahra	333	Theatre and Dance	Kee-Yoon Nahm
Okonma	Jenefas	334	Theatre and Dance	Kee-Yoon Nahm