

Afternoon Session Abstracts

AGRICULTURE

ASSESSMENT OF WITHIN STORE QUALITY VARIATION OF FRESH PORK LOINS

Presenter(s): Griffin, Mackenzie, Undergraduate, Agriculture

Mentor: Dr. Justin Rickard

The objective of this study was to characterize the quality of pork loins sold by store franchises located in the same geographical area. Two major grocery store chains were visited, each with three locations in the Bloomington-Normal area. Three fresh pork loins were purchased from each store location, where available, and transported to the Illinois State University Meat Lab. Loins were subsequently evaluated for the following: color, marbling, and firmness. Following subjective analysis, the loins were fabricated into center-cut chops (n=16) and allowed to bloom for 15 minutes. Following bloom, chops were weighed prior to being packaged. Each chop was labeled, placed on a foam tray with an absorbent pad, and overwrapped in an oxygen-permeable polyvinylchloride film before subsequent objective color evaluation. Instrumental color measurements [L^* (lightness), a^* (redness), b^* (yellowness)] were taken for each chop with a HunterLab Miniscan XE Plus Spectrophotometer using a D_{65} illuminant, 10° observer, and 35-mm aperture. Chops were then stored in the Illinois State University Meat Lab for 7 d at 7°C to simulate retail conditions. During retail simulation, color measurements were taken on d 0, 1, 3, and 7. On d 7, chops were removed from packaging and weighed to determine package purge (PP). The chops were then cooked to a final internal temperature of 71°C and subjected to tenderness analysis via Warner-Bratzler Shear Force (WBSF). Statistical analysis included mean, standard deviation, and range. Minimal variation was observed in subjective quality measurements, WBSF, or PP, within each store location. When looking across store franchises using these criteria, the results remained consistent with minimal variation observed. In locations 1 and 2 (Store 1) significant differences in the L^* values were measured on d 0, 1, 3, and 7. Location 1 consistently displayed the largest range in L^* values, regardless of evaluation day. In location 2 (Store 2) significant variation in the L^* values were also measured on all evaluation days. When comparing L^* , a^* , b^* values across franchises, the a^* and b^* values remained consistent across both store locations and franchises. There were substantial differences measured in L^* values across the Store 1 locations on d 1, 3, 7 as well as the Store 2 locations on d 0. The data recorded in this study suggests that the quality of pork loins remains consistent and uniform both within store and across the studied franchises.

EVALUATING STUDENT STRESS IN AN ANIMAL SCIENCE COURSE WITH UNSUPERVISED LIVESTOCK EXPERIENCE

Presenter(s): Lawrence, Jayden, Graduate, Agriculture

Mentor: Dr. Drew Lugar

Authorship: Jayden Lawrence

Animal Science demographics are shifting from students that come with an abundance of experience, to students that do not have any prior animal experience. It is important to note the present student demographics, could be impacting student mental health. In a semester long Parturition Management course, students attend overnight, unsupervised shifts during the birthing process of sheep, cattle, and pigs. Throughout the course, physiological measurements via heart rate variability (HRV) and psychological stress data via Perceived Stress Surveys (PSS) were collected, along with student demographic and background data. Both units of stress data were compared back to baseline measurements taken on campus during the daytime to quantify the stress caused by the class. Heart rate variability did not differ in this study ($P > 0.15$) in all of the demographic variables measured. The data analysis showed that students had the highest level of change in PSS (cPSS) in lamb watch, the first species of the class ($P < 0.01$).

Students that had expert level experience had the greatest cPSS among all other levels ($P < 0.01$). They also showed that, ethnicity, academic sequence, and hometown population played a role in how high cPSS was. These findings may be due to self-reporting of their prior animal experience, which may have resulted in bias towards their true experience level. It is also possible that this study needs to be completed in the introductory level course that has students' first collegiate interaction with animals, to capture their initial college stress levels associated with animals. However, the physiological stress results showed no significant differences among the demographic categories, or the species measured. This is likely due to the timing of the course taking place overnight because it is suggested that heart rate variability measurements are most accurate when taken in the morning.

BUYER VALUATION OF SPORT HORSES SOLD THROUGH ONLINE AUCTIONS

Presenter(s): Stiverson, Whitney, Undergraduate, Agriculture

Mentor: Dr. Michelle Kibler

The United States has become a large part of the global equine industry with approximately 7 million horses, contributing \$122 billion and 1.7 million jobs to the U.S. economy. While thoroughbred racing is common among the general public and accounts for \$15.6 billion, sport horses and the competition sector account for the second largest economic contribution in the equine industry at \$11.8 billion (American Horse Council Foundation, 2017). According to the World Breeding Federation For Sport Horses, sports horses are bred to compete in hunters, jumpers, dressage, three-day eventing, and marathon-driving. They have also concluded that sellers and breeders of sport horses lack current information indicating buyer preferences (breed, color, height, etc.), which may affect their success in marketing to potential buyers (2021). Sport horses continue to grow more popular, with data from 2007 to 2014 indicating that the number of registered horses with the United States Equestrian Federation increased by almost 10,000 (Lampert, 2015). Therefore, for the market to succeed, up-to-date data needs to be available to bridge the understanding of expectations between buyers and sellers.

Existing studies have shown that buyers searching for post-racing thoroughbreds indicate their interest in young, chestnut or gray/roan, geldings with competition experience (Camp et al., 2023). Other studies that focus on stock-type horses have determined buyers seek out unique-colored mares that are more mature and accomplished (Kibler & Thompson, 2020). Although data is limited, other sport horse research indicates that a horse with less education may be more sought after (Ashburn et al., 2021).

This study will analyze the results of eight online sport horse auctions that took place in 2023 (SportHorseAuctions.com). With hundreds of sport horses sold, sellers provide basic information such as breed, sex, color, age, and more detailed information dealing with bloodlines and ancestry. The objective of this study is to use regression analysis and descriptive statistics for sport horses sold at online auctions to determine the relationship between the characteristics of sport horses (breed, sex, color, age, height, experience) and buyer valuation. This research will quantify horse experience based on the seller's input of discipline keywords and collect information on the location of sellers. The results of this study will provide updated data to educate sellers and breeders of sport horses on the importance of different characteristics most sought after by buyers, to help them succeed within the market.

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IMPACT OF WINTER COVER CROPS ON SOYBEAN YIELD AND SEED QUALITY

Presenter(s): Stockmaster, Ashley, Graduate, Agriculture

Mentor: Dr. Rob Rhykerd

Winter cover crops are being used in the Midwest to reduce nutrient runoff from agricultural fields and show potential to mitigate climate change. However, some have expressed concern that cover crops may reduce summer cash crop yields. This study evaluates the impact of selected cover crops on soybean yield and quality. A field study was conducted at the Western Illinois University Research Farm in Macomb, Illinois. The experimental design was a block design replicated four times. Winter cover crop treatments consisted of a pea-clover-radish-oat mix, wild pennycress, golden pennycress, cereal rye, annual rye, and a fallow (reference) plot. Soybeans were the summer cash crop planted in June 2023. After the soybeans grew throughout the summer and reached maturity, they were ready for harvest in October 2023. During the harvesting process, the soybean yield was measured using a yield monitor. To evaluate soybean seed quality, plants were harvested by hand from a six-foot strip of the two center rows of the plots. The number of plants harvested from each plot were then counted for a plant population. Seeds were removed from the pods by hand after the plants had been air dried. Soybean seed samples were then analyzed for indicators of seed quality using a Near Infrared (NIR) Spectrometer. The NIR measured moisture, fiber, protein, oil, and ash. Results showed no significant differences in soybean yield. The winter cover crops had no impact on soybean seed quality. Longer term studies are needed to better show the impact of cover crops on summer cash crop yield and quality.

NUTRIENTS TRANSPORT AND CYCLING IN ANEROBIC CO-DIGESTION OF SOYBEAN BIOMASS, COVER CROPS, AND SWINE MANURE

Presenter(s): Stoner, Shelby, Graduate, Agriculture

Mentor: Dr. Liangcheng Yang, Health Sciences

Co-Mentor: Dr. Rhykerd Rob

Cover crops have many purposes to improve soil quality, water quality, soil health, reduce soil fertilizer use, and increase nutrient availability to cash crops. Most of the benefits of cover crops are discussed due to the below ground presence of cover crops, but the aboveground biomass can serve as a source of sustainable energy through anaerobic digestion. The nutrients in the above ground biomass can also be recycled and reused through land application of digestion effluent. We have tested anaerobic co-digestion of cover crop, soybean, and swine manure using both small and pilot scale digesters and analyzed NPK nutrients in different forms and their distributions. It was observed that co-digestion improved biogas production. The liquid fraction of the digestion effluent contained about the same amount of the Ammonium Nitrogen and Organic Nitrogen, and about 60-80% of the Potassium, while the solid fraction of the digestion effluent contained more Organic Nitrogen than the Ammonium Nitrogen. Overall, 94% Nitrogen, 94% Phosphorus, and 85% Potassium were recovered in the digestion effluent from the 60:40 soybean-swine manure mixing conditions. Ammonia Nitrogen in biogas will be measured in pilot scale experiments in spring 2024. Cover crops including rye grass, annual rye, and PCRO (pea, clover, radish, oat) mix were planted in September 2023 and will be harvested and tested in anaerobic digesters in spring and summer 2024 for energy production and nutrient cycling.

BIOLOGICAL SCIENCES

EFFECT OF CORTICOSTEROIDS PREDNISONE AND DEFLAZACORT ON THE CALCIUM KINETICS OF DYSTROPHIC MUSCLES

Presenter(s): Aidoo, Erinda, Undergraduate, Biological Sciences

Mentor: Dr. Andrés Vidal-Gadea

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

Duchenne muscular dystrophy (DMD) is an X-linked degenerative disease that affects 1 in about 5000 live-born males. The disorder is caused by mutations leading to the absence of the dystrophin protein in muscles. It is characterized by increased calcium levels in the muscle, progressive muscle degeneration, loss of ambulation, respiratory insufficiency, and early death. At present the only available treatment consists of the corticosteroids prednisone and deflazacort. While these steroids extend life and ambulation by about a decade, they are accompanied by numerous side effects that limit their use. To date, it remains unclear how these corticosteroids produce their beneficial and detrimental effects on DMD patients. Our lab studies the pathophysiology of DMD using the nematode *C. elegans*. Like human DMD patients, dystrophic worms experience increased muscular calcium levels and undergo muscle degeneration and early mortality. Furthermore, previous work has shown that, like DMD patients, dystrophic worms also benefit from treatment with prednisone and deflazacort. We are therefore using this tiny nematode to investigate how these corticosteroids produce their beneficial and detrimental effects on dystrophic muscles. Understanding how these drugs work in dystrophic muscles will allow us to identify alternative compounds that might be more powerful or less susceptible to induce unwanted side effects. To this end, we are measuring calcium kinetics, and muscular function in the muscles of healthy and dystrophic nematodes treated with these corticosteroids. We further plan to probe the mechanism of action of these steroids by using RNA interference to test the role played by potential targets of deflazacort and prednisone. This work has the potential to point the way to improved therapeutics for the treatment of Duchenne muscular dystrophy.

THE POTENTIAL ROLE OF *C. ELEGANS*' AMSH GLIA IN COORDINATION OF ESCAPE RESPONSES TO AVERSIVE STIMULI

Presenter(s): Awe, Temitope, Graduate, Biological Sciences

Mentor: Dr. Andrés Vidal-Gadea

Authorship: Temitope Awe, Aalimah Akinosho, Jessica Adams, Shifat Niha, Wolfgang Stein, Andrés Vidal-Gadea

Glia are non-neuronal cells in the nervous system that play vital roles in supporting the function and structure of neurons and in modulating neuronal activity. The extent of their contributions in sensory processing and integration is the subject of ongoing investigation. The amphid sheath glia of the nematode *C. elegans* (AMsh) surrounds and supports a dozen sensory neurons in the head of the worm. AMsh directly respond to aversive odorants and mechanical stimuli, and they have been implicated in contributing to escape responses. They mediate the adaptation of avoidance behaviors to repeated aversive odorant via GABA signaling. However, the behavioral significance and molecular mechanisms of AMsh's response to mechanical stimuli remain unresolved. We used mutant analysis, RNA interference, behavioral analysis, and calcium imaging to investigate the role of AMsh in mechanosensation and their contribution to escape behaviors in *C. elegans*. We found in freely-crawling animals that AMsh activity peaks only coincided with the termination of escape reversal behaviors following nose touch stimuli. Additionally, genetic ablation of AMsh resulted in prolonged reversal durations in response to nose touch. These findings suggest that *C. elegans*' AMsh play an important role in terminating escape responses to nose touch. We next identified key molecules required for nose touch transduction by AMsh. Lastly, we found that AMsh modulation of nose touch-induced reversal duration is mediated by GABAergic signaling. This demonstrated an overlap of mechanism in the AMsh modulation of escape responses to aversive odorants and mechanical stimuli.

CHOLERA WHO? CHARACTERIZATION OF A NOVEL REGULATORY SYSTEM THAT CONTROLS *VIBRIO CHOLERAE* PATHOGENESIS

Presenter: Basu, Debajyoti, Graduate, Biological Sciences

Mentor: Dr. Kyle Anthony Floyd

Authorship: Anindita Saha, Gursewak Bains, Joseph Alexander

Vibrio cholerae is a naturally occurring aquatic bacterium, facultative human pathogen, and causative agent of the life-threatening gastrointestinal disease cholera. Environmental survival of *V. cholerae* is enhanced by its ability to form multicellular biofilm communities, mediated by the type IV mannose-sensitive hemagglutinin (MSHA) pilus. However, during early stages of host infection, cell-surface presentation of MSHA pili triggers innate immune responses to induce bacterial clearance. Therefore, proper regulation of MSHA production is vital to facilitate the transition of *V. cholerae* from colonization of the environment to colonization of the host. Previously, our lab identified the fatty acid metabolism regulator protein (FadR) as a putative transcriptional enhancer of MSHA pilus production under environmental conditions, and observed a putative FadR consensus binding sequence within the second promoter region (P2) of the first *msh* (*msh-I*) operon. In the absence of *fadR*, analysis of *msh-I* P2 promoter expression using a plasmid-based transcriptional reporter, showed a ~7-fold decrease in P2 expression compared to wild-type. Activity of FadR is negatively regulated by long-chain fatty acids (LCFAs), a major component of the mammalian diet. Based on these observations, we hypothesized that LCFAs serve as a host-derived signal to down-regulate MSHA pilus production during *V. cholerae* infection through inactivation of FadR. To test this hypothesis, we examined the addition of known FadR ligands on *msh-I* P2 promoter expression in wild-type *V. cholerae*. Addition of saturated LCFAs myristic (carbon residues: double bonds, 14:0) and palmitic (16:0) acids showed no significant reduction of *msh-I* P2 expression. Supplementation of unsaturated LCFAs, including oleic (18:1) and palmitoleic (16:1) acids, showed a significant reduction in *msh-I* P2 promoter expression over a range of concentrations extending from 16 - 2000 μ M. Further analysis with a unsaturated trans isomer of oleic acid (elaidic acid, trans-9-18:1) and linoleic acid (18:2), both showed a similar reduction in *msh-I* P2 expression. These data suggest that unsaturated LCFAs modulate FadR-mediated expression of the *msh-I* P2 promoter, to regulate MSHA pilus production and aid in the transition between environmental and host colonization. Future studies will further validate this novel regulatory network, and define the role of FadR and unsaturated LCFAs on *V. cholerae* surface colonization and biofilm formation within the environment and the host.

NESTLING SIZE AND ORNAMENTATION INTERACT TO SHAPE EARLY DEVELOPMENT IN HOUSE SPARROW FAMILIES

Presenter(s): Border, Shana, Graduate, Biological Sciences

Mentor: Dr. Matthew Dugas

Authorship: Shana Border, Matthew Dugas

In many nuclear families, dependent offspring receive unequal shares of parental investment. Initial overproduction can be adaptive from the perspective of parents, but parents must be able to identify appropriate candidates for favorite status. We studied early nestling development in house sparrows (*Passer domesticus*), a species in which the loss of some brood members is common, testing the prediction that body mass and carotenoid-rich flange colors are important to nestling success. There was substantial variation in both traits within broods, even only one day after hatching. Nestlings low in the within-brood mass hierarchy gained more mass if they displayed more carotenoid-rich flanges than broodmates. Position in the color hierarchy did not, however, predict mass gain for individuals that were heavier than their broodmates. Nestlings that were heavier or had more carotenoid-rich mouths were also less likely to be the victim of brood reduction. Our results suggest that house sparrow parents use both nestling body size and mouth color when making allocation decisions. Understanding both how and when offspring traits and parental preferences function is key to understanding how selective pressures act on offspring-parent communication.

REFINING THE *RFK-2* LOCUS OF *SK-3* IN *NEUROSPORA CRASSA*

Presenter(s): Bowen, Thera, Undergraduate, Biological Sciences

Mentor: Dr. Tom Hammond

Authorship: Thera Bowen, David Liu, Tom Hammond

Meiotic drive is a non-Mendelian inheritance phenomenon where selfish genetic elements change gene transmission in their own favor. This phenomenon occurs in the fungus *Neurospora crassa* during spore killing. When a strain carrying a spore killer genetic element is crossed with a non-spore killing wild type strain, the cross will produce half viable and half inviable offspring. The *N. crassa Sk-3* spore killer is found on Chromosome III. *Sk-3* is one of the most studied meiotic drive elements in *Neurospora* fungi and it is thought to require a killer gene and a resistance gene for spore killing. While the killer gene has not been identified, recent work has isolated a mutation (*rfk-2^{uv}*) that disrupts spore killing. Although this mutation has been mapped to Chromosome III, its exact location is not known. In this work, we investigate the role of two DNA intervals in *Sk-3*-based spore killing. These DNA intervals, referred to as V373 and V386, are thought to reside within or near *rfk-2^{uv}*. Our results will contribute to future efforts to identify the *Sk-3* killer gene.

PEDIGREE FORMATION AND PARENTAL LINEAGING IN HOUSE WRENS

Presenter(s): Canon, Maria, Undergraduate, Biological Sciences
Rodriguez, Ashley, Undergraduate, Biological Sciences
Steinberg, Kaitlyn, Undergraduate, Biological Sciences
Boland, Sarah, Undergraduate, Biological Sciences
Dart, Avery, Graduate, Biological Sciences

Mentor: Dr. Pirmin Nietlisbach

Authorship: Maria Canon, Ashley Rodriguez, Kaitlyn Steinberg, Sarah Boland, Avery Dart, Pirmin Nietlisbach

The genetic consequences of inbreeding (i.e. reproduction among relatives) usually leads to reduced survival and reproductive success of plants and animals. Specifically, extra-pair paternity is when there is mating outside of the social pair bond, and there are many things still unknown about it. The major question is why some individuals participate in extra-pair reproduction while others do not. It is unknown whether or how females benefit from extra-pair mating, thus additional studies are needed. Genetic paternity testing allows us to detect extra-pair paternities in populations, and if done across multiple generations, allows constructing pedigrees. A genetic approach provides an accurate and useful way to track extra-pair mating in populations and study the causes and consequences of this behavior. We collected blood samples from adult and nestling house wrens from a population near Illinois State University. We extracted DNA and used polymerase chain reaction to amplify 12 variable genes. We will then quantify the length variation of these genes and use them to identify parents of all nestling birds. We will present data about the genetic variation in house wrens as well as parentage data. This will allow us to quantify how many offspring in each nest resulted from extra-pair reproduction. Having detailed pedigrees of this house wren population allows us to trace related offspring in neighboring nests, giving us a better understanding of their mating system.

NEGATIVE GEOTAXIS IN CRAYFISH

Presenter: Clark, Kyle, Undergraduate, Biological Sciences
Lane, Kristen, Undergraduate, Biological Sciences
Mentor: Dr. Wolfgang Stein

Negative geotaxis, the tendency of organisms to move against the force of gravity, is a fundamental behavior observed across various taxa. In this study, we aimed to elucidate whether crayfish exhibit negative geotaxis and whether this behavior is dependent on individual size and environmental conditions.

We used a climbing assay, in which crayfish were placed at the bottom of a cylinder and allowed to climb ad libitum and quantified their climbing activity during 10-minute trials. We tested animals of 5 cm, 4 cm, and 2 cm size. We found evidence that 2 cm small animals had the highest climbing propensity, 72%, in the 10 cm cylinder. Our results indicate 50% of the 5 cm large animals climbed in a 10 cm wide cylinder. Climbing preference increased to 90% in a 30 cm wide cylinder, indicating that the surrounding space influenced climbing behavior. We found a similar result for 4 cm large animals. 60% of the 4 cm large animals climbed in a 10 cm wide cylinder. Climbing preference increased to 87.5% in the 30 cm wide cylinder. These data suggest that crayfish show robust climbing behavior when exposed to a large environment.

Since our climbing assay did not give the animals the option to climb down, we also tested crayfish on an incline that examined climbing preference at 30- and 60-degree angles. We are currently analyzing the results of our angled climbing assay.

THE EFFECT OF STRESS ON FEMALE PREFERENCE IN MULTIMODAL COMMUNICATION DURING COURTSHIP DISPLAYS

Presenter(s): Enevold, Alyssa, Graduate, Biological Sciences

Mentor: Dr. Fernanda Duque

Authorship: Alyssa Enevold, Fernanda Duque

Species use complex displays with concurrent signals to communicate. This process, known as multimodal communication, can include signals that stimulate different sensory modalities, such as visual, auditory, and olfactory signals. The nature of multimodality leads to the question of whether one signal is preferred by the receiver over the other or if the combination of signals is the most preferred. Such preference becomes even more relevant in the context of mate choice because courtship displays are often multimodal. In addition, animals face different stressors in the wild, and this stress may affect a female's perception of signals, her assessment of potential mates, or whether she wants to mate at all. Male house sparrows (*Passer domesticus*) use multimodal signaling in their courtship display which consists of chirping while puffing their chest and hopping in front of the female. We will assess female preference for the mate's multimodal display over presentations of single sensory modalities (visual and auditory, respectively) under unstressed and stressed conditions. Using a Y-maze, females will be presented with three signal options: typical multimodal display, sound-only, and visual-only. We will assess female's preference based on which option she approaches and how long it takes her to go to one or another. We predict that an unstressed female will prefer the multimodal option as that is the typical display in the wild, while we will see no preference in the stressed females. Understanding how stress affects female preference for multimodal signals will shed light on how the physiological state of an individual can influence their perception of communication signals and subsequent behavior. In the future, we will investigate how stress affects gene expression in the brain of female house sparrows which will assess courtship signals to better understand the neural mechanisms underlying decision making in social contexts.

LOCALIZATION AND FUNCTION OF TONNEAU1 RECRUITING MOTIF (TRM) IN *ARABIDOPSIS THALIANA*

Presenter(s): Falk, Tyler, Graduate, Biological Sciences

Mentor: Dr. Viktor Kirik

Authorship: Tyler Falk, Trevor Rickerd, Giulian Frontier, Viktor Kirik

Plants use a specific microtubule array called the preprophase band (PPB) to properly orient the cell wall during cytokinesis and act as a guide during division.

One of the proteins essential for the PPB formation is TONNEAU (TON1). TON1 has been shown to work in complex with TON1 recruiting motifs (TRM) proteins. This is a superfamily of 34 different proteins, grouped into eight subfamilies, and an outgroup consisting of five TRM proteins.

To study the function and localization of the TRMs we used different promoters to express TRM proteins fused to GFP. The GL2 promoter was used to overexpress TRMs in the trichome and root epidermal cells, and a ubiquitous TP1 promoter was used for expression throughout the plant. Preliminary data showed that overexpression with GL2 causes underbranching in *Arabidopsis thaliana* trichome cells. In addition, each TRM's native promoter was acquired by amplifying the proximal sequence upstream of the gene and then fused to GFP to ensure that localization of the TRMs with the previous promoters is correct and matches expression with the native promoter. TRMs that seem to localize to microtubules were crossed with a plant expressing a microtubule marker mScarlet-TUA to analyze co-expression.

DECREASING SEED GLUCOSINOLATE CONTENT IN THE OILSEED PLANT, PENNYCRESS (THLASPI ARVENSE L.)

Presenter(s): Gautam, Liza, Graduate, Biological Sciences

Mentor: Prof. John Sedbrook

Authorship: Liza Gautam, Abby Vollmer, Brice Jarvis, Dalton Willians, Ratan Chopra, Shengjun Liu, Win Phippen, Mary Phippen, John Sedbrook

Pennycress (*Thlaspi arvense* L.; Field Pennycress) holds considerable potential for producing “climate-smart commodities” including low-carbon-intensity biofuels and animal feed while sequestering carbon and nutrients in farm soils. For pennycress to reach its full potential as an oilseed-producing winter cash cover crop grown on hundreds of millions of acres throughout the world, domestication traits must be improved including reduced seed glucosinolate content. Glucosinolates are secondary metabolites found in Brassica species including pennycress which have pungent odors and deter herbivory by producing toxic compounds upon tissue damage. Reducing seed glucosinolate content in pennycress without compromising plant fitness has been particularly challenging given the high levels this plant produces, hence its nickname “stinkweed”. 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 40 percent 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 multiplexing, identifying previously undescribed changes in seed glucosinolate content, succeeding in reducing seed glucosinolate levels to near the regulatory limit of 30 micromol/gram without negatively impacting plant growth and seed yields. 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. Taken together, our work has identified and validated gene targets and domestication trait mutations which are now being introduced into commercial pennycress varieties.

CHARACTERIZING AND INTERROGATING DROUGHT RESILIENCE IN THE WINTER OILSEED CROP PENNYCRESS

Presenter(s): Gautam, Liza, Graduate, Biological Sciences

Mentor: Prof. John Sedbrook

Authorship: Liza Gautam, Nikhil Jaikumar, Carol Kiam Assato, Arjuman Lima, Ryan Bayliss, Maggie Marlino, Amanda Darcy, Abby Volmar, and John Sedbrook

Drought damage to crops is a major threat to food security and is becoming a growing problem due to climate change. Amongst all abiotic stresses, drought is the most impactful on soil biota and crop productivity. According to the National Integrated Drought Information System (NIDIS), in 2020, 40% of the United States was under drought, and it is predicted that this number will continue to rise in the forthcoming years due to global warming. Pennycrest (*Thlaspi arvense*) is a member of the *Brassicaceae* family related to canola and *Arabidopsis* that is being rapidly developed as an oilseed-producing winter cover crop for the U.S. Midwest and other temperate growing regions. As part of our efforts in domesticating this new crop, we are focusing on further understanding how pennycrest responds to drought and identifying genetic changes that can improve drought tolerance without negatively impacting plant growth and seed yields. To broaden knowledge, we developed assays to test pennycrest seedlings' and plants' responses to drought including water withholding and chemical treatments that mimic drought. Our preliminary analyses indicated that pennycrest naturally has drought tolerance, which may overlap with its extreme cold tolerance. Using CRISPR-Cas9 mutagenesis, we generated pennycrest single, double, and triple mutants targeting different genes like ABA-induced transcription repressors (AITRs) -*AITR2*, *AITR5* and *AITR6*, Early Response to Dehydration 15 (*ERD15*), U-box E3 ubiquitin ligases *PUB22* and *PUB23*, and WRKY transcription factor (*WRKY6*) shown to be negative regulators of drought responsiveness in other species. Preliminary phenotypic analyses of these mutant lines also support our hypotheses that pennycrest may have relatively higher drought tolerance than its close relative, the model plant *Arabidopsis thaliana*. These data will be presented and discussed.

SONG DIALECTS IN A BIRD WITH HIGHLY PRECISE TIMING OF NOTES (MICROCERCULUS MARGINATUS)

Presenter(s): Geyer, Tara, Undergraduate, Biological Sciences

Mentor: Dr. Carlos Rodriguez-Saltos

Authorship: Tara Geyer, Dr. Carlos Rodriguez-Saltos, Dr. Fernanda Duque

Vocal learning may allow birds such as the scaly-breasted wren (*Microcerculus marginatus*) to reach levels of precision at timing their notes that are comparable to those of professional musicians. An initial approach to studying vocal learning in any animal is the characterization of vocal dialects, which are geographically restricted variations in communication signals often resulting from cultural evolution. Despite a long history of studying dialects in songbirds, little is known about dialects in the timing of the notes in bird song. In this study, I will test whether *M. marginatus* has dialects based on the timing of its notes. I will use a crowd-sourced database to download recordings of *M. marginatus* songs from throughout the entire species distribution, in Central and South America. I will characterize timing patterns in the songs of *M. marginatus* by measuring the duration of intervals between the notes. Based on the pattern of succession of silence intervals, I will classify the songs into one of the four variants already described in the literature or a new variant if necessary.

Finally, I will test whether the vocal variants differ according to the geographic populations of *M. marginatus*. Finding dialects would suggest that *M. marginatus* learns the timing of its notes, establishing this bird as a potential model organism for studying mechanisms of timing in communication signals and how they are regulated by learning and practice.

INSIGHTS INTO PROTEIN LOCALIZATION AND DEVELOPMENTAL PATTERN FORMATION USING A DROSOPHILA PROTEIN-TAGGING SYSTEM

Presenter(s): Hasan, Sumaiya, Graduate, Biological Sciences

Mentor: Dr. Kevin Edwards

Authorship: Sumaiya Hasan, Karli Erdahl, Fawwaz Ali Chowhan, Brandon Bernicky, Kevin Edwards

The environment inside the cell is highly structured, with myriad protein-protein interactions controlling the subcellular location of each protein; localization in turn regulates the protein's ability to do its job. For example, a “gene-control” protein (transcription factor) may migrate into the nucleus to regulate gene expression only under specific conditions, or a protein may associate with specific membrane-bound compartments to anchor them or move them within the cell. To identify novel protein localization mechanisms in an unbiased manner, we generated lines in *Drosophila* (fruit fly) using molecular markers to label individual genes. Our lab developed the hostile takeover (*Hto*) gene tagging method, which enables the researcher to activate the tagged genes at discrete times and in particular cell types during development. The *Hto* transposon inserts randomly in the genome, and upon activation it makes mRNA with the coding region of mCherry Red Fluorescent Protein (RFP) fused to that of the next downstream gene. The resulting fusion protein can be tracked in the cell using confocal microscopy. We previously used a live-embryo screen to recover ~50 lines with new RFP localization patterns in epidermal cells. Here we show results from a similar screen using embryo muscle cells. Two recovered lines create proteins that collect in small structures that might be protein aggregates or organelles. One of these seems to accumulate in pre-existing structures, therefore its behavior is unlikely to be due to aggregation. *Drosophila* is best known for yielding useful mutant phenotypes that can connect genes to their functional pathways in the cell or in development. To take advantage of this power, we have screened for *Hto* fusions that produce visible adult mutant phenotypes. Here we present 12 lines from a screen for fusions that disrupt wing development. Each line has a distinct wing phenotype and fusion protein localization. The line *SNK* makes fusion associated with the cell cortex and nucleus that produces multi actin-based wing hairs instead of one per cell in typical wings. *SNK* is on the X chromosome, but a core set four genes that specify wing hairs are on the autosomes. Thus, the line identifies a novel member of this pathway.

INVESTIGATING RCRB'S ROLE IN UROPATHOGENIC ESCHERICHIA COLI 'S RESISTANCE TO HYPOCHLOROUS ACID

Presenter(s): Jackson, Charles, Undergraduate, Biological Sciences

Mentor: Dr. Jan-Ulrik Dahl

Authorship: Charles Jackson, Sadia Sultana, Jan-Ulrik Dahl

Modern medicine has made great strides in eradicating many diseases that were thought untreatable years ago. Despite the surge in medical research, pathogenic microorganisms still linger and cause significant morbidity and mortality to humans. One such organism is uropathogenic *Escherichia coli* (UPEC), the common cause of urinary tract infections (UTIs). UTIs are conventionally treated with antibiotics; however, UPEC strains are increasingly developing multidrug resistance. Hence, an essential aspect of treating UTIs would be to develop alternate therapeutic options.

In general, our immune systems are well-equipped to fight against invading pathogens. Innate immune cells, neutrophils, generate toxic antimicrobial hypochlorous acid (HOCl) to kill pathogenic organisms. Recently, Dahl lab found that UPEC's are more resistant to HOCl and neutrophil-mediated killing compared to other *E. coli*s. Dahl lab also identified the *rcrB* gene is responsible for the observed sensitive phenotype as deletion of the gene render UPEC's highly susceptible to HOCl (Sultana et. al 2022). However, how RcrB confers UPEC HOCl resistance is still unknown. Therefore, the goal of my proposed research was to understand the mechanisms behind RcrB-mediated bacterial HOCl-resistance. RcrB is located in the membrane of bacteria; and bioinformatic analyses showed it crosses the membrane four times and contains redox active amino acids, such as methionine and lysine. Methionine and lysine amino acids are well known for their antioxidant activities therefore, we hypothesize that RcrB likely plays a role as a HOCl-detoxificant.

To investigate this hypothesis, I initially performed a quenching assay where I quantified the amount of HOCl remaining in the media containing wildtype (WT) UPEC CFT073 or RcrB-deficient mutant ($\Delta rcrB$) cells. And, indeed, our data suggests that the expression of RcrB potentially detoxifies the HOCl. To further confirm our hypothesis, I continued to pursue the quenching assay using a recombinant version of $\Delta rcrB$ cells. Together this finding will solve the mystery of how UPEC utilizes RcrB to defend HOCl-stress.

INVESTIGATING THE ROLE OF THE *ydeH* GENE IN BIOFILM PRODUCTION

Presenter: Jacobson, Grady, Undergraduate, Chemistry

Mentor: Dr. Jan Dahl

Urinary tract infections (UTIs) are among the most commonly acquired bacterial infections worldwide that affect 150 million people every year.

Women are particularly prone to developing UTI, which become increasingly difficult to treat due to emerging antibiotic resistance. The most common UTI is caused by *Uropathogenic E. coli (UPEC)*, which exists harmlessly in the gut, but colonizes the bladder upon entry into the urinary tract, where they cause cystitis. Moreover, patients with catheters are at high risk for catheter associated UTIs, because UPEC adhere to and form a protective extracellular matrix forming stress- and treatment-resistant biofilm communities. To switch from the free-floating to the biofilm growth, bacteria modulate their gene expression, turning down motility related genes and induce biofilm genes, such as *ydeH*. The goal of this research is to investigate the extent to which antimicrobials affect *ydeH* expression. I performed *PydeH-lacZ* fusions and tested the effect of AGXX, a novel silver-containing antimicrobial, on the promoter activity by determining the beta-galactosidase activities. I found that the higher concentrations of AGXX lead to increased biofilm production, which shows that AGXX is not a good antimicrobial for targeting biofilms.

FREQUENCIES OF DELETERIOUS ALLELES IN SMALL, HIGHLY ISOLATED POPULATIONS

Presenter(s): Koeplin, Madeline, Graduate, Biological Sciences

Mentor: Dr. Pirmin Nietlisbach

Authorship: Madeline Koeplin, Pirmin Nietlisbach

Genetic drift, or the alteration of gene frequencies due to random chance, is strongest in small populations. This includes deleterious, or harmful, alleles. Weakly, moderately, and highly deleterious alleles may be impacted in different ways depending on the size of the affected population, but this has rarely been researched in wild populations. The deer mouse (*Peromyscus maniculatus*) populations in the Canadian Gulf Islands are a great system to study varying deleterious allele frequency. These populations differ in size from one island to another, and genomic studies have shown that these populations are strongly isolated from each other. The objective for my study is to determine how highly and moderately deleterious allele frequencies differ in differently sized populations. I will determine this by studying island populations of deer mice in Canada's Gulf Islands. I will use samples collected in 2021, 2022, and 2023, as well as from the upcoming field seasons in the summers of 2024 and 2025.

To capture the mice, I will bait and set 120 Sherman live traps, with two traps at each site and sites being eighteen meters apart. When a mouse is found in a trap, I will weight them, visually determine their sex and reproductive status, and collect a small outer-ear sample using a hole punch. If the mouse is an adult, I will also take tail, foot, and ear length measurements. After extraction, sequencing, and amplification, I will then search for heterozygous areas within the genome, which will show differences in genetic diversity in the different populations. This will determine how the frequency of mildly and highly deleterious alleles vary in the differently sized populations. By using the deer mouse populations on the Canadian Gulf Islands, I can address questions regarding how purging and genetic drift can impact the genetic makeup of very isolated and small populations. There have been very few empirical studies regarding how population size and isolation can impact deleterious allele frequencies in natural populations. My study will broaden our knowledge in both evolutionary and conservation genetics, and in the face of increasing habitat fragmentation, this knowledge is needed.

FIRST DESCRIPTION OF SARCOMERE BRANCHING IN THE MUSCULATURE OF THE NEMATODE CAENORHABDITIS ELEGANS

Presenter: Kollbaum, Sabrina, Undergraduate, Biological Sciences

Mentor: Dr. Andrés Vidal-Gadea

Authorship: Sabrina Kollbaum, Adina Fazyl, Andrés Vidal-Gadea

Sarcomere branching is a recently discovered fundamental aspect of muscle cell architecture that influences force transmission during movement. Despite its importance in human neuromuscular function and disease, and potential implications for diseases such as Duchenne's Muscular Dystrophy (DMD), much remains to be understood about the regulation and function of this phenomenon. In this study, we provide the first description of sarcomere branching in the nematode *C. elegans*, a model organism for muscle research. We characterize sarcomere branching in healthy and dystrophic *C. elegans* strains grown under varying conditions. We document activity-dependent changes in sarcomere branching in healthy nematodes and compare these to a dystrophic strain in a crawling environment to evaluate the impact of genetic muscular impairment. Our findings reveal distinct branching patterns responsive to environmental stress and disease state, with variations in filament thickness, inter-filament spacing, and overall muscle size. These results suggest that sarcomere branching may be an adaptable feature of muscle cells with potential implications for understanding muscle plasticity and developing therapies for DMD. This study advances our knowledge of sarcomere architecture and highlights the utility of *C. elegans* in revealing conserved mechanisms of muscle organization relevant to human health.

STUDYING A GENETIC ELEMENT REQUIRED FOR SPORE KILLING IN *NEUROSPORA CRASSA*

Presenter(s): Lee, Jalen, Undergraduate, Biological Sciences
Sands, Julia, Undergraduate, Biological Sciences
Grampps, Lydia, Undergraduate, Agriculture
Mentor: Dr. Tom Hammond
Authorship: Jalen Lee, Julia Sands, Lydia Grampps, Tom Hammond

Some isolates of the fungus *Neurospora crassa* possess a chromosomal factor that causes spore killing, leading to death of ascospores. It has been shown that these chromosomal factors are genetic elements called spore killers. For example, if a cross is performed between a parent with an *Sk-S* (sensitive) allele and a parent with an *Sk-K* (killer) allele, the cross will produce half viable offspring and half inviable offspring, where the inviable half has been killed by spore killing. This phenomenon can be explained by meiotic drive, wherein a selfish gene disrupts the randomness of sexual transmission, favoring its own success. In this study, we focus on a *Neurospora Spore killer* known as *Sk-3*. *Sk-3* is thought to possess both a killer element and a resistance element. The resistance element is *rsk*, a gene that keeps ascospores alive and viable when in the presence of the killer element. However, the mechanism by which the killer element kills ascospores is unknown. A major obstacle to studying the killing mechanism is that the identity of the *Sk-3* killer element itself has remained elusive. Our goal is to identify the *Sk-3* killer element. We have narrowed our search to the left arm of Chromosome III. Specifically, preliminary results have shown that deletion of a 1.3 kb DNA interval, called V350, causes loss of spore killing. This suggests that a regulatory element, or a hidden gene, overlaps with the V350 interval. To help determine why V350 deletion correlates with loss of spore killing, we are examining the deletion of two related DNA intervals (V384 and V385) and reexamining the effect of V350 deletion on spore killing. The results presented here should shed light on the roles of these various DNA intervals in spore killing by *Neurospora Sk-3*.

EMPLOYING CRISPR GENOME EDITING TO IMPROVE SEED MEAL QUALITY IN THE OILSEED PLANT PENNYCRESS

Presenter: Lima, Arjuman, Graduate, Biological Sciences
Mentor: Prof. John Sedbrook
Authorship: Arjuman Lima, Liza Gautam, John Sedbrook

The need for low-carbon-intensity biofuels to mitigate climate change is driving development of new oilseed crops which do not compete with food crops. One such crop is domesticated pennycress (e.g., variety CoverCress™) derived from the weed Field Pennycress (*Thlapsi arvensis* L.). Pennycress has extreme cold tolerance and a relatively short life cycle allowing it to fit in the offseason between corn and soybeans in the U.S. Midwest and other temperate regions. Domesticated pennycress varieties have been developed having reduced seed coat fiber content, low erucic acid seed oil content, and which produce over 1,500 pounds of seed per acre in the lower U.S. Midwest, yielding 65 gallons of oil and 1,200 pounds of meal per acre. To improve this new crop further, we are exploring ways to improve seed meal quality through reducing seed glucosinolate and sinapic acid content. Regarding reducing sinapic acid content, two genes in which we have generated mutations using CRISPR-Cas9 targeted mutagenesis are *Ferulic Acid 5-Hydroxylase (F5H)* and *Reduced Epidermal Fluorescence 1 (REF1)*. Studies in rapeseed have shown that sinapate esters with sinapoylcholine (sinapine) contribute to the bitter taste, astringency, and dark color of seed products (Husken et al., 2005, *Molecular Breeding*). During the seed oil processing, sinapate esters gets oxidized and form complexes with proteins, thus lowering the digestibility of the meal. We found that pennycress *f5h* and *ref1* single mutants produced seeds with substantially reduced amounts of sinapic acid. *f5h* and *ref1* mutant plants grew indistinguishable from wild type suggesting that these loss-of-function mutations may be agronomically relevant. These and other data will be presented that explore genetic relationships between reductions in sinapate esters and pennycress seed meal quality.

COVER CROP EFFECT ON SOIL FUNGAL BIOMASS

Presenter(s): Long, Brenna, Undergraduate, Biological Sciences

Mentor: Dr. Bill Perry

Cover crops can prevent soil erosion, reduce nutrient run-off, and increase soil fungal biomass leading to increased soil fertility. Healthy fungal communities are vital for litter decomposition, nutrient cycling, and mineralization in soils. We investigated the influence of differing cover crops on soil fungal biomass. We collected samples ($n=3$) from plots with cereal rye and pennycress cover crops compared to a fallow reference plot. As a Brassica, pennycress produces glucosinolates which may inhibit fungal and bacterial growth. Thus, we predicted that pennycress plots would have less fungal biomass than cereal rye plots. We tested the samples for microbial carbon and fungal biomass to bacteria ratios using a microBiometer[®] test kit, then converted the given values to find μg fungal biomass per gram of soil. Cereal rye had the highest fungal biomass ($798 \pm 235 \mu\text{g/g}$) followed by reference ($441 \pm 85 \mu\text{g/g}$) and pennycress ($437 \pm 213 \mu\text{g/g}$). Fungal biomass did not differ between groups ($F=1.2$, $df=2$, $p=0.37$) given the small sample size. However clear trends in the data demonstrate that differences between groups may be present with increased replication, warranting further investigation. Through glucosinolate production, pennycress may inhibit the establishment of soil fungal communities. To further explore this pattern, we will measure variation in fungal biomass across soil depths and 5 different cover crop treatments- cereal rye, annual rye, golden pennycress, wild-type pennycress, and a pea-clover-radish-oat mix relative to a fallow reference. By doing so we will better understand the influence of cover crops on soil fungal communities.

RESOURCE SUPPLEMENTATION INFLUENCES PARENTAL INVESTMENT IN AN EGG-FEEDING FROG

Presenter(s): Maertens, Hayley, Undergraduate, Biological Sciences

Mentor: Dr. Matthew B. Dugas

Parents contribute to the fitness of their offspring in many ways including providing meals. Parental care, however, often comes at the cost of other current or future reproductive opportunities, and so caring parents are expected to modulate the level of care they provide as the costs and benefits of care change. Variation in the availability of food resources is one factor that may shape why and how much parents invest in their offspring. We tested the hypothesis that variation in offspring food availability directly impacts parental investment in the mimic poison frog (*Ranitomeya imitator*), a species in which tadpoles are reared in solitary nurseries, can forage for food independently in their nurseries, and consume trophic eggs from parents. We provided broods of tadpoles with increasing amounts of food and quantified the number of trophic eggs parents provided to tadpoles and the number of reproductive eggs parents produced. Regardless of how much additional food tadpoles received, parents produced the same total number of eggs (trophic and reproductive). Parents did, however, produce proportionally more reproductive eggs when rearing tadpoles received the most additional food. Across all supplementation experiments, parents appeared to favor feeding some tadpoles over others with some tadpoles not receiving any trophic eggs at all. Collectively, these results suggest that parental investment in *R. imitator* is shaped at least partially by food availability, and that parents may assess other factors both intrinsic and extrinsic to their offspring when allocating parental investment within and among broods.

UNUSUAL INTRONS OF THE RFK-1 GENE IN NEUROSPORA CRASSA

Presenter(s): Mahmud, Shahriar, Graduate, Biological Sciences

Mentor: Dr. Tom Hammond

Authorship: Shahriar Mahmud, Gabriela Mendoza-Rangel, Nicholas Rhoades, Tom Hammond

The selfish genetic element *Spore killer-2* (*Sk-2*) is transmitted to viable *Neurospora* ascospores in a biased manner through spore killing. Spore killing is dependent on a gene called *required for killing-1* (*rfk-1*). This gene contains four exons and three introns. Intron 1 is unusual because it contains seven repeats of a 46–48 bp sequence. While the importance of Intron 1 to *rfk-1* function is unclear, our preliminary data suggests that Intron 1 is critical for phenotypic expression of *rfk-1*. Here, we present our current results concerning the roles of *rfk-1* introns in *rfk-1* phenotypic expression.

PRAIRIE VAMPIRES: PATHWAYS BY WHICH HEMIPARASITIC *PEDICULARIS CANADENSIS* INFLUENCES COMMUNITY DYNAMICS IN THE PRESENCE OF INVASIVE *LESPEDEZA CUNEATA*

Presenter(s): McGinnis, Cassie, Graduate, Biological Sciences

Mentor: Dr. Victoria Borowicz

Authorship: Cassie McGinnis, Victoria Borowicz

Hemiparasitic plants attach to host plant roots or shoots via specialist structures called haustoria for carbon, nutrients, and water while still retaining functional chloroplasts for photosynthesis. These plants can influence plant communities through theft of resources or modification of nutrient availability, and thus hemiparasites potentially alter prairie biodiversity and resistance to invasion. The native root hemiparasite *Pedicularis canadensis* can alter tallgrass prairie community composition, but how this occurs is not known. Two mechanisms have been postulated. It could act as a Keystone Species if it reduces growth of competitively dominant species more than competitively subordinate species. It could act as an Ecosystem Engineer if it alters nutrient availability for other species through nutrient-rich plant litter and changes the soil microbial community. Through both these mechanisms *P. canadensis* could alter a prairie's susceptibility to invasion. The goals of my thesis research are: (1) to determine the mechanisms by which *P. canadensis* affects its local community, and (2) to determine if *P. canadensis* can impede the establishment and spread of the invasive species *Lespedeza cuneata*. In 2006, 96 1-m² plots were established on a restored prairie to test effects of fertilizer and hemiparasite removal on hemiparasite-community relations. The community composition and dry mass of *L. cuneata* and *P. canadensis* in plots were previously assessed in 2015 and all treatments were discontinued. In summer 2024 I will record the presence and percentage cover of species in these plots and determine species richness, relative abundances of species, and dry mass of *L. cuneata* and *P. canadensis*. I will also sample soil from the center of each plot to characterize the soil microbial community. I will use these new data and data from 2015 in structural equation modeling to test hypotheses for the role of *P. canadensis* in the prairie. Knowing how hemiparasites such as *P. canadensis* impact local biodiversity and resistance to invasion and identifying the mechanisms by which they produce these effects can inform prairie management and restoration. Knowledge regarding hemiparasites may help practitioners control invasive species and develop seed mixes for resilient prairie communities.

UNDERSTANDING THE ROLE OF ANTIOXIDANT ENZYMES IN PROTECTING AGAINST OXIDATIVE STRESS DURING EMBRYONIC DEVELOPMENT

Presenter(s): Montalbano, Caitlin, Undergraduate, Biological Sciences

Mentor: Dr. Ryan Paitz

Oxidative stress occurs when tissues experience an imbalance of reactive oxygen species (ROS) and antioxidant defenses. This oxidative stress can cause detrimental damage to key cell structures and the DNA of an embryo. Glutathione peroxidase 1 (GPX4) and thioredoxin (TRX) are two antioxidant enzymes that provide defense against ROS and oxidative damage. Thus in this study, we were interested in the effects of inhibiting these enzymes and how it would affect embryo survival and growth in chickens. The hypothesis is that early embryonic exposure to inhibitors of TRX and GPX4 will result in overall low embryo mortality and weight due to the lack of defense against oxidative stress. Embryonic sex was also assessed through PCR to test for sex-specific responses to the inhibitor treatments. We hypothesized that females will be affected by the inhibition of TRX because the TRX gene is located on the Z chromosome and females only have a single Z chromosome. Our results revealed no effect of either enzyme inhibitor on embryonic survival or growth. There were also no differences between the sexes. Thus from these results, we can conclude that effects of inhibiting antioxidant enzymes might only occur when embryos are faced with an oxidative challenge like paraquat. We then conducted a study investigating embryonic responses to paraquat and potential antioxidant defenses. In this study, the hypothesis is that early embryonic exposure to paraquat will result in low embryo weight and mortality due to the increase of oxidative damage. We also tested the hypothesis that glutathione (GSH) provides protection against the effects of paraquat. We exposed embryos to a drug that reduces cysteine uptake (Erastin), because cysteine is necessary for GSH production. We predicted that exposure to this drug plus the paraquat will result in an even lower embryo mortality and weight compared to paraquat alone. Furthermore, we wanted to see the effects of directly inhibiting GSH synthesis Buthionine sulphoximine (BSO) and predicted early embryonic exposure to BSO plus

POLLEN DIET AND THE GUT MICROBIAL COMMUNITY AND HEALTH OF BUMBLE BEES

Presenter(s): Mwilambwe, Amelie, Undergraduate, Biological Sciences

Mentor: Dr. Ben Sadd

Co-Mentor: Dr. Logan Sauers

Authorship: Amelie Mwilambwe, Logan Sauers, Ben Sadd

Gut microbial communities or microbiota play crucial roles for host health, aiding in digestion, detoxification, and defense. Yet, these communities vary and understanding the factors that influence community membership and function is essential to appreciate the effects on health. There is a clear connection between a host's diet and its gut microbial community, but diet diversity and its relationship is relatively understudied in important pollinating insects. We used the model host-gut microbiota system of a bumble bee to investigate how pollen diet influences its gut microbiota and health. Bumble bees are naturally and agriculturally important pollinators, but land use changes have consequences for their diet. We hypothesize that due to variation in nutrition and diversity diet will affect bumble bee microbiota structure and consequently health. Adult bees were given one of five diet treatments, including no pollen, one of three individual pollen types varying in nutritional content, or a diverse mix of the three pollen types. These bees were sampled for their gut microbiota composition or survival under stressful conditions. Results are still being analyzed, but we predict a diverse pollen diet leads to health microbiota establishment and single pollen diets will differ depending on their nutritional profiles, with the consequences for survival. This work increases our knowledge of the link between diet, gut microbiota and host health in general, and additionally how pollen availability may affect health and conservation of a key pollinator through effects on its microbiota.

IDENTIFYING NEURONAL EXPRESSION AND FUNCTION OF DYSTROPHIN IN THE NERVOUS SYSTEM OF THE NEMATODE *CAENORHABDITIS ELEGANS*

Presenter(s): Niha, Shifat, Graduate, Biological Sciences

Mentor: Dr. Andrés Vidal-Gadea

Authorship: Shifat Niha, Andres Vidal-Gadea, Adina Fazyl

Duchenne Muscular dystrophy (DMD) is a progressive muscle degenerative disease caused by mutation in the gene encoding the dystrophin protein. Several isoforms of the dystrophin protein are expressed in both muscle tissues and the neurons. Dystrophin in the muscles play critical role in maintaining the structural stability of the muscle fiber; however, its precise functions in neurons remain unknown, as does the mechanism by which its loss contributes to the recognized neurological phenotypes in this condition. Although *C. elegans* are known to carry a homologue of human dystrophin (*dys-1*), and have been used to study DMD for decades, the cellular and subcellular expression pattern of *dys-1* in the neurons is still unknown. The goal of this study is to get a better understanding of the function of dystrophin in the nervous system, and their potential involvement in the neurological phenotypes observed associated with DMD. To identify the neurons expressing different *dys-1* isoforms, we have used a transgenic strain of *C. elegans* containing multiple neuron-specific reporters, each of which expresses a unique combination of fluorophores.

Preliminary data have indicated distinct expression patterns of dystrophin isoforms in different neurons. Behavioral assays using *dys-1* mutants showed diverse abnormalities in the behaviors associated with the neurons expressing the gene. The completion of this study will shed light on an effective system to study the neurological aspects of Duchene muscular dystrophy using *C. elegans*.

LETHALITY RATES OF HYDROGEN SULFIDE IN CHICKEN EMBRYOS

Presenter: Noel, Jady, Undergraduate, Biological Sciences

Mentor: Dr. Ryan Paitz, Biological Sciences

Authorship: Jady Noel, Ryan Paitz

Bacterial infections during pregnancy are a cause of mortality and preterm delivery in fetuses. These infections occur in maternal tissues such as the uterus or fetal tissues such as the placenta. And while we know infections are linked with infertility, miscarriage, and premature birth, the specific factors that cause these effects remain unknown. Some effects may be mediated by the maternal immune response, while others may be due to a direct response of embryos to the bacteria. Chicken embryos provide an opportunity to determine how embryos directly respond to bacteria because they develop independently from maternal circulation/immune responses. The goal of this study is to isolate the causative agent from bacteria that is responsible for the detrimental effects on growth and survival. Since many bacteria are known to release hydrogen sulfide, a colorless gas that can have negative effects on cells, we tested the effect of hydrogen sulfide exposure on chicken embryo development. High exposure to H₂S is lethal due to how easily it is oxidized in the presence of ions and metals.

However, minimal concentrations are necessary for essential biological processes such as energy metabolism and disease stress resistance. To test the effect of H₂S on embryos, we will inject GYY 4173, a water-soluble compound that releases H₂S to evaluate if H₂S affects embryonic growth or mortality. The embryos will be divided into 3 groups that will be exposed to a low concentration, high concentration, or vehicle only control. The embryos will be incubated for 2 weeks post-injection and evaluated for change in growth and viability. This experiment can give insight as to what concentrations of hydrogen sulfide are lethal, while also giving insight to limiting embryonic responses to bacteria early in development.

CAN RELACORILANT PREVENT THE NEGATIVE EFFECTS OF GLUCOCORTICOID EXPOSURE?

Presenter(s): Roseland, Anna, Undergraduate, Biological Sciences

Mentor: Dr. 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. Unfortunately, administering RU486 early and late in development also led to decreased embryo mass by day fourteen of development. This effect of RU486 on growth may be due to off-target effects the drug has on other receptors, such as the progesterone receptor. The goal of this study is to use a newer drug (Relacorilant) that is more selective for the glucocorticoid receptor than RU486. Relacorilant is predicted to prevent glucocorticoid induced mortality without decreasing embryonic growth. In order to determine the most effective dosage of Relacorilant that does not decrease embryonic growth, we investigated the effects of varying Relacorilant dosages during the first fourteen days of development and identified several low doses that did not reduce growth. Therefore, the most recent study conducted investigated a variety of low-dose Relacorilant treatments in order to find the most effective dosage in increasing survival following corticosterone exposure. 120 eggs were split into four randomized treatment groups. One group received an injection of oil (Control group). One group received an injection of 10 μg of corticosterone (Cort Only). The other two groups received 10 μg of corticosterone plus 1 μg of Relacorilant (High), or 10 μg of corticosterone plus 0.1 μg of Relacorilant (Low). After the injections were complete, the eggs were then placed to be incubated for 14 days. Following the incubation period, embryos were dissected from the egg and weighed. The results of this study revealed that the low concentration of Relacorilant prevented the negative effects of corticosterone on embryonic growth and resulted in embryos that were similar to the control.

COOPERATION AMONG ANTIPHONAL-DUETTING PARTNERS

Presenter(s): Schinzler, Rachel, Graduate, Biological Sciences

Mentor: Dr. Carlos Rodríguez-Saltos

Authorship: Rachel Schinzler, Carlos Rodríguez-Saltos

In duetting songbirds, females and males combine their vocalizations. In antiphonal duetting, the birds precisely alternate their vocalizations. Males and females each have certain syllables that are followed by a corresponding syllable from the opposite sex as they build their vocalizations. This precision suggests a strong social bond between partners. We will test this hypothesis using plain-tailed wrens (*Pheugopedius euophrys*). To evaluate the strength of their bond, we will use operant conditioning to test for a preference for the partner's song. Our operant conditioning device is a cage that contains a key on either side of the cage. It has a speaker connected to each key that plays a plain-tailed wren vocalization when pressed. One key has a higher probability of playing the vocalization of the subject's partner. The other has a higher probability of playing the vocalization of a conspecific of the opposite sex. This way, the subject can still have balanced exposure to either individual. We expect that preference for that song will be correlated with the level of coordination between partners. We propose studying coordination among socially bonded birds to understand turn-taking amidst social interactions.

ESTABLISHING GENOME EDITING IN MARBLED CRAYFISH

Presenter(s): Seymour, Mackenzie, Graduate, Biological Sciences
Mentor: Prof. Wolfgang Stein
Co-Mentor: Prof. Andrés Vidal-Gadea
Authorship: Mackenzie Seymour, Andrés Vidal-Gadea, Wolfgang Stein

Gene editing is a powerful tool to generate insight into development and function of physiological processes, including those in the nervous system. However, few organisms are amenable to gene editing using currently available technologies and to test the neurophysiological effects of that editing. While many organisms studied today can either be genetically modified or measured neurophysiologically, most lack the ability to combine both of these characteristics. We are addressing this issue by expanding genetic tools for use in decapod crustaceans. Decapod crustaceans possess large, well-characterized neurons that have been used as neurophysiology models for several decades. These neurons allow access for real time physiology measurements in both individual neurons and whole circuits with long tissue survival. One species that shows potential for applying genetic tools is the marbled crayfish (*Procambarus virginalis*) because it produces genetically identical offspring through parthenogenesis and has a fully sequenced genome and transcriptome. We aim to establish genome editing in oocytes of this species by using the gene editing system CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) in conjunction with the novel method ReMOT Control (Receptor-mediated Ovary Transduction of Cargo). Traditional applications of CRISPR for germline editing involve delivery of the protein Cas9 to developing eggs, for example through embryonic microinjections, which have low success rates due to high rates of damaging eggs and anatomical barriers. To overcome this barrier, ReMOT Control bypasses individually injecting eggs by molecularly delivering proteins of interest to developing eggs through hijacking the vitellogenesis pathway, which is the naturally occurring process of transporting vital nutrients to eggs in oviparous animals. Injecting vitellogenic females with an arthropod ligand derived from the vitellogenesis pathway bound to Cas9 have shown successful gene editing capabilities in several invertebrates. Based on these observations, we expect Cas9 to be delivered into developing eggs of marbled crayfish. To confirm successful gene editing, we are targeting a phenotype that can easily be detected early in development, such as eye pigmentation (*scarlet*) and eye development (*eyeless*). Our preliminary data indicate that this method of gene editing is successful, making marbled crayfish the first crustacean to have CRISPR/ReMOT Control established. However, our data also indicates that this method may result in lethality in some offspring during larval development. We are currently optimizing this process, and testing the success and effects of editing these genes.

TEMPERATURE RESPONSES OF CRUSTACEAN DESCENDING MODULATORY PROJECTION NEURONS

Presenter: Steiger, Charlotte, Undergraduate, Biological Sciences

Mentor: Dr. Wolfgang Stein

Authorship: Charlotte Steiger, Liisi Vink-Lainas, Wolfgang Stein

Rapidly changing temperatures are a major challenge to neuronal function. This can cause an imbalance of ionic conductances that are key to normal neuronal and synaptic activity. This is a threat for ectothermic species that experience rapid environmental temperature fluctuations, like natural and climate-change related weather extremes. Nevertheless, some species that possess physiological mechanisms can mitigate the effects of temperature changes in the nervous system and as a result withstand a wide range of temperatures. We have previous data that suggests that the release of peptide modulators in the nervous system enables temperature robustness, while also suggesting that the activity of the modulatory neurons that release the peptides increases with temperature as well. However, this has so far only been investigated in one animal species, the Jonah crab (*Cancer borealis*). We are now testing a second species to investigate the hypothesis that neuropeptide release enables temperature robustness across crustacean species. To test this hypothesis, we investigate temperature responses of descending modulatory neurons in the crustacean stomatogastric (STG) nervous system of green crabs (*Carcinus maenas*). We predict that the firing rates of these neurons will increase with higher temperatures. Specifically, we record the firing rates of the modulatory commissural neuron 1 (MCN1) and its postsynaptic target, the lateral gastric neuron (LG). We dissect and isolate the stomatogastric nervous system and extracellularly record MCN1 and LG. To test whether temperature directly or indirectly affects MCN1 firing rates, we manipulate temperature separately for MCN1 and LG through the creation of petroleum jelly wells with separate temperature control. If MCN1 firing rate increases as predicted, this would indicate that modulatory projection neurons respond to temperature and may contribute to enabling temperature robust neuronal activity.

SURVIVAL OF THE FITTEST: UROPATHOGENIC ESCHERICHIA COLI'S INCREASED RESISTANCE TO NEUTROPHILIC ANTIMICROBIAL HYPOCHLOROUS ACID

Presenter(s): Sultana, Sadia, Graduate, Biological Sciences

Mentor: 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. Recently, we reported that uropathogenic *Escherichia coli* (UPEC), the common etiological agent of urinary tract infections, is substantially more resistant to HOCl exposure and neutrophil-mediated killing than intestinal *E. coli* pathotypes. We identified the molecular mechanism behind UPEC's increased HOCl resistance: an operon consisting of three uncharacterized genes, *rcrA*, *rcrR*, and *rcrB*. Upon exposure to sublethal HOCl, UPEC cells upregulate this operon. We characterized RcrR as a HOCl-sensing transcriptional repressor that represses the operon during non-stress conditions and becomes inactivated during HOCl-stress, resulting in the expression of target genes *rcrA* and *rcrB*. Moreover, our data confirmed that *rcrB* is particularly crucial for UPEC's increased HOCl resistance; *rcrB*-deficient UPEC strains (both lab strains and clinical isolates) are as sensitive to HOCl as intestinal *E. coli* pathotypes. Alternatively, recombinant expression of RcrB in HOCl-sensitive intestinal *E. coli* renders the strain highly resistant to HOCl.

RcrB is a putative membrane protein with an unknown function; hence, the overarching goal of my research is to identify RcrB's mode of action. We hypothesize that RcrB likely functions as a barrier to potentially reduce HOCl influx into the cell. To decipher the precise mechanism of RcrB, we will now investigate the HOCl-influx into the cell using redox sensing probes and will analyze potential molecular interaction partners of RcrB using immunoprecipitation and proteomics analyses. Deciphering RcrB's role in bacterial HOCl defense will help us to better understand how UPEC survives in HOCl-rich environments such as the urinary tract.

INVESTIGATING OXIDATIVE DAMAGE AS A MECHANISM UNDERLYING LETHAL CONSEQUENCES FROM EMBRYONIC EXPOSURE TO CORTICOSTERONE

Presenter(s): Tillman, Libby, Undergraduate, Biological Sciences

Mentor: Dr. Ryan Paitz

Authorship: Libby Tillman, Ryan Paitz

Vertebrates increase their production of glucocorticoids to coordinate a physiological response to an external stressor. When a developing embryo is exposed to glucocorticoids, it can negatively affect its growth and survival. These effects are hypothesized to arise because activation of the glucocorticoid receptor induces inappropriate gene expression that leads to oxidative damage.

Antioxidants, such as vitamin E, may prevent oxidative damage caused by free radicals. In a previous study, we tested the hypothesis that embryonic glucocorticoid exposure increases oxidative damage and leads to negative effects on growth and survival. We found that adding Vitamin E to corticosterone-exposed chicken embryos did not prevent negative effects on growth and survival. In the current experiment, we will test the same hypothesis, but with two other antioxidants, glutathione and trolox. Trolox and glutathione will be separately injected into eggs already injected with corticosterone, alongside two other treatments of oil (control) and corticosterone in oil. After being incubated for fourteen days, the embryos will be dissected from their shells and weighed. We will determine whether or not introducing an antioxidant to eggs exposed to corticosterone will negate increased mortality and decreased embryonic growth.

Understanding the relationship between glucocorticoid exposure and embryonic effects allows for appropriate action most beneficial for the developing fetus. If oxidative damage explains the cause of these effects, antioxidant use as a preventative measure can be looked into in future studies.

CHEMISTRY

TMC-126: CONVERGENT ASYMMETRIC SYNTHESIS OF THE HIV DRUG TMC-126 USING THE CRIMMINS' AUXILIARY IN A NON-EVANS SYN-GLYCOLATE ALDOL ADDITION PATHWAY

Presenter(s): Affram, Kweku Amaning, Graduate, Chemistry

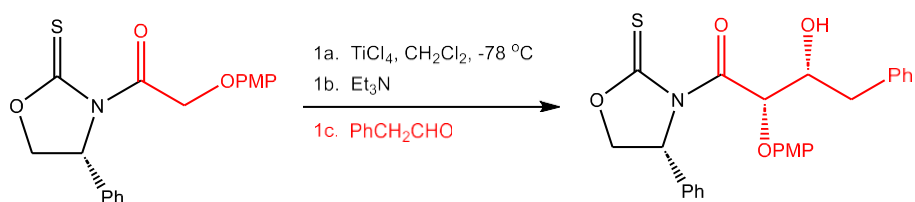
Mentor: Dr. Shawn R. Hitchcock

Authorship: Kweku Amaning Affram, Shawn R. Hitchcock, Joy Odeh

Today, millions of people around the world have HIV and much research has been done in order to treat it. Highly active antiretroviral therapy (HAART) has significantly reduced the mortality and morbidity rate across the world. HAART employs a combination of some classes of inhibitors mainly reverse transcriptase, integrase and protease inhibitors that are potent against the virus but overtime the viral strain develop resistance against the potent HAART combination. TMC-126 is an anti-viral medication used in the treatment of human immunodeficiency virus type 1 (HIV-1). A special area known as the catalytic dyad, formed from two aspartate molecules, is responsible for breaking peptide bonds so that the peptide fragments can be used to propagate the virus. TMC-126 is a protease inhibitor; the alcohol group on TMC-126 interacts with the carboxylic acids on the aspartate molecules in the catalytic dyad to inhibit further protease activity and prevent replication of the virus. Compared to some of the other drugs that are being used, TMC-126 has shown to be the most potent in terms of inhibiting the enzyme and antiviral activity. It is also highly successful in preventing numerous drug-resistant mutations thus making it that much more of an effective treatment.

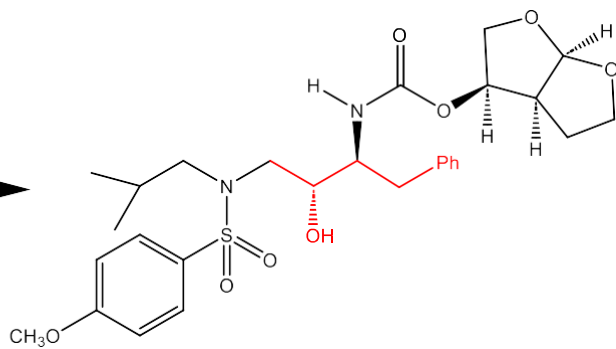
The goal of our research lab is to synthesize this HIV protease inhibitor through an asymmetric glycolate aldol addition approach. We will accomplish this by focusing on the synthesis of a beta lactone that would be used as a building block for this process and ultimately become another pathway in the treatment of this disease.

With this project, we are seeking to develop a more efficient stereoselective method for the synthesis of TMC-126.



transamidation
borane reduction
bis-nosylation

azidation
deprotection
reduction/acylation



OXIDOPYRYLIUM-BASED (5+2) CYCLOADDITIONS WITH AMINE TETHERS

Presenter(s): Alende, Joy, Graduate, Chemistry

Mentor: Dr. Andy Mitchell

Cycloaddition reactions are fundamental in organic chemistry, effectively synthesizing essential ring structures found in pharmaceuticals and biologically significant compounds. While the [4+2] Diels-Alder cycloaddition is widely known, the (5+2) variant is less recognized. (5+2) cycloadditions involving oxidopyrylium intermediates offer a convenient route for building complex seven-membered ring systems, crucial components in various biological molecules. In this work, we explore the synthesis of substrates with amine tethers to further investigate oxidopyrylium-based (5+2) cycloadditions.

INVESTIGATIONS INTO THE SYNTHESIS OF QUINONE-FUSED CARBAPORPHYRINS

Presenter: Awa, Francis, Graduate, Chemistry

Mentor: Dr. Timothy Lash

Authorship: Francis Awa, Timothy Lash

Porphyrins are macrocyclic derivatives that occur naturally and represent examples of non-benzenoid aromatic systems. Porphyrins have become of great interest as they offer many applications in science and industry. Owing to the immense importance of porphyrins, many related macrocycles have been synthesized. In carbaporphyrins, a carbon atom replaces one nitrogen in the internal cavity, while in N-confused porphyrins (NCPs), an inverted pyrrole unit is incorporated that places a nitrogen at the periphery. Extending the conjugation of porphyrinoid systems is also of great interest and this can be achieved by fusing aromatic rings at one or more of the pyrrole units as in benzoporphyrins and naphthoporphyrins. In previous studies, carbaporphyrins with fused benzene, naphthalene and anthracene units were investigated. In an extension of these studies, the synthesis and properties of carbaporphyrins with fused naphthoquinone or anthroquinone units is under investigation. The preparation of quinone-porphyrin adducts 1 requires the availability of suitable dialdehyde precursors. 1,4-Naphthoquinone and 1,4-anthroquinone underwent Diels-Alder cycloadditions with 1,3-cyclopentadiene to give norbornene adducts 2. Attempts to convert 2 into required dialdehydes 3 were unsuccessful and an alternative strategy was investigated. Reaction of 2 with methyl iodide and 1,8-diazabicyclo[5.4.0]undec-7-ene (DBU) gave dimethoxy derivatives 4. Reaction with potassium permanganate afforded dialcohols that underwent ring cleavage with potassium periodate to afford dialdehydes 5. Condensation of 5 with tripyrrane 6 in the presence of trifluoroacetic acid, followed by oxidation with 2,3-dichloro-5,6-dicyano-1,4-benzoquinone (DDQ), gave modest yields of dimethoxynaphtho- and dimethoxyanthrocarbaporphyrins 7. Current investigations are being directed towards improving the yields of the dimethoxy derivatives and in developing alternative routes to quinone-fused carbaporphyrins 1. The results of this research will demonstrate the influence of fused quinone aromatic units on the spectroscopic properties, aromatic characteristics, and chemical reactivity of fused carbaporphyrinoid systems.

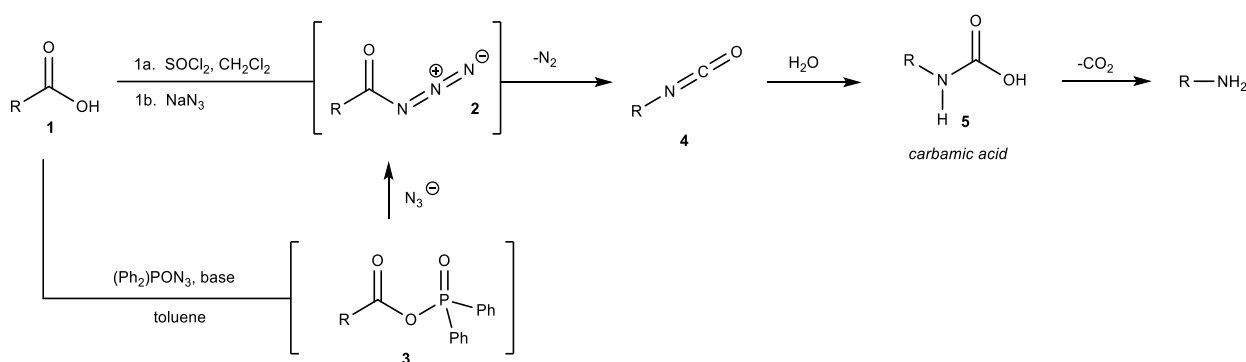
THE CURTIUS REARRANGEMENT OF (*R*)-ALPHA-METHOXYPHENYLACETIC ACID: ISOLATION OF THE THERMALLY LABILE ISOCYANATE INTERMEDIATE WITH PHENOLIC SUBSTRATES

Presenter(s): Bambalas, Lillian, Undergraduate, Chemistry

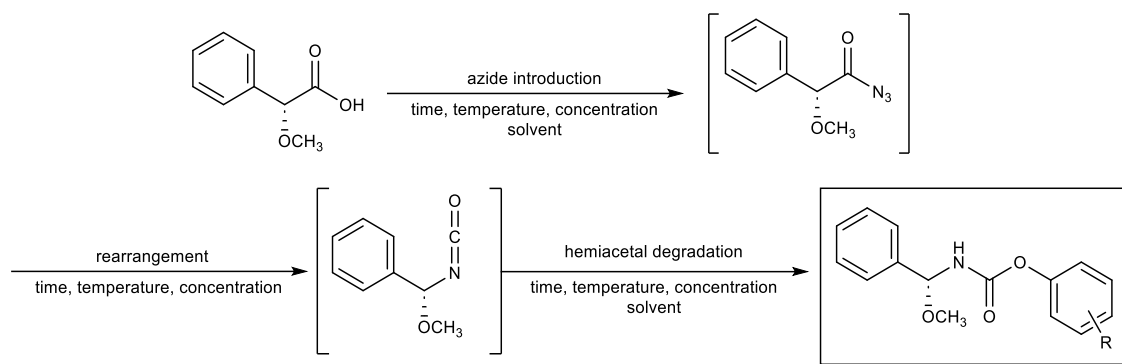
Mentor: Dr. Shawn R. Hitchcock

Authorship: Lillian Bambalas, Joy Odeh, Jordan M. Witte, Shawn R. Hitchcock

The Curtius reaction¹ and its variants (the Lossen rearrangement, the Hofmann rearrangement, and the Schmidt rearrangement) are well-known reactions in synthetic organic chemistry. This class of reactions converts carboxylic acids into amines with the loss of a carbon in the form of carbon dioxide. The overall process has been known for more than a century and has been recently review by Ghosh and coworkers.¹ The Curtius rearrangement can be carried out in a variety of ways. In one variant, a carboxylic acid is converted to the corresponding acyl chloride and then into an acyl azide (**2**) by addition of sodium azide (Scheme 1). Upon heating, the acyl azide undergoes a thermal decomposition to form a transient isocyanate intermediate (**4**) that reacts with water to yield a carbamic acid that releases carbon dioxide to become the free amine. In an alternate pathway, the reagent diphenylphosphoryl azide (dppa) is reacted with carboxylic acid in the presence of a base such as triethylamine to lead to the *in-situ* formation of an activated mixed anhydride (**3**) of the carboxylic acid. This intermediate undergoes nucleophilic displacement with azide to yield the acyl azide that undergoes the thermal rearrangement to form the key isocyanate. In this research program, the stated hypothesis is that the introduction of an electron withdrawing group in the alpha position of the carboxylic acid will allow for the formation of structurally novel systems not normally accessible via conventional synthetic means (Scheme 2). It has been determined through experimentation that the introduction of an alpha-methoxy group to the carboxylic acid causes the isocyanate to form more rapidly than is normally expected and leads to the formation of *O*-methyl hemi-aminals rather than a free amine. This poster describes the discovery work that was initiated to optimize the formation of the isocyanate intermediate and its trapping with a variety of phenolic substrates.



Scheme 1. The Curtius Rearrangement.



Scheme 2. The Curtius Rearrangement of alpha-methoxyphenylacetic acid.

CHARACTERIZATION OF PROTEIN THIOLATION ON ADSORPTION AND ACTIVITY UPON IMMOBILIZATION TO GOLD NANOPARTICLES

Presenter(s): Breausche, Faith, Undergraduate, Chemistry

Mentor: Dr. Jeremy Driskell

Authorship: Faith E. Breausche, Annelise H. Somerlot, Jason R. Walder, and Jeremy D. Driskell

Conjugation of proteins to gold nanoparticles (AuNPs) is an expanding area of study for its ability to enhance novel drug delivery systems, imaging, immunoassays, and biosensing techniques. This research aims to gather a better understanding and facilitate protein adsorption through alteration of protein chemistry as opposed to modification of the AuNP surface chemistry. In specific, the model enzyme, horseradish peroxidase (HRP), is thiolated via Traut's reagent to increase the robustness and enzymatic activity of the bioconjugate. This is speculated to occur as the addition of a sulfhydryl group increases the protein's affinity for the AuNP surface. This study explores the impact of protein thiolation on the immobilization to the AuNP in addition to the enzymatic activity. Immobilization of HRP and its thiolated analog (THRP) were analyzed through UV-Vis spectroscopy, circular dichroism, zeta potential measurements, and enzyme-substrate kinetics assays. The substrate 2,2'-azinobis [3- ethylbenzothiazoline-6-sulfonic acid]-diammonium salt (ABTS) was utilized to quantitatively evaluate the product development of the bioconjugates. Additionally, the resulting enzymatic activities provide a quantitative method to determine the ratio of enzymes adsorbed per AuNP. Our data show greater adsorption for THRP in comparison to HRP on the AuNP as the interactions are due to the added sulfhydryl group as opposed to electrostatic interactions. The increase in molecules result in a considerable increase in bioconjugate activity. Preliminary studies also suggest that immobilization of THRP extends the lifetime of enzyme structure and function. The outcome of this investigation emphasizes the benefits of protein-AuNP bioconjugate applications in the advancement of medicinal and bioanalytical methods.

INVESTIGATIONS INTO CONJUGATION PATHWAYS IN ANNULATED PORPHYRINS: SYNTHESIS OF N-METHYLPYRENOPORPHYRINS

Presenter(s): Carpenter, Brian, Graduate, Chemistry

Mentor: Dr. Timothy Lash

Authorship: Brian Carpenter, Timothy Lash

Porphyrins are highly conjugated, strongly colored macrocyclic compounds consisting of four pyrrole units linked by methine bridges. A typical porphyrin contains an 18 π electron conjugation pathway that makes it strongly aromatic. The porphyrin system can be modified in a variety of ways, including by the introduction of fused aromatic moieties. In earlier studies, a series of porphyrins with fused pyrene units were synthesized but only minor changes were observed in the UV-vis spectra. Porphyrins have two inner protons that are orientated trans to one another but two nonequivalent tautomers, 1 and 2a, may be present. In tautomer 1, the aromatic conjugation pathway is disconnected from the pyrene, but in tautomer 2a, extended conjugation pathways with up to 30 π electrons are possible. In order to gain a better understanding of this issue, an N-methylated pyrenoporphyrim 2b was targeted that blocks tautomerization. Barton-Zard condensation of 4-nitropyrene with ethyl isocyanoacetate in the presence of a phosphazene base gave pyrenopyrrole 3. Alkylation with NaOH and methyl iodide in DMSO gave N-methyl derivative 4a and subsequent cleavage of the ester group with KOH in ethylene glycol at 200 oC afforded 4b. Reaction with 2 equivalents of acetoxymethylpyrrole 5 in acetic acid-isopropyl alcohol afforded tripyrrane 6. Removal of the terminal tert-butyl ester protective groups with TFA and condensation with pyrrole dialdehyde 7 gave N-methyl pyrenoporphyrim 2b. Details of the spectroscopic characterization for 2b will be presented and evidence for extended conjugation presented. The same concepts are currently being applied to the synthesis of N-alkylated porphyrin analogues.

PROGRESS TOWARD SUBSTRATES FOR (5+2) CYCLOADDITION VIA REACTIONS OF MALTOL AND TECHNIQUES INVOLVED

Presenters: Christenson, Gavin, Undergraduate, Chemistry

Mentor: Dr. Andy Mitchell

(5+2) Cycloadditions are useful reactions and substrates to explore them include maltol protection, bromination, and amination. The protection of maltol is achieved through reaction with imidazole and tert-butyldiphenylsilyl chloride (TBDPS-Cl) in DCM. TBDPS is used as the protecting agent and imidazole is a base to remove the hydrogen from the alcohol on maltol. To monitor the reaction, thin layer chromatography (TLC) is used to compare the reaction products with the starting material. Flash column chromatography is used after extraction to purify the product which is analyzed by $^1\text{H-NMR}$ spectroscopy. If the reaction is carried out properly, the product can be obtained in high yield and purity and will be used in the subsequent bromination and amination reactions.

DEVELOPING A ONE POT SYNTHETIC PROCESS FROM NITRILES TO OXADIAZOLES: SYNTHESIS OF 1,2,3-OXADIAZOLE ANTIMICROBIAL AGENTS AGAINST PATHOGENIC BACTERIA IN THE GASTROINTESTINAL TRACT

Presenter(s): Carter, Austin, Graduate, Chemistry

Mentor: Dr. Shawn R. Hitchcock

Authorship: Austin J. Carter, Desmond H. Murray, Shawn R. Hitchcock

1,2,4-Oxadiazoles are 5-membered ring heterocyclic structures that possess an array of biologically important properties. This family of compounds was first synthesized by Tiemann and Krüger in 1884.¹ Interest in these compounds had been limited until the 1960s when the pharmaceutical drug Oxolamine was introduced as a cough suppressant.² Further studies with these compounds have led to the discovery of a vast array of biological properties that these compounds have that can be translated into potential medicinal agents. These properties include anticancer, antiviral, antibacterial, antifungal, anti-oedema, and anti-Alzheimer. In addition to this, it has been demonstrated that 1,2,4-oxadiazoles can act as antimicrobial agents against pathogenic bacteria that occur in the gastrointestinal tract. This project is focused on the efficient synthesis of 1,2,4-oxadiazoles from commonly available starting materials. In this regard, the most common starting material for the synthesis of these compounds are compounds known as amidoximes. These materials are synthesized from the reaction of aliphatic and aromatic nitriles with hydroxylamine hydrochloride in the presence of a base. In turn, the amidoximes are typically reacted with an activated carboxylic acid to yield the desired 1,2,4-oxadiazole. In 2018, Zarei³ published on the feasibility of making the two-step process into a single step process using the Vilsmeier reagent to accomplish this goal. The process proved to be successful, but there is room for growth in this area. The hypothesis for this research is focused on the use of alternate activating agents to conduct a single step reaction that will afford the 1,2,4-oxadiazole from the simple nitrile starting material. Ultimately, this process will then be applied to the synthesis of an oxadiazole based medicinal agent that has been shown to be effective against pathogenic bacteria in the gastrointestinal tract.

CONVERSION OF MALTOL INTO STARTING MATERIALS FOR CYCLOADDITIONS

Presenter(s): Eifert, Rex, Undergraduate, Chemistry

Mentor: Dr. Andy Mitchell

Authorship: Rex Eifert

The first reaction, the protection of maltol, is achieved through a reaction with *tert*-butyldiphenylsilyl chloride (TBDPS-Cl) and imidazole. The protection reaction is performed to selectively shield the hydroxyl functionality of maltol. The *tert*-butyldiphenylsilyl (TBDPS) group serves as a robust protecting group, allowing further synthetic manipulations to the molecule without altering the TBDPS position. The reaction is monitored using analytical techniques such as NMR and TLC. The product is obtained in good yield and purity and acts as a good intermediate for further reactions such as bromination and then amination toward substrates that will enable study of the key (5+2) cycloaddition.

SYNTHESIS OF SUBSTRATES TO INVESTIGATE (5+2) CYCLOADDITIONS

Presenter(s): Ervin, Quentin, Undergraduate, Chemistry

Mentor: Dr. Andy Mitchell

The purpose of these experiments was to synthesize materials that would be used for future study of (5+2) cycloadditions. In order to become proficient in the synthesis of substrates for this important reaction, various procedures and techniques have been introduced. Specifically, several known reactions have been conducted including protection of Maltol, bromination of the protected maltol, and amination of that bromide. Techniques used to monitor, purify, and interpret these reactions include Thin Layer Chromatography (TLC), Flash Column Chromatography, and ^1H and ^{13}C NMR spectroscopy, respectively. Finally, these reactions provided a foundational experience and a stock of materials for further research toward (5+2) cycloadditions.

SYNTHESES OF RHENIUM SELENIDE CLUSTERS CONTAINING *PARA*-SUBSTITUTED PHENYLACETYLIDE LIGANDS

Presenter: Helmink, Katie, Undergraduate, Chemistry

Mentor: Dr. Lisa Szczepura

Authorship: Katie Helmink, Cory Hicks, Lisa Szczepura

Recently, we expanded the organometallic chemistry of octahedral rhenium chalcogenide clusters through the synthesis and study of some Re_6 cluster complexes containing η^5 -bound phenylacetylide. The complexes prepared include $[\text{Re}_6\text{Se}_8(\text{PEt}_3)_5(\text{C}\equiv\text{CPh})](\text{SbF}_6)$ and *cis*- and *trans*- $[\text{Re}_6\text{Se}_8(\text{PEt}_3)_4(\text{C}\equiv\text{CPh})_2]$. The nature of the cluster-acetylide bond was then interrogated by examining the reactivity of $[\text{Re}_6\text{Se}_8(\text{PEt}_3)_5(\text{C}\equiv\text{CPh})](\text{SbF}_6)$ with activated alkenes and various electrophilic reagents. We are now in the process of expanding upon the chemistry of these complexes, by synthesizing $[\text{Re}_6\text{Se}_8]^{2+}$ clusters containing *para*-substituted phenylacetylide ligands. We are interested in using these clusters for electrochemical and photophysical studies and this presentation will specifically focus on the synthesis and full characterization of the following series of complexes: $[\text{Re}_6\text{Se}_8(\text{PEt}_3)_5(\text{C}\equiv\text{C-C}_6\text{H}_4\text{-X})](\text{SbF}_6)$ (where X = $-\text{NO}_2$, $-\text{C}(\text{O})\text{OMe}$, $-\text{CH}_3$, and $-\text{OCH}_3$).

THE INTERESTING EFFECTS OF TRYPTAMINE, HARMINE, AND HARMALINE ON *LEISHMANIA TARENTOLAE* IN A ROCKING ENVIRONMENT

Presenter(s): Hohman, Grace, Undergraduate, Biological Sciences

Mentor: Dr. Marjorie Jones, Chemistry

Leishmaniasis is considered a neglected tropical disease affecting millions of people worldwide and is caused by the parasitic protozoan *Leishmania* (1). The current treatments for the disease can be costly and have various adverse side effects (2). There have been limited studies on compounds that are used in various religious practices where leishmaniasis is widespread. In some of these regions with a higher prevalence of leishmaniasis, an indole class of hallucinogens called tryptamines, are used in ritualistic practices. Since individuals with leishmaniasis might be exposed to these compounds, it is important to investigate if these indole derivatives are activating or inhibiting the *Leishmania* parasite (3). Studying this will help us better understand if the ceremonial use of the indole compounds in some societies might pose a risk to people in regions where leishmaniasis is endemic. Additionally, growing *Leishmania* cells on a lab rocker can be tested with the aim of getting a more accurate representation of cell growth and viability *in vitro* (4). These conditions offer a better understanding of *Leishmania* cell activity in their hosts because the rocking motion may resemble movement of living organisms. This research tested the effects of either tryptamine, harmine, or harmaline on cell growth and activity of the enzyme, secreted acid phosphatase (SAP), in a static or rocking environment. Preliminary results show that the rocking motion altered the way *Leishmania* cells responded to the indole compounds. The cultures in a constant rocking motion exhibited different growth patterns and SAP production compared to the static cultures.

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SYNTHESIS OF PORPHYRINOIDS WITH FUSED ISOQUINOLINE UNITS AND THEIR CATIONIC DERIVATIVES

Presenter: Hostert, Jane, Undergraduate, Chemistry

Mentor: Dr. Timothy Lash

Porphyrins have numerous medicinal applications, including uses as photosensitizers in photodynamic therapy. In addition, cationic derivatives of pyridylporphyrins have been shown to be effective telomerase inhibitors that bind with quadruplex DNA. In studies directed towards the synthesis of porphyrinoids with fused aromatic rings, isoquinoline fused structures have been prepared. 5-Nitroisoquinoline reacted with ethyl isocyanoacetate in the presence of a phosphazene base to give isoquinopyrrole **1a**. The ester moiety was cleaved with KOH in refluxing ethylene glycol and the resulting unsubstituted heterocycle **1b** was condensed with two equivalents of acetoxymethylpyrrole **2** in refluxing acetic acid-2-propanol to generate tripyrrane **3**. The tert-butyl ester groups were removed by dissolving **3** in TFA. Following dilution with dichloromethane, condensation with pyrrole dialdehyde **4** and oxidation with 2,3-dichloro-5,6-dicyano-1,4-benzoquinone (DDQ) gave excellent yields of isoquinoporphyrin **5**. Similarly, reaction with indene dialdehyde **6** gave a related isoquinocarbaporphyrin **7**. Reaction of these isoquinoporphyrinoids with methyl iodide in DMF gave cationic derivatives **8** and **9**. The influence of N-alkylations on the spectroscopic properties and aromatic characteristics of these porphyrinoids is currently under investigation.

SIMULATED FRAGMENTATION OF TMe-DMe-Lysine⁺: MASS SPECTRA AND MECHANISMS

Presenter(s): Kobulnicky, Trent, Undergraduate, Chemistry

Mentor: Dr. George Barnes

Authorship: Trent Kobulnicky, George Barnes

Post-translational modifications (PTMs) of proteins play an indispensable role in biological processes. Researchers rely on tandem mass spectrometry to characterize systems that have undergone PTMs. However, standard experimental results do not provide information on the reaction mechanisms that take place or the final structures and protonation state of the products. Computational approaches can provide an atomic-level view of this reactivity and the associated energetics. In this work, we simulate the positive-mode fragmentation of lysine modified with a trimethylated side chain and dimethylated N-terminus (TMe-DMe-lysine⁺).

Results were then compared to experimental results from unmodified lysine and TMe-DMe-lysine⁺.

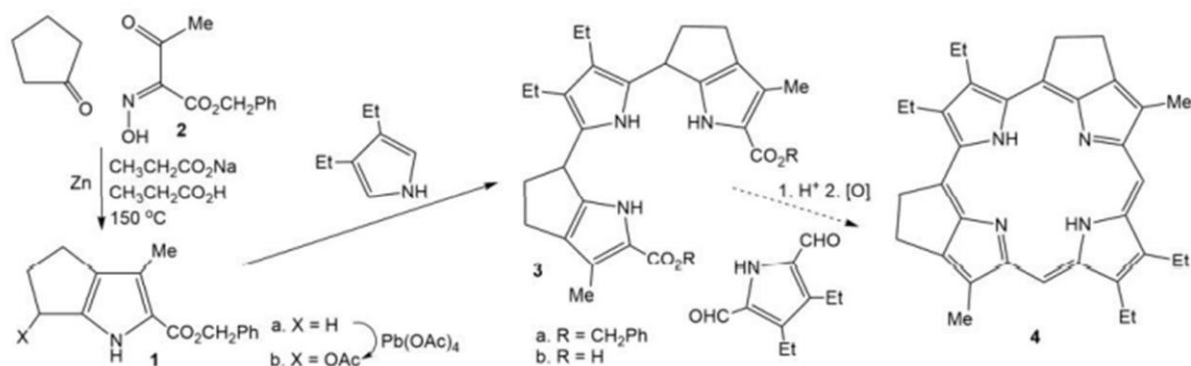
APPROACHES TO THE SYNTHESIS OF NOVEL PORPHYRINS WITH TWO EXOCYCLIC RINGS

Presenter(s): Marinucci, Nicole, Undergraduate, Chemistry

Mentor: Dr. Timothy Lash

Authorship: Nicole Marinucci, Timothy Lash

Porphyrins are widely investigated due to their potential for applications in numerous areas, including as photosensitizers in photodynamic therapy. Modification of the porphyrin chromophore has been of great interest as this allows the properties of the system to be altered. In this study, the synthesis of porphyrins with fused exocyclic rings is being investigated. Cyclopenta[b]pyrrole **1a** was prepared by reacting oxime **2** with cyclopentanone in the presence of zinc dust at 150 °C. Selective oxidation with lead tetraacetate afforded the corresponding acetoxy derivative **1b** and this was condensed with 3,4-diethylpyrrole in a 2:1 ratio to generate tripyrrane **3a**. Deprotection of the terminal benzyl esters with hydrogen over 10% Pd/C gave the related dicarboxylic acid **3b**. Currently, the preparation of porphyrin **4** with two five-membered exocyclic rings is being pursued. In addition, related structures with extended conjugation are being considered.



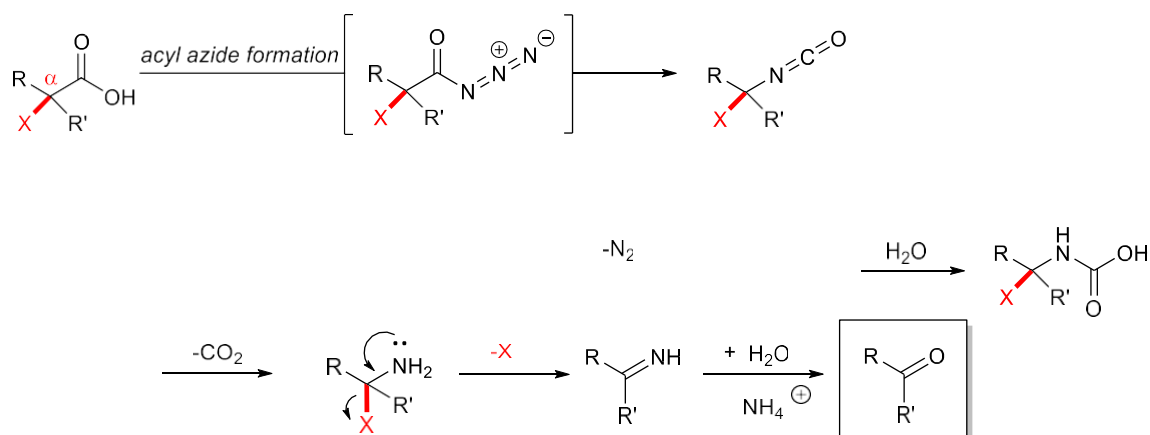
NEW DIRECTIONS FOR AN OLD REACTION: A CURTIUS REARRANGEMENT DRIVEN DEHOMOLOGATION FROM CARBOXYLIC ACIDS TO ALDEHYDES AND KETONES

Presenter(s): Odeh, Joy, Graduate, Chemistry

Mentor: Dr. Shawn Hitchcock

Authorship: Jordan Witte, Daniel Wright

The Curtius rearrangement has been known for more than 130 years and is a well-known transformation in synthetic organic chemistry that involves the synthetic preparation and subsequent thermal decomposition of acyl azide with the elimination of nitrogen gas into their corresponding isocyanates. These isocyanates, when exposed to different nucleophilic attack can be converted to the corresponding amines, carbamates, or substituted urea derivatives. In reviewing the Curtius rearrangement, it became of interest to exploit the synthetic intermediates that form in the molecular Rearrangement of the acyl azide. It is hypothesized that it is possible to alter the course of the Curtius rearrangement in such a way that the end products are dehomologated carbonyl compounds such as aldehydes and ketones *rather than amines*. To test this hypothesis, a research plan has been developed that is divided into three phases. The first phase of the proposal is focused on the use of alpha-hydroxycarboxylic acids derived from the petroleum industry as synthetic precursors to carboxylic acids with leaving groups in the alpha-position (i.e., alkoxy, phenoxy, and acyloxy groups). The testing of these substrates in the Curtius rearrangement will serve as the starting point of testing the central hypothesis. The second phase of the research is centered on capturing mechanistic intermediates that will be expected to form. There will also be a focus on testing the scope and limitations of substrate carboxylic acids in this new variant of the Curtius rearrangement. The final phase of this proposed research will be directed towards using the new reaction variant to achieve the synthesis of aldehydes deuterated at the aldehydic position.



Scheme 1. The Proposed alternative route for the Curtius rearrangement.

SITE-SPECIFIC CONJUGATION OF HUMAN IgG1 WITH PEPTIDES MEDIATED BY MICROBIAL TRANSGLUTAMINASE (mTG) FOR ADSORPTION TO AuNPs

Presenter: Osei, Kwame, Graduate, Chemistry

Mentor: Dr. Jeremy Driskell

Authorship: Kwame Osei, Jeremy Driskell

Gold nanoparticles (AuNPs) have been exploited in many emerging technologies due to their unique chemical, optical, electronic, and catalytic properties. AuNPs functionalized with antibodies confer effective surface modification that imparts selective binding to targeted analytes in diagnostic applications or tissues for imaging and drug delivery. Despite extensive efforts, current strategies of AuNP-antibody bioconjugation chemistries are not universally applicable to all antibodies, are pH dependent, result in random orientation leading to diminished activity, and/or have limited stability. In previous works, studies established the role of localized protein charge and thiol functional groups on the orientation and affinity, respectively, for the adsorption of proteins to AuNPs. In this research, we explore the conjugation of a polypeptides to the Fc region of an antibody to facilitate oriented and robust adsorption to AuNPs. Specifically, microbial transglutaminase (mTG) is employed for the site-specific conjugation of the peptide to the Q295 residue that is conserved on the Fc fragment of monoclonal human IgG1. Rationally designed peptides that incorporate a high density of localized positive charge and multiple thiol groups will confer proper orientation and strong affinity, respectively, of the antibody adsorption onto AuNPs. Verification and characterization of the modified antibody include amplite fluorimetric assay for thiol quantitation and mass spectrometry. Dynamic light scattering (DLS) and nanoparticle tracking analysis confirms adsorption of the modified antibody onto the AuNPs, and antigen-binding activity will be quantified to assess orientation of the immobilized antibody. A series of peptides will be investigated to optimize antibody adsorption and will be extended to other antibodies.

Keywords: Bioconjugation, gold nanoparticles, polypeptides.

INTERPLAY OF ANION AND SOLVENT COMPOSITION ON ETHENYLPYRIDINE LIGAND COORDINATED SILVER(I) ION PACKING IN THE SOLID-STATE

Presenter(s): Rohrig, Isabella G., Undergraduate, Chemistry

Mentor: Dr. Gregory M. Ferrence

Authorship: Isabella G. Rohrig, Eric Bosch, Ryan H. Groeneman, Gregory M. Ferrence

The formation and structure of four new silver(I) complexes based upon either methanesulfonate [Ag(CH₃SO₃)] or hexafluorophosphate [AgPF₆] anions along with the ester-based reactant molecule trans-1-(4-methylbenzoate)-2-(4-pyridyl)ethylene (4-PEBE) are reported. In each of the four complexes, silver(I) ions form coordinated covalent bonds to the 4-pyridyl groups on two 4-PEBE ligands; however, anion identity and crystallization conditions result in various solid-state compositions and architectures. Such architectures do or don't contain significant anion to silver interactions, solvates, and metal coordinated solvates.

Additionally, architectures contain varying degrees of argentophilic interactions or close packing of a pair of silver(I) ions. The four new structures will be compared and contrasted with previously published, related structures that incorporate either trifluoromethanesulfonate (CF₃SO₃⁻) or toluenesulfonate (C₇H₇SO₃⁻) anions.

INVESTIGATION OF EFFECTS IN VITRO ON CANCER CELL MODEL SYSTEMS FROM EXPOSURE TO STRONTIUM-BASED OXYFLUORIDES

Presenter(s): Terry, Katelyn, Undergraduate, Chemistry

Mentor: Dr. Marjorie A. Jones

Authorship: Katelyn Terry, David C. Platt, Marjorie A. Jones, Joseph Drinkwater, Eirin Sullivan

Being derived from rats, a common human model species, studies using C6 and PC12 cells have been able to associate their findings with potential therapeutics for human utilization. Both cell types have been used in multiple studies as a model system to study brain tumors, nerve physiology, and pharmacology. Our previous study found that eight novel strontium-based oxyfluorides had negative effects on the cell viability of the parasitic protozoan *Leishmania tarentolae*, a *Leishmania* model species found in reptiles. Leishmaniasis is a vector-borne parasitic disease, caused by the protozoan parasite genus *Leishmania*. Animal and human infections are prevalent in portions of the tropics, subtropics, southern Europe, and as recent studies show, along the Texas-Mexico border. This study reports the first experimental effects of the same eight oxyfluoride compounds introduced to PC12 neuronal or C6 glial cancer cell models in vitro, to further investigate the potential inhibitory effects of these in other model systems. Cultures were exposed to 5 μ M strontium-based oxyfluorides for 24 hours. In comparison to the DMSO control, several compounds resulted in diminished cell viability, as measured by the MTT viability assay. The C6 cells appeared to be more sensitive to inhibition than the PC12 cells. Data were analyzed as an average absorbance (A 595 nm) of replicates (n=5) and corrected using the average absorbance of cell-free blanks. Among the eight compounds tested, Sr₃Al_{0.9}B_{0.1}O₄F had the largest, while Sr₃GaO₄F and Sr_{2.5}Ba_{0.5}AlO₄F had the smallest, inhibitory effects.

STRUCTURAL DETERMINANTS FOR BINDING AND ENZYMATIC ACTIVITY OF *SULFOLOBUS ISLANDICUS* AND *LISTERIA MONOCYTOGENES* GLYCEROL KINASE

Presenter: Walis, Sara, Undergraduate, Chemistry

Mentor: Dr. Jon Friesen

Authorship: Sara Walis, Jon Friesen

Sulfolobus islandicus (Sisl) is an extremophilic archaea that survives in high temperature, high salt, and low pH conditions. This organism is utilized as a model system by many scientists to understand cellular processes. Another organism that survives in high salt, temperature, and bile conditions is the pathogenic bacterium *Listeria monocytogenes* (Lmon). This bacterium causes the food-borne illness listeriosis. Understanding the molecular processes of archaea and bacteria could lead to further development of treatments of illnesses.

Organisms such as *Sulfolobus* and *Listeria*, along with eukaryotes have a lipid membrane that serves as structure for the cell and is a site of molecular transport and molecular signaling. Many of the lipids found in the membranes contain the molecule glycerol as a backbone. A major precursor to glycerophospholipid synthesis in eukaryotes is glycerol 3-phosphate, which can be produced from glycerol through catalysis by ATP dependent glycerol kinase. Enzyme structure is determined by the protein's amino acids. Since the structure of *Sulfolobus islandicus* and *Listeria monocytogenes* glycerol kinase are not known, a known structure from the organism *Enterococcus casseliflavus* glycerol kinase (EcGK) was used for comparison. Upon analyzing the structure of EcGK the amino acids arginine, glutamate, aspartate, and tryptophan were conserved in all three organisms at the active site. Altering those amino acids could change the catalytic activity of the enzyme, potentially inhibiting or activating it.

The overall goal of this research is to isolate the gene that codes for glycerol kinase in both the Sisl and Lmon genome and express it in *E. coli* cells. For both organisms, glycerol kinase can be kinetically characterized to determine the catalytic efficiency of the enzyme. Site-directed mutagenesis is then carried out on the amino acids present in the active site. This process allows the alteration of nucleotides that could code for an amino acid of similar structure or an amino acid of a completely different structure. Upon alteration, the mutated enzyme can be kinetically characterized to determine the effects of the mutated amino acid on the catalytic activity.

COMMUNICATION

PRESIDENTIAL CANDIDATES' USE OF SOCIAL MEDIA: AN ANALYSIS OF PRESIDENT BOLA AHMED TINUBU'S UTILIZATION OF TWITTER

Presenter: Asare Kwakye, Isaac, Graduate, Communication

Mentor: Dr. John Baldwin, Communication

This study investigated the utilization of Twitter by Bola Ahmed Tinubu during the 2023 Nigerian presidential elections, focusing on how social media strategies influenced voter engagement and political discourse. The impacts of political campaigns in the United States have been extensively studied and U. S. campaigns are recognized as setting global standards for innovative organizational practices and voter mobilization strategies (Kluver et al., 2007).

Studies suggest the use of digital media. Particularly, social media platforms like Twitter, has become an essential tool for presidential candidates in American political campaigns (Jungherr, 2023; Kim et al., 2018; Richardson, 2023). However, a number of scholars (e.g., Miller, 2005; Miller et al., 2013, Shutter, 1990) have suggested that communication researchers have ignored many parts of the world, including Africa. Also, Nigeria, being Africa's most populous country and one of its largest economies, has a complex and dynamic political environment thus, understanding how social media is used in Nigerian political campaigns could offer insights into the strategies employed in a highly competitive and diverse political landscape. Using a qualitative analysis of Tinubu's tweets, I explored thematic areas including global image projection, campaign dynamics, policy advocacy, and high-profile endorsements. I applied Uses and Gratifications Theory, showing the active role of audiences in political communication. The in-depth analysis of Bola Ahmed Tinubu's Twitter engagement during the 2023 Nigerian presidential elections revealed several key strategic themes in his social media usage such as global image and diplomacy, campaign dynamics and strategic territorial engagement, strategic policy advocacy, and high-profile testimonial endorsement. The study offers insights into the evolving landscape of digital political communication in Nigeria, demonstrating the impact of strategic social media use on shaping political narratives and voter behavior.

“MEME-ING” FOR CHANGE: AN EXPLORATION OF GHANAIAN SOCIO-POLITICAL MEMES

Presenter(s): Elewosi, Millicent, Graduate, Communication

Mentor: Dr. Joseph Zompetti

Authorship: Millicent Elewosi

In a globally dynamic world where the line between the virtual and the physical is blurred, the power that memes exert in social change in both worlds cannot be underestimated. Meme scholars acknowledge the growing interest in its unfolding dynamism across cultures.

Specifically, in this study, I will shed light on how African cartoon memes have become a tool for enacting change in socio-political spheres. Analyzing three memes created by Ghana’s renowned artist, “Tilapia Da Cartoonist,” henceforth known as Tilapia, I employ a satirical criticism in conjunction with Burke’s Perspective by Incongruity to uncover how these memes publicly ridicule perpetrators and dismantle false notions propagated by the government. I conclude that Tilapia employed satire, incongruity, and indigenous artistic techniques to expose follies, dispute false notions, build resonance, and heighten audience consciousness to demand change in online spaces and the real world where economic and political crises affect citizens.

REPRESENTATION OF EASTERN EUROPEAN AND LATINA WOMEN ON AMERICAN TV: *JANE THE VIRGIN*

Presenter(s): Niftulaeva, Alina, Graduate, Communication

Mentor: Dr. John Baldwin

Authorship: Alina Niftulaeva

This research examines the portrayal of Eastern European and Latina women in *Jane the Virgin* through a feminist media studies lens. It tracks the evolution of these characters, initially constrained by stereotypes that gradually get challenged. While Eastern European women start in limited roles and Latina women struggle with traditional stereotypes, the series later presents more nuanced and multifaceted identities for them. The study emphasizes the influence of media on viewer perceptions and urges creators to offer authentic and positive portrayals. Despite its limitations, this research contributes to the dialogue on media representation, advocating for diverse narratives that challenge stereotypes and reflect human experiences across cultures.

RHYTHMS OF REFLECTION: UNPACKING MENTAL HEALTH THEMES IN THE MUSIC OF KANYE WEST AND MAC MILLER

Presenter(s): Nkanta, Edikan, Graduate, Communication

Mentor: Dr. John Baldwin

Authorship: Edikan Nkanta

In the realm of music, particularly rap, there is a growing trend of openly addressing mental health. The study addresses the limited scholarly exploration of mental health in rap by conducting a thematic analysis of Kanye West and Mac Miller's discography. A combined total of twenty songs from both artists was thematically analyzed. The themes that emerged were drug and substance use, suicide, anxiety, depression, and inner struggle. The study advocates for comprehensive mental health support mechanisms within the music industry and accessible resources to assist artists facing mental health challenges. Future research directions include addressing potential biases in thematic analysis, expanding the study to musicians from diverse genres, and exploring fan interpretations of artistes' mental health narratives.

STRATEGIES AND SOLUTIONS FOR BLACK STUDENTS AT HISTORICALLY WHITE INSTITUTIONS

Presenter(s): Polion, Danielle, Graduate, Communication

Mentor: Dr. Cheri Simonds

Co-Mentor: Dr. Bryon Craig

Authorship: Danielle Polion

The presence of mentorship has been widely acknowledged as a critical factor in the academic and professional success of students across various demographics. However, within the context of Historically White Institutions (HWIs), African American students face unique challenges that call for tailored mentorship dedicated to them. This literature review explores the significance of mentorship for African American students attending HWIs and its role in fostering their academic achievement, personal development, and sense of belonging. In conclusion, the literature review covers the indispensable role of mentorship in enhancing the academic success and overall well-being of African American students at HWIs. It advocates for comprehensive mentorship strategies that address the unique needs and challenges faced by this demographic group, ultimately contributing to greater diversity, equity, and inclusion within higher education institutions. This review of literature will serve as a needs analysis for an upcoming video project. This video project will highlight African American students at ISU and their mentorship's experiences. Once these students are interviewed, I will propose some recommendations for university support of this student population.

FREEDOM OF SPEECH IN THE CLASSROOM: ILLINOIS STATE UNIVERSITY

Presenter(s): Rey, Haley, Graduate, Communication

Mentor: Dr. Cheri Simonds

The debate between freedom of speech and speech regulation in higher education reveals a general lack of understanding among students and teachers. The rules within these academic contexts must stem from state and federal law and depend on circumstances.

For instance, regulation justification varies by campus space and the presence or absence of a syllabus contract in a public college or university. Research methods used in this study include interviews with lawyers, the dean of students, and graduate teaching assistants. The purpose of the present research is to provide accessible advice, policies, and practices for protected and permissible regulation guidelines in the state of Illinois, at Illinois State University, and within ISU's School of Communication, specifically looking at the regulation of speech topics in the Communication as Critical Inquiry (COM 110) program.

QUESTIONING GOD: A CRITICAL MEDIA ANALYSIS OF *KEEP SWEET: PRAY AND OBEY*

Presenter(s): Smith, Courtney, Graduate, Communication

Mentor: Dr. Andrew Ventimiglia

Netflix's *Keep Sweet: Pray and Obey* documentary shocked and amazed audiences by revealing the realities occurring within an extremist sect of Mormonism, the Fundamentalists of the Church of Jesus Christ of Latter-Day Saints (FLDS). With settlements throughout the United States, the FLDS is led by the now imprisoned prophet Warren Jeffs, encompasses over 10,000 members, and upholds strict beliefs and unyielding regulations. Utilizing a feminist critique to analyze the text, this paper identifies themes of female subservience, male control, silencing, and perversion were found. Avenues for future research could explore more texts and other frameworks to further understand life in this patriarchal closed religious community.

“IT’S LIKELY YOUR MOTHER’S FAULT:” DISCURSIVE CONSTRUCTIONS OF INCEL IDEOLOGY AND FEMALE FAMILY MEMBERS

Presenter(s): Wolff, Miriam, Graduate, Communication
Roller, Makayla, Graduate

Mentor: Dr. Lindsey, Thomas

Authorship: Miriam Wolff, Makayla Roller

Online incel (involuntary celibate) communities are known for misogynistic views, but research rarely examines the interplay of such perspectives and relations with female family members. Guided by social constructionist theory and the concept of “weaponized subordination,” this study aims to uncover if and how incels’ gender-based extremism manifests discursively. Researchers conducted a qualitative thematic analysis of 30 online incel forum discussion threads containing references to female relatives. Data were coded inductively, using an iterative constant comparative method of coding. Four primary themes emerged around incels’ discursive construction of predominantly mothers and sisters: (1) sexual degradation of female family members (2) normalization and encouragement of physical/sexual violence against female family members (3) blaming mothers as scapegoats for incelism (4) imposing traditional gender role expectations on female family members.

Despite familial ties, incels’ broader misogynistic worldviews permeate talk about female family members. This study provides evidence that online extremist indoctrination is related to a corrosion of domestic relations along gender lines. The research advances understanding of relationships at the intersection of misogynistic radicalization and family communication.

COMMUNICATION SCIENCES AND DISORDERS

MEMORY STRATEGIES UNDERLYING STRATEGIC PROCESSING IN AGE-RELATED HEARING LOSS

Presenter(s): Beilstein, Kathryn, Undergraduate, Communication Sciences and Disorders
Cunningham, Derian, Graduate, Communication Sciences and Disorders
Mentor: Dr. Shraddha Shende
Authorship: Kathryn Beilstein, Derian Cunningham, Shraddha Shende, Raksha Mudar

Hearing loss is one of the most common health-related conditions among older adults. There is emerging evidence that suggests age-related hearing loss (ARHL) is one of the most common modifiable risk factors for cognitive decline. However, the relationship between ARHL and higher-order cognitive functions, such as those employed during value-directed strategic processing, remains understudied. Furthermore, to date, no studies have looked at memory strategies used for performing value-directed strategic processing tasks in those with ARHL. The purpose of this study is to examine memory strategies used for value-directed strategic processing between older adults with ARHL and age-matched normal hearing individuals. This study included 17 participants with mild ARHL and 16 age-matched normal hearing controls. We used an in-house developed value-directed strategic processing task. Participants were shown word lists, with one word at a time. Some words were high-value words worth 10-points each and some were low-value words worth 1-point each.

Value was assigned based on letter case, such that uppercase [or lowercase] letters were worth 10-points [or 1-point] depending on the version used. At the end of each word list, participants were asked to recall as many words as possible, with the goal of scoring the highest number of points. Following these trials, participants were then asked if they used any strategies to aid in recall. The reported strategies were collated and were analyzed thematically to understand if, and how, the ARHL group differed from the normal hearing group in use of memory strategies. While a variety of strategies were used, both groups used association as the most frequent strategy. However, it was found that participants within the normal hearing group had a higher frequency of employing multiple strategies within their trials. The current findings are preliminary given that we had a small sample size. Further work is necessary to explore use of memory strategies during higher-order cognitive tasks in those with ARHL.

ACCESS TO HEARING HEALTH CARE IN THE U.S. FOR RURAL, CULTURALLY DIVERSE, AND AGING POPULATIONS: MOBILE HEALTHCARE

Presenter(s): Braasch, Julia, Undergraduate, Communication Sciences and Disorders
Hanger, Maggie, Undergraduate, Communication Sciences and Disorders
Clay, Taylor, Graduate, Communication Sciences and Disorders
Mast, Daniel, Graduate, Communication Sciences and Disorders
Whitcomb, Molly, Graduate, Communication Sciences and Disorders

Mentor: Dr. Antony Joseph

Authorship: Julia Braasch, Maggie Hanger, Taylor Clay, Daniel Mast, Molly Whitcomb, Dr. Antony Joseph

The primary aim of this project was to determine the prevalence, effectiveness, and financial implications of mobile health services and mobile audiology services in the United States. Various search terms were used across 3 databases and resultant articles were analyzed for relevancy. Mobile health units were found to be effective methods of healthcare across the country, particularly benefiting underprivileged groups in rural areas. Challenges such as financial constraints and transportation barriers impede healthcare access for underserved communities, including the elderly and homeless populations. We discovered that some mobile health units are located in urban areas but cannot provide care to those in need. Despite their efficacy, the cost of operating and maintaining a successful mobile health unit is high and challenging to sustain in the long term. While self-reported data from the U.S. Mobile Health Map indicated limited availability of mobile audiology clinics, existing units have had success despite challenges related to ambient noise levels and time-cost efficiency. Although several notable mobile audiology units exist throughout the country, additional resources are needed. We identified a research gap for mobile audiology services and there is a need for comprehensive studies examining the time, resources, and finances involved in establishing and maintaining mobile health and mobile audiology units in rural areas throughout the United States.

MY RESEARCH METHODOLOGY WAS GUIDED BY THE QUESTION: DO CHILDREN ADOPTED OUT OF FOSTER CARE EXHIBIT SOCIAL COMMUNICATION DIFFICULTIES, AND IF SO, WHAT TYPES OF DIFFICULTIES DO THEY EXPERIENCE?

Presenter(s): Giuffre, Caroline, Graduate, Communication Sciences Disorders

Mentor: Dr. Ciera Lorio

Authorship: Caroline Giuffre, Ciera Lorio

Children who have spent time in foster care are often subject to traumatic events during their early years. Research shows that exposure to early trauma is associated with various language difficulties. However, there is a lack of literature related to how time in foster care may impact social language skills. Time in foster care is associated with negative peer interactions and behavior problems. Behavior problems have the potential to negatively affect social development and cause difficulty in forming relationships with others. Frequent interactions and relationships with others are associated with a higher quality of life. As Speech-Language Pathologists (SLPs), our scope of practice includes social skills. This is a population that is likely being underserved in this area.

This survey study asked adoptive parents to report on their children's social skills. The survey questions were developed based on "Everyday Speech: A Social Language Learning Platform," which is an evidence-based curriculum used to teach social skills. After the first draft was developed, it was reviewed by multiple professionals in the field as well as a foster parent. It was then distributed via Facebook to parents who have adopted a child out of foster care between ages 5-17. The same survey was distributed to parents of biological children for comparison purposes. Data from the survey was analyzed and compiled into tables and graphs to illustrate general areas of challenge and strength that adoptive parents reported. Additionally, 5 follow-up phone interviews with adoptive parent participants were completed to gather qualitative data and see how it compared with the quantitative survey data.

Because of the complexity of the backgrounds of children with trauma, many of them have co-occurring disabilities in language or learning. Typically, academic concerns will take priority in the schools, and the schools are where these children are getting support services. However, if they are not given support for social language development, these children may be missing out on forming strong, meaningful relationships. The purpose of this research is to inform SLPs on potential challenge areas in social communication for this population, and clarify where or how to support these children. The ability to connect and engage with others is a lifelong skill, and these children need support so that they can not only succeed academically, but also form worthwhile, powerful connections throughout their lives.

ACCESS TO HEARING HEALTH CARE FOR VARIOUS POULATIONS USING TELEHEALTH AND TELE-AUDIOLOGY SERVICES

Presenter(s): Hanger, Maggie, Undergraduate, Communication Sciences and Disorders
Braasch, Julia, Undergraduate, Communication Sciences and Disorders Taylor Clay,
Graduate, Communication Sciences and Disorders
Daniel Mast, Graduate, Communication Sciences and Disorders
Molly Whitcomb, Graduate, Communication Sciences and Disorders
Mentor: Dr. Antony Joseph

The primary aim of this project was to determine the prevalence of tele-health in the United States, specifically within the field of audiology. Tele-health is a service delivery method that employs telecommunication technologies for the evaluation and management of patients and families virtually. A literature search was conducted to describe how tele-health has been implemented by health clinics. We determined that tele-health has proven to be capable of extending healthcare and making it more accessible and affordable to various populations. Due to its longevity, tele-health was adopted by allied health specialists such as audiologists (e.g., tele-audiology) to provide services for populations who could not be physically present in the clinic; however, the tele-audiology service delivery model presents some challenges. Problems may arise with access to, and the ability to properly use, technology such as secure internet connectivity, ambient noise reduction, and the availability of easy-to-use technologic devices. Yet, it appears that the benefits of tele-audiology generally outweigh most of the competing difficulties. This investigation of the literature demonstrated that tele-health has been available and in use for many years, increasing significantly because of the *COVID-19 Pandemic*, although tele-audiology has been less popular but has continued to evolve with the scope of clinical audiology.

AN ANALYSIS OF FATHERS' AND TODDLERS' BEHAVIORS DURING SHARED BOOK READING

Presenter(s): Kelly, Caitlin, Graduate, Communication Sciences and Disorders

Mentor: Dr. Ciera Lorio

Authorship: Caitlin Kelly, Ciera Lorio

Shared book reading interactions between parents and their children have been studied to draw correlations to a child's vocabulary growth, language development, mathematical scores, and socioemotional skills. However, there is a lack of research regarding fathers' and toddlers' engagement and behaviors during shared book reading interactions. The current study investigated and analyzed father and toddler interactions during shared book reading. The data was collected from a larger longitudinal study. Seven father-child dyads participated in the study ($M_{age} = 35$ years; range = 30-43 years). The children included four males and two females, and up to two videos were collected for each child at 18 and 24 months. A total of eleven shared book reading videos were collected and coded for parent and child behaviors. All videos were coded using a comprehensive coding manual, and results of the coding revealed fathers and toddlers displayed a wide range of communicative behaviors. Fathers' most common behaviors were modeling language and making comments about the text while reading to their children. The main behaviors toddlers engaged in were commenting, responding, and behaviors showing understanding of print concepts (e.g., turning pages, holding books correctly). At 18 months, toddlers exhibited commenting and responding behaviors through vocal, gestural, and verbal means, and these behaviors increased in frequency when children were 24 months old. This increase was most likely due to children meeting more advanced spoken language milestones at 24 months of age (e.g., increased expressive vocabulary, use of 2+ word utterances). The results of this study will contribute to the limited literature on father-child shared book reading with children under the age of three years.

COMMERCIAL FOOD FOR PATIENTS WITH SWALLOWING DISORDERS

Presenter(s): Kravik, Sheridan, Undergraduate, Communication Sciences and Disorders

Mentor: Dr. Taeok Park

Introduction: When a patient is diagnosed with a swallowing disorder, they're placed on a new diet that focuses on the consistency of food based on swallowing evaluations. Diet modification is used to reduce the burden of swallowing impairment and increasing safety. The purpose of this project was to investigate the available commercial dysphagia food.

Methods: Seven dysphagia food companies were selected: Simply Think, Thick & Easy, Thik & Clear, Thick It, Thicken Up, Ready Care, and Nestle. These dysphagia brands are commonly used for patients with a swallowing disorder (Garcia et al., 2005). The data was collected from the official dysphagia food companies' website.

Results: Results indicate that the extremely thick level is the most common and the slightly thick level is the least common level of consistency. Further, individuals diagnosed with a slightly thick level dysphagic diet will encounter more of a challenge discovering foods that are safe for them to swallow. The extremely thick level data shows eight different flavors of foods ranging from \$1.298 to \$6.2857 per serving. The slightly thick level data shows one flavor of a food thickener at \$0.4795 per serving.

Conclusion: The benefits of diet modification are that patients can maintain their nutrition through diet modification. This project found a lack of variety of foods for different levels of consistency for patients with swallowing disorders. It is necessary to develop more dysphagia food to improve the quality of life for these patients.

ENHANCING UNDERSTANDING AND INTEREST IN BILINGUAL SPEECH-LANGUAGE PATHOLOGY: THE IMPACT OF A COMMUNICATION SCIENCES & DISORDERS JOURNAL CLUB

Presenter(s): Lopez, Jessica, Undergraduate, Communication Sciences & Disorders

Mentor: Dr. Lidia Huerta

Authorship: Jessica Lopez, Lidia Huerta

Numerous studies encourage preservice training on culturally and linguistically responsive care (CLRC) to enhance future speech-language pathologists' self-efficacy in serving individuals from diverse backgrounds with communication disorders. Early exposure to CLRC during preservice training is crucial, as it not only equips future clinicians with essential skills but may also spark interest in areas of the field they might not have previously explored.

Moreover, journal clubs have been recognized for enhancing knowledge in specific areas outside of conventional academic settings (e.g., classroom; Ebbert et al., 2001). These gatherings provide opportunities for individuals to engage in discussions centered around selected professional literature. Thus, journal clubs create a platform for social and intellectual exchange to share ideas, thoughts, feelings, and reactions. By reading and discussing professional literature in the community, journal clubs may expand existing conceptual frameworks related to bilingual speech-language pathology (SLP).

The Communication Sciences & Disorders (CSD) journal club began with the interest of students wanting to learn more about bilingual SLP. Discussions on various topics about bilingual SLP, such as cultural and linguistic considerations when serving bilingual children (Hoff & Core, 2015), clinicians' self-efficacy in serving culturally and linguistically diverse communities (Santhanam & Parveen, 2018), and strategies SLPs may consider when serving individuals from diverse communities (Johnson & Hall, 2020), promoted a deeper understanding and interest in bilingual SLP. As a result, the CSD journal club may broaden students' knowledge and interest in this specialty area, foster the advancement of competency in CLRC, and advance students' exposure to culturally responsive research in the field. As such, this study aimed to assess the journal club's impact on participants' understanding of bilingual speech-language pathology and explore changes in students' interest in bilingual SLP after attending the journal club sessions.

During the Fall 2023 term, the CSD journal club met three times to discuss selected peer-reviewed research on bilingual SLP. At the end of each journal club meeting, participants of this study completed a survey using a 5-point Likert-type scale to measure agreement. The items asked participants to provide their insight on how the journal club meeting impacted their interest and understanding in bilingual SLP. The results of this study will be shared at the presentation.

ECONOMICS

LONELINESS AND ITS EFFECTS ON EDUCATION AND EMPLOYMENT

Presenter(s): Riffle, Samuel, Graduate, Applied Economics

Mentor: Dr. Dimitrios Nikolaou

Authorship: Samuel Riffle

In this paper, I examine loneliness and its relationship with education and employment using panel data from the 1999-2021 waves of the Swiss Household Panel. I develop a theoretical model for the production of loneliness and its role in the production of outcomes. I estimate this as a structural model using education and employment as outcomes. The results support the theoretical production function for loneliness with non-cognitive skills, relational investment, and periodic shocks as inputs. However, results do not support the role of loneliness as a significant factor of production for education, or employment beyond a small indirect effect. This disagrees with the predicted negative effects in each production function. My results provide the groundwork for the factors of production for loneliness and its effects on various outcomes. Additionally, they have implications for future policies aimed at mitigating the effects of loneliness.

EDUCATIONAL ADMINISTRATION

THE TALE OF TWO LIVES: GRADUATE STUDENTS WORKING PART-TIME TO SURVIVE

Presenter(s): Flores-Lerch, Tatum, Graduate, Educational Administration
Botts, Maddy, Graduate, Educational Administration

Mentor: Dr. Gavin Weiser

Being a Graduate Student in any instance is not easy. Our focus is on experiences of being a full-time graduate student, working a 20-hour assistantship, and working part-time while balancing life. Our research is a representation of not only who we are, but the resilience and dedication we possess within ourselves. Our photovoice research highlights the highs and lows of the graduate student experience and starts a conversation about the authentic struggles of graduate students.

ENGLISH

EPISTEMIC VIOLENCE, INTELLECTUAL CLEANSING, AND JUSTICE IN BANGLADESH

Presenter: Mizan, Ridita, Graduate, English

Mentor: Prof. Rebecca Saunders

Co-mentor: Dr. Ela Przybylo

The Shahbag Movement of 2013 in Bangladesh initially arose to seek justice for war crimes committed during the 1971 liberation war. However, the trajectory of this movement, which initially advocated political accountability and judicial independence, took an unexpected turn as it was co-opted by political leadership. This poster shows that the Shahbag Movement and its aftermath represent another chapter in the ongoing intellectual cleansing of Bangladesh. The intellectual cleansing, as presented in this poster, is intricately linked to the political economy of epistemic violence. The poster provides an understanding of the positionality of intellectuals within the secularist civil society of Bangladesh, whose advocacy for so-called Western ideals gets obstructed due to strategic and systematic cleansing aiming to erase plural histories and thwart the pursuit of justice in the country. The poster shows how geopolitical power struggles manifest in this intellectual cleansing, deliberately hindering the progression of pluralism in Bangladesh. Drawing from Nishat and Hossain's research analyzing the killing of Bengali intellectuals during the country's Liberation War through the 1948 Genocide Convention, this poster urges a reinterpretation of the convention to recognize intellectuals as a distinct protected group. However, this poster opts for the term 'intellectual cleansing' instead, to precisely describe the calculated elimination of the intellectual group, if not class. Based on these ideas, the poster argues that the epistemic violence the country has been experiencing is perpetuated through cultural imperialism and neocolonialism by various internal and external influences. It shows how dealing with multiple elite hierarchies has resulted in conflicting and contradictory currents among the mass people of Bangladesh, which has manifested in tunnel vision and mob mentality in them. By discussing these issues, the poster brings to light the political economy of epistemic violence in the country. It connects the cultural and psychological warfare with the ongoing intellectual cleansing of Bangladesh and raises questions about Bangladesh's identity as a sovereign nation capable of democratic evolution. As its citizens continue to be compelled to self-censor, lead diasporic lives, or even seek asylum, the poster emphasizes the urgent need to address the country's struggles with intellectual freedom and democratic values. Thus, the poster contributes to the understanding of Bangladesh's socio-political landscape, exploring the connections between the Shahbag Movement, intellectual cleansing, and the political economy of epistemic violence and their implications in the pursuit of justice in Bangladesh.

VOCABULARY TEACHING & LEARNING STRATEGIES IN GHANAIAN SENIOR HIGH SCHOOLS

Presenter: Neequaye, Ishmael, Graduate, English

Mentor: Prof. Kristina Lewis

Ghafir and Mohamedamin's (2022) research indicates that learners regard vocabulary acquisition as the most pivotal aspect of language acquisition. While there exists a plethora of studies on Teaching English as a Second Language, within the Ghanaian context, there remains a lot to be done. Reports from the West African Examination Council in Ghana indicate that the performance of students in English as a compulsory subject of study has been on the decline since 2018. This situation has limited the chances of many high school graduates who wish to enroll in tertiary institutions. Among the factors that influenced this performance include recurrent spelling errors, dearth of students' vocabulary, poor comprehension of questions asked, poor interpretation of feedback on the part of the student (Agyei, 2019). Lanfeng and Anokye (2018) indicate that many ESL and EFL teachers are unclear about how to teach vocabulary. According to Mohammed (2023) teachers and students have neglected vocabulary acquisition strategies, despite their proven usefulness. Given the dearth of research in the Ghanaian context pertaining to vocabulary instruction, the primary objective of this study was to provide an initial overview of the vocabulary acquisition methodologies employed by educational institutions in Ghana at the secondary level. The study was guided by Vygotsky's 1978 social constructivism theory. Being a pilot study, semi-structured interviews, and Focused Group Discussion (FGD) were used to collect data from 20 participants: 10 English Language teachers 10 Students. The interview as well as the FGD explored the aim of vocabulary teaching, the teaching and learning strategies of vocabulary acquisition as well as challenges behind the practice and suggested solutions. With the participants' consent, data was recorded, transcribed and themes were generated together with their supporting claims. The responses concerning the 6 research questions were analyzed thematically. The study revealed that the goal of vocabulary instruction is to develop the proficiency skills of learners. Again, the study revealed that 90% of the participants used incidental approaches to vocabulary acquisition. These strategies which affirm Parviz Ajideh study in 2013 included guessing, reading, using dictionaries and vocabulary journals. Given that English is both the official language and the prerequisite for tertiary education in Ghana, I recommend that, in addition to the incidental approach, both English teachers and second language learners approach the study of vocabulary intentionally with consideration for its practical application and relevance beyond the classroom as opined by vocabulary learning researchers (De la Fuente, 2006; Laufer, 2005).

AN-OTHER 'POVERTY PORN' OR PERHAPS AN-OTHER NARRATIVE IN NEED OF A NEW NAME?: RE-IMAGINING UTOPIA IN NOVIOLET BULAWAYO'S 'WE NEED NEW NAMES'

Presenter(s): Nelson, Sheilla, Graduate, English
Mentor: Dr. Ela Przybylo
Co-Mentor: Prof. Rebecca Saunders
Authorship: Sheilla Nelson

About a decade after its inception, the now AKO Caine Prize for African Writing (nicknamed the 'African [Man] Booker' Prize) came under critical attack for a pattern of awarding the prize to African writers whose short stories allegedly made for the perfect 'African Poverty Porn' (APP), a literary trope born from a curious mix of many African writers' anxiety to repeat and perpetuate stereotyped narratives about Africa, and to be validated and anointed by white gaze and glory. Chimamanda Ngozi Adichie (2002 finalist) and Binyavanga Wainana (2002 winner) were some of the most vocal critics, with Wainana writing his famous satirical article, *How to Write About Africa*. The perfect APP is a story about war, hunger, HIV AIDS, corruption, economic regression, lack of social amenities and infrastructure, breakdown of democracy and political leadership – and ultimately, utter material poverty. In 2011, when said critical attacks were rife, NoViolet Bulawayo won the prize, with her short story, *Hitting Budapest*, which later turned out to be the first chapter of her novel, *We Need New Names*. Like many African writers who were adjudged finalists and or winners of the prize, Bulawayo was quickly propelled into visibility and further re-/awards, most of which remain outside of and or not exactly Africa(n), just like the Caine Prize itself. Despite having followed this part of the pattern, the case of Bulawayo and her *We Need New Names* is quite delicate, at the very least, if not an arguably exceptional case. With explicit details and graphic images of Robert Mugabe's regime in the 2000s' Zimbabwe, and with the story largely told with the simple and innocent truth and wisdom of a set of children's Point of View, *We Need New Names* easily fits the APP trope. Further deepening Bulawayo's novel committing the sin of this trope is how numerous academic papers always and readily name America as the utopia in the novel – America being where Darling, a/the major character in the story, migrates to, and where the second half of the story is set. This paper, however, argues that before and transcending the albeit readily obvious America(n) utopia in the novel, and mainly through the relatively obscure MotherLove character, there is a utopia in the story, and specifically, right in the rather ironically-named Paradise setting in the novel. Altogether, this paper proposes not only a re-imagination of what existential realities utopia consists of, but also, of the said perfect African Poverty Porn literary trope.

CONCEPTUALIZING THE SPATIO-CULTURAL PLASTICITY OF AFRICAN LITERATURE IN THE GENDER AND QUEER DISCUSSIONS

Presenter: Tetteh, Kelvin, Graduate, English

Mentor: Dr. Ela Przybylo

In this study, using a Ghanaian play text, I argue that to create literary works in Africa that champion LGBTQI rights, the cultural setting must be engaged in negotiations of its thoughts/borders towards genderism. African society is conservative and prides itself in values traditionally buried in a constructed morality. The challenge lies in the plasticity of these values and norms, which must be negotiated with.

The LGBTQI community in Africa faces challenges in navigating social contracts, societal norms, values, self-categorization, and the plasticity of factors such as legal factors. The history of the public acceptance of LGBTQI in the United States will reveal inclusions from subtle to bold statements of pro-LGBTQI characters, subjects, and themes in literary arts. It takes gradual absorption, time, notional and national negotiations, and renegotiations for a practice that is not common within a cultural space to become a norm.

Catherine Malabou, a French philosopher, emphasizes the concept of plasticity as a thought process that can either change shape or destroy shape. In the African cultural space, introducing new identities can disrupt pre-existing social contracts that guide self-identification and self-categorization. This disruption can lead to cultural turbulence and the shifting of borders to accommodate these new identities. The plasticity of psychological and social identities argues that once the brain is capable of being shaped and altered, it challenges deterministic beliefs on human nature. It allows for both individual and collective activity, as well as responsibility for constructing one's own identity and the societal institutions that influence it (Malabou, 91).

I propose that in the contemporary age of digitally influenced sexual, biological, and political self-creation, African literature has the potential to reform or explode social norms. The spatio-cultural climate of Africa is different from the Western cultural climate, and the legal and legislative approach to getting the culture to open to LGBTQI in Africa is ineffective and counterproductive. African writers must push for and test this social plasticity because it is evident that literary arts movements such as the Harlem Renaissance, American Renaissance, and English Renaissance points to the efficacy of literature in cultural changes and definitions.

FAMILY AND CONSUMER SCIENCES

GEN-Z'S TOP CLOTHING BRANDS IMPACT ON SUSTAINABILITY

Presenter(s): Monino, Janelle, Undergraduate, Family and Consumer Sciences

Mentor: Dr. Yoon Jin Ma

Authorship: Janelle Monino, Yoon Jin Ma

The fashion industry has been progressively harming the environment by increasing carbon emissions, using abundant water and energy sources, and growing waste. Brands are now implementing sustainability measures by creating products made from raw materials, administering zero carbon and waste campaigns, and using sustainable manufacturing techniques as solutions to improve these conditions. Fast fashion is inexpensive clothing that is mass-produced with the entire production process taking just weeks to complete. It is a contributor to the state of the environment because companies are using intense practices to get their products finished in a short amount of time. Fast fashion began in the late 1990s and early 2000s while continuing to rapidly increase with the growth of online retailers. One of its causes is the overproduction of apparel which has led to a trend of customers overconsuming. Consumers are now becoming aware of these harms and desire to purchase from companies that are taking sustainable measures. The purpose of this research was to analyze Gen-Z's top five clothing brands' impact on sustainability to confirm if they are being truthful in their work to reduce harmful methods. The five clothing brands that were investigated are Nike, Lululemon, American Eagle Outfitters, Pacsun, and Shein. Using content analysis, the data were collected from the brand's website as well as scholarly sources to verify the company's sustainability efforts. This topic is important to inform people of the problems fast fashion has created and why it is necessary to support brands that are taking sustainable actions. The findings will help educate consumers on how to make more conscious and responsible decisions when deciding what companies they should purchase from.

GEOGRAPHY, GEOLOGY, AND THE ENVIRONMENT

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

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

Mentor: Dr. Eric Peterson

Authorship: Aminat Abdulsalam, Eric Peterson, Jonathan Thayn

In the U.S. Midwest, where fertile soils with high water retention are prevalent, the installation of tile drainage networks have become a common practice to drain excess soil water, which enhances plant growth and increases crop productivity. However, tile drainage networks coupled with the use of inorganic fertilizers have significant implications on water quality, contributing to eutrophication, leading to harmful algal blooms, and resulting in hypoxic conditions in surface water bodies. To mitigate excess nutrient exports to surface water bodies, edge-of-field practices have been introduced. One such practice is the saturated riparian buffer (SRB), which utilizes a diversion system to redirect tile drainage water from an agricultural field into a riparian buffer rather than directly discharging into a stream. As a best management practice, SRBs have been shown to reduce nitrate loads delivered to surface water by increasing the travel time of nutrient- rich waters through soils and exposing the nutrients to soil processes. Examining six years (2015-2021) of data from a SRB, this research investigated trends in the nitrate as nitrogen (NO₃-N) concentrations of the groundwater upgradient (independent) of the diversion system as compared to waters downgradient (dependent) of the diversion system during tile flow and examined the duration of time the tile water influences the SRB. A mixed effect model analysis of the data identified a positive relationship between NO₃-N concentrations in the downgradient groundwater and the volume of diverted tile flow. However, the NO₃-N concentrations in the upgradient groundwater decreased as the tile discharge increased. The difference in the response between the upgradient and downgradient waters highlighted the influence of the diverted tile water on the SRB. In the absence of flow, the concentration of NO₃-N in the downgradient groundwater continued to increase up to two weeks before declining after three weeks. After five weeks, the concentration of NO₃-N in the downgradient groundwater returned to its initial concentration before tile flow. On a year-to-year basis, NO₃-N concentrations within the SRB remained stable, indicating that there was not a long-term accumulation within SRB.

THE INFLUENCE OF TILE FLOW AND THE TRANSPORT -FATE OF NITRATE IN A SATURATED RIPARIAN BUFFER: A CASE STUDY IN CENTRAL ILLINOIS

Presenter(s): Akrofi, Benedicta, Graduate, Geography, Geology, and the Environment

Mentor: Dr. Eric W. Peterson

Illinois has fertile but poorly drained soils, resulting in the installation of tile drainage systems. Tiles drain soil water from agricultural fields directly into streams, short-circuiting the soil's role in nutrient cycling and contributing to elevated nitrate as nitrogen ($\text{NO}_3\text{-N}$) concentrations in surface waters. Most $\text{NO}_3\text{-N}$ exports from tile-drained watersheds in the Midwest occur from January to June, corresponding to periods of tile flow. The diversion of tile-drained water into a saturated riparian buffer (SRB) has been shown to reduce $\text{NO}_3\text{-N}$ concentrations, but what happens in the vadose zone near the tile in terms of water flow and nitrate transport - fate is unknown. The vadose zone is a critical nitrogen storage location and foci for biogeochemical processes utilizing nitrate. This study examined the influence of tile flow on water movement in the vadose zone and the transport and fate of nitrate in an SRB. Nitrate sampling began in April 2023 and ended in December 2023, representing conditions when the tiles are running versus periods when the tiles are not running. During the period of tile flow, mean $\text{NO}_3\text{-N}$ concentrations in the vadose zone waters at depths 0.3 m and 0.60 m below the surface were 0.68 mg/L and 0.50 mg/L, respectively. The tile water had a mean of 10.44 mg/L, while in the groundwater, drawn from wells screened 1.5 m below land surface, concentrations were 0.80 mg/L upgradient of the diversion tile and 6.97 mg/L downgradient of the tile. A one-way ANOVA indicated that the $\text{NO}_3\text{-N}$ concentrations within the waters of the vadose zone and upgradient of the tile were significantly different from the downgradient and tile waters. The data suggest the tile has an influence on the downgradient of the tile compared to the vadose zone waters and upgradient of the diversion tile. By the end of May, tile flow had ceased corresponding with a lowering of the groundwater table. During the drier conditions, no tile flow, the lysimeters did not yield water even after heavy rains. The inability to draw water from the vadose zone suggest any available water is being withdrawn by the plants.

INVESTIGATING HETEROGENEITY AND ITS INFLUENCE ON GROUNDWATER DYNAMICS WITHIN A SATURATED RIPARIAN BUFFER IN CENTRAL ILLINOIS USING HYDRAULIC CONDUCTIVITY

Presenter: Awuku, Joseph, Graduate, Geography, Geology, & the Environment

Mentor: Dr. Eric Peterson

Authorship: Joseph Awuku, Eric Peterson

The use of Saturated Riparian Buffers (SRBs) as a means of reducing contamination of surface and groundwater resources has gained popularity due to their ability to retain water and remove solutes through physicochemical processes such as plant uptake, denitrification, and microbial breakdown. Studies on the effectiveness of SRBs in floodplain water resource management have increased in areas of high agricultural activities where there is extensive use of various plant fertilizers to increase crop yield. However, a greater percentage of these studies have mainly targeted the biological and chemical activities within SRBs that contribute to improved solute removal with a minimal focus on how the physical properties of SRBs such as the heterogeneity of hydraulic conductivity (K) which directly controls the fluxes of water and solutes removal efficiency within SRBs. Therefore, the objective of this study is to investigate the spatial heterogeneity in K and its contributions to groundwater dynamics within an SRB adjacent to an agricultural farm field drained with tile in central Illinois (T3 Site). Geometrically averaged hydraulic conductivities obtained from slug tests on wells installed in the study area will be used for this study. In addition to the slug test data, hydraulic head measurements obtained from water level measurements will be used to determine the hydraulic gradient distribution within the study area. The quantity of groundwater discharge between different geologic units in the study area would then be computed using Darcy's equation from the hydraulic conductivity and hydraulic gradient measurements. ESRI's ArcGIS Pro would be used to generate a spatial heterogeneity map of K at a specified depth of 2.3 m for the study area using the kriging interpolation tool. It is expected that hydraulic conductivity would vary at least by an order of magnitude in response to the differences in weathering within the subsurface materials resulting in the presence of preferential flow paths and differences in groundwater-specific discharge. The expected direction of water flow is lateral, from the east to the west, with some areas in the study areas experiencing upward flow in response to the reversal of hydraulic head gradient. The ultimate effect of the heterogeneity in hydraulic conductivity is then expected to result in different volumes of water exchanged at different locations within the study area, where areas of lower hydraulic conductivity would dissipate the least amount of water and vice versa.

APPLICATION OF FLOATING WETLANDS TO IMPROVE URBAN STREAM QUALITY

Presenter: Chukwudi, Daniel, Graduate, Geography, Geology, and the Environment

Mentor: Dr. Eric Peterson

Authorship: Daniel Chukwudi, Eric Peterson

Urbanization has significantly altered natural landscapes, leading to the development of urban stream syndrome characterized by degraded ecological health and water quality issues. One major source of nutrients in urban streams is stormwater runoff as a result of impervious surfaces within the urban catchment. To address nutrient pollution in urban streams, floating wetlands have emerged as an in-situ phytoremediation of urbanization on stream ecosystems. Using a floating wetland system constructed within a portion of the Chicago River as a case study, this work aims to answer the following questions: 1) Do floating wetlands lower nitrate and phosphate concentrations of the river? 2) Are there seasonal differences in the effectiveness of floating wetlands in lowering nutrient concentration within the water column? To address this first question, two hypotheses were proposed: I) Nitrate concentrations of the waters upstream from the floating wetlands will be higher than the concentrations downstream of the waters. II) Phosphate concentrations of the waters upstream from the floating wetlands will be higher than the concentrations downstream of the waters. To address this second question, one hypothesis is proposed: I) The floating wetland will exhibit seasonal variation (during the growing and dormant season) in lowering nutrient concentration downstream the floating wetland. To test these hypotheses, water samples will be collected upstream and downstream of the floating garden at two depths during each sampling event: at the water surface and at 0.3 m below the water surface during both the growing (April-September) and dormant seasons (October – December). The water samples will be analyzed for nitrate, phosphate, and other major anions (chloride, bromide and sulfate) using ion chromatography (IC). The concentrations of nitrate and phosphate will be analyzed statistically. We expect the result of the study to show that floating wetlands remove nitrates and phosphate and are more effective during the growing season. This research aims to demonstrate the potential of floating wetlands as a sustainable and effective solution for improving water quality in urban streams impacted by urbanization.

SPECTRUM OF THE LAKES: UNVEILING WATER COLOR OF MINNESOTA'S SENTINEL LAKES WITH SATELLITE REMOTE SENSING FOR WATER QUALITY MONITORING

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

Mentor: Dr. Wondy Seyoum

Authorship: Andrew Dooley, Wondy Seyoum

Surface waters are precious natural resources requiring costly time and labor for effective water quality monitoring. New applications of water color analysis by satellite remote sensing are a promising 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 chromaticity analysis for midcontinent lakes in Minnesota, USA. The results of this project are the first accounts of Minnesota's Sentinel Lake water color, variability of water color by ecoregion, and temporal consistency of water color within major ecoregions. Minnesota state research initiative, Sustaining Lakes In a Changing Environment (SLICE), ordains "Sentinel Lakes" as representative of lake populations within major ecoregions of Minnesota.

Following launch in 2013, NASA's Landsat 8 OLI satellite services a growing public record of Earth's surface reflectance in the visible spectrum. Generational improvements of the Landsat 8 OLI sensor introduced capabilities for remote sensing of smaller terrestrial surface waters.

Chromaticity analysis interprets dominant visible wavelength from water surface reflectance, quantifying water color. Visible light reflectance from the deepest area within each Sentinel Lakes was gathered during the late summer of 2013 – 2022. The late summer months represent peak insolation and bolstered trophic activity. A decade analysis of Sentinel Lake water color was documented. Ecoregional differences show varying color prominence, more red colors in the Northeastern and Southern parts of the state. Statistical analysis of water color demonstrates a preferential water color for lakes in an ecoregion. However, uniqueness of color was not statistically definable. Majority of Sentinel Lakes demonstrate a historically decreasing wavelength trend. Decadal patterns operate as instructive bounds to implement further investment to a hydrologic anomaly. Noticeable natural variation in the Canadian Shield ecoregion water color is attributed to forested catchment and undisturbed hydrology. Land use and climatic factors are of important consideration in continuing to develop a predictive water color model to improve existing water quality monitoring networks.

UNDERSTANDING NITRATE REDUCTION IN A SATURATED RIPARIAN BUFFER USING A THREE-DIMENSIONAL REACTIVE CONTAMINANT TRANSPORT MODEL

Presenter: Ijigade, Franklin, Graduate, Geography, Geology, and the Environment

Mentor: Dr. Wondessen Seyoum

Authorship: Franklin Ijigade, Wondessen Seyoum

The exponential rate of nitrogen fertilizer applied to agricultural farmland, aimed at increasing crop productivity, has led to the leaching of nitrate beyond the root zone. This leaching occurs through the discharge of subsurface tile flow, leading to nitrate contamination in water bodies. The State of Illinois applies around 7.7 billion kilograms of nitrogen fertilizer to corn fields annually. This has become a major regional concern, as it threatens the terrestrial environment and aquatic ecosystems, causing dead zones due to eutrophication. To mitigate this problem, various management practices, such as the Saturated Riparian Buffer (SRB), were implemented. Natural and anthropogenic inputs of nitrate load under certain hydrogeological conditions, such as hydraulic conductivity and subsurface thickness, play a pivotal role in controlling nitrate reduction in SRB. The objectives of the study are to (1) assess how the variability of subsurface thickness affects nitrate reduction in the SRB; (2) evaluate how various inputs of nitrate load (mass) affect nitrate reduction within the (SRB); and (3) quantify the mass of $\text{NO}_3\text{—N}$ transported out of the SRB. Hence, this study will employ a 3D reactive contaminant transport model that will be used as tool for understanding nitrate transport and fate within an agricultural area. The model will be developed in Groundwater Modeling System software and will consist of three geologic layers ranging from the dark rich organic topsoil, mix of silty-clay thin sand unit, and diamicton, that will used to build the hydro-stratigraphy of the model. No flow boundaries will be assigned at the north and southern boundaries of the model, specified head at the east, the head-dependent boundary at the west, and recharge and no flow boundary at the top and bottom of the boundary, respectively. Water samples will be collected during Spring, Fall, and Winter for nitrate sampling and water level from 38 wells as well as from the stream adjacent to the study area, which will be used in calibrating the reactive transport model. The mass budget calculation from the model scenario analysis will be used to estimate the mass of nitrate out of SRB. It is expected that nitrate reduction should be highest during the Spring compared to nitrate reduction in the Fall and Winter due to the influence of tile flow. This study will help implement effective SRB designs and enhance our understanding on the efficiency of the Saturated Riparian Buffer in reducing nitrate pollution from agricultural runoff.

DELINEATING SULFATE SOURCES IN WATERS WITHIN AN AGRICULTURAL AREA< MCLEAN COUNTY, CENTRAL ILLNOIS

Presenter: Obi, Christabel, Graduate, Geography, Geology, and the Environment

Mentor: Dr. Eric Peterson

Authorship: Christabel Obi, Eric Peterson

Increasing sulfate (SO_4^{2-}) concentrations in the water environment, corresponding with increases in urbanization and industrialization, are rising global concerns. This threatens human health and the ecosystem and geological processes, such as the weathering of carbonate rocks, which contributes to the evolution of the global carbon cycle. Identifying sources of sulfates, natural or anthropogenic, in the water environment is essential in understanding the transport and fate of sulfate. This study focuses on understanding the origin and transport of SO_4^{2-} in groundwater in a saturated riparian buffer (SRB) zone adjacent to an agricultural field in McLean County. Water samples will be collected in addition to pre-existing data that spans eight years (2015-2023) collected from thirty-seven observation wells at the study site to analyze the major contributors of SO_4^{2-} at the study site and observe trends that exist between the SO_4^{2-} concentrations in the water samples with seasonal changes within water types from the study site. To assess seasonal changes, seasons will be subdivided according to equinoxes and solstices, corresponding with agricultural practices: spring/planting (April - June), summer/growing (July - September), fall/harvest (October - December), and winter/fallow (January - March). The water samples will be analyzed for SO_4^{2-} concentrations. Results from these analyses will be used to (1) identify the number (s) of contributory population of SO_4^{2-} using cumulative probability plots calculated with SO_4^{2-} concentration values and (2) assess variations in sulfate concentrations under the conditions of seasonal changes and tile conditions among the different subgroups using a two-way ANOVA test. It is expected that there will be two contributing sources of sulfate in the study area, with agriculture contributing the larger percentage. Also, sulfate concentrations are expected to be higher in the fall and winter than in the spring and summer seasons. A full understanding of sulfate dynamics in the study area would be important for future decisions on environmental management in the area.

PROVENACE ANALYSIS OF THE PALEOGENE STRATA AT PUMPKIN BUTTES, POWDER RIVER BASIN, WYOMING

Presenter(s): Saul, Celeste, Undergraduate, Geography, Geology, and the Environment

Mentor: Dr. David H. Malone

Authorship: John Craddock, Adam Trzinski, Josh R. Malone

The Powder River basin is among several yoked inter-montane basins that occur within the Laramide foreland. More than 2000 m of Paleogene synorogenic strata fill the basin, which consists of the Fort Union and Wasatch Formations. Pumpkin Buttes are in the southwestern area of the Powder River basin; ten to twenty meters of conglomeratic sandstone and mudstone of the post-Laramide Oligocene White River Formation caps the buttes. Our broad goal is to characterize the provenance of White River Group strata of the Rocky Mountains and Great Plains and the late Paleogene burial of this region. Here we present detrital zircon data (LA-ICPMS at the Arizona Laserchron Center) for the matrix of the basal conglomeratic sandstone at Pumpkin Buttes ($n=104$). The youngest zircon fraction is middle Eocene in age, indicating a maximum age of deposition of ~46 Ma. These zircons were likely sourced by the Absaroka volcanic field 250 km to the west. The principal age peak is ~1460 Ma, which was likely sourced from basement-cored Laramide uplifts in central Colorado more than 500 km to the southwest. The age spectrum also includes smaller Yavapai (geon 17) and Archean (geon 27 and >geon 30) age peaks. The Yavapai zircons were likely derived from central Colorado, whereas the Archean zircons were likely sourced from the Beartooth and Tobacco Root Mountains of southwest Montana more than 350 km to the northwest. Thus, the zircon age spectrum reveals a variety of distal sediment source areas, mainly from the tops prominent mountain ranges. Our data set supports the hypothesis that the Laramide ranges in this area were buried by the early Oligocene, with regional high topography supplying the bulk of the sediment to the Powder River basin at this time.

MODELING CHLOROPHYLL-A CONCENTRATIONS USING MACHINE LEARNING ALGORITHMS AND THE HARMONIZED LANDSAT AND SENTINEL-2 CONSTELLATION: A CASE STUDY OF LAKE ERIE

Presenter: Schwarz, Alex J., Graduate, Geography, Geology, and the Environment
Mentor: Wondessen Seyoum
Authorship: Alex Schwarz, Wondessen Seyoum, Jonathan Thayne, Catherine O'Reilly,
Eric Peterson

Harmful algal blooms (HABs), once considered only a natural phenomenon, have emerged as a growing ecological concern with far-reaching consequences for aquatic ecosystems and human populations. In inland lakes, HABs are recognized as a public health threat due to the risk of exposure to cyanobacterial toxins (various congeners of microcystin). The cyanobacteria, along with other diatoms and dinoflagellates in the HAB, release the toxins as secondary metabolites throughout their lifecycle that, in high concentrations, can cause liver and kidney toxicity and neurotoxicity in both humans and animals. As lakes represent a significant freshwater resource for the human population and provide various aquatic ecosystems for many animals, forecasting high levels of toxins is essential.

Cyanobacterial toxins and microcystin have been shown to be associated with other, more commonly measured and well understood, water quality parameters. Chlorophyll-a, which is a very commonly measured water quality parameter, has been shown to be positively associated with microcystin concentrations. This positive relationship allows Chlorophyll-a concentrations to be used as a proxy for determining elevated levels of Microcystin toxins within inland lakes.

This research will utilize various Machine Learning Algorithms (MLAs) and the relatively new Harmonized Landsat and Sentinel-2 (HLS) Constellation (Version 2.0), released in 2021, to model Chlorophyll-a concentrations within the western basin of Lake Erie. The western basin of Lake Erie has been extensively researched since the late 2000s due to the concern HABs have for public health and safety. Starting in 2012, researchers at the Great Lakes Environmental Research Laboratory (GLERL), with support from the Great Lakes Restoration Initiative (GLRI), formalized a sampling routine to monitor the spatial and temporal variability of seasonal HABs in the western basin of Lake Erie, which provides sufficient historical data for this project.

The overall goal of this study is to assess whether varying machine learning algorithms can reliably estimate chlorophyll-a concentrations, using high temporal and spatial resolution surface reflectance data products from the HLS Constellation, after being trained with known, site specific, retrieved chlorophyll-a concentrations and surface reflectance values for the satellite image pixel the retrieval took place in. The HLS constellation, composed of Landsat-8/9 and Sentinel-2A/B satellites, will supply high temporal and spectral resolution imagery to supplement MLA training. The various MLAs will be trained using multiple data points in the machine learning program, Python. The results will provide valuable insights for effectively monitoring and managing harmful algal blooms in inland lakes.

IMPACT OF CHLORIDE CONCENTRATION ON DENITRIFICATION EFFICIENCY: A CASE STUDY OF AN AGRICULTURAL FIELD (T3 SITE), MCLEAN COUNTY, CENTRAL ILLINOIS

Presenter: Suleiman, Zainab, Graduate, Geography, Geology, and the Environment

Mentor: Dr. Eric Peterson

Authorship: Sainab Suleiman, Eric Peterson

The widespread use of nitrogen-based fertilizers in agricultural fields has led to a significant increase in nitrate concentrations in soil and water, posing a significant threat to human health and aquatic ecosystems. This raises interest in understanding the factors influencing denitrification processes. One factor is the concentration of chloride, which is believed to inhibit denitrification. This study focuses on understanding the impact of chloride on denitrification through column studies. The research employs laboratory analysis using soil columns from the study area (T3 site) to assess the interactions between varying chloride levels and nitrate loss. It is expected that increasing the chloride concentration reduces the rate of nitrate loss. This is attributed to the inhibitory effect of chloride on microorganism activity. This research contributes to the broader efforts towards sustainable water quality management and environmental conservation. The findings may highlight the need for a better understanding of the impact of chloride on nitrogen reduction and in developing effective strategies for mitigating nitrate contamination in water ecosystems. It will provide practical implications for managing nitrate pollution in agricultural settings. Furthermore, the study underscores the importance of considering microbial communities in future models and environmental management practices aimed at optimizing denitrification processes in contaminated surface and subsurface environments.

HEALTH SCIENCES

AN ANALYSIS OF HEALTHCARE SYSTEMS IN SIX NORTH AMERICAN AND EUROPEAN COUNTRIES: A COMPARISON BETWEEN OUTCOMES AND ECONOMIC VARIABLES

Presenter(s): Drankhan, Bryce, Undergraduate, Health Sciences
Ferber, Natalie, Undergraduate, Health Sciences
Mentor: Prof. Quen VanDermay-Kirkham
Authorship: Bryce Drankhan, Natalie Ferber

Healthcare is an industry flooded with different ideologies and payer sources, but which has the optimal balance between cost and quality? The purpose of this study was to compare five healthcare quality metrics across North America and Europe and compare them by individual country and payer type. The research team selected only developed countries including the United States, Canada, Mexico, Germany, France, and Spain. The healthcare metrics analyzed were selected because they are among the most deterministic of a successful healthcare system and include life expectancy, maternal death rate, infant mortality rate, obesity rate, and smoking rate. The metrics cover a wide range of services and outcomes in healthcare and were selected to be an overall indicator of the success of the healthcare systems analyzed. The data sets were collected from various global databases that contain country level healthcare and economic data. The data were compared to benchmarks and correlations between economic indicators and healthcare outcomes were analyzed. The findings were recorded in tables and presented graphically. Limitations of this study included a lack of consistent inclusion criteria between countries, how they reported specific metrics, and non-universal data collection methods, such as annual censuses. This resulted in some of the data sets representing different time periods, but all were the most current data available for the individual countries. The results of the study can help guide the determination of what the best type of healthcare system is to balance population health and healthcare expenditures.

INFORMATION TECHNOLOGY

AI CHATBOT FOR UNIVERSITY FITNESS CENTER

Presenter(s): Suryadevara, Sowmya, Graduate, Information Technology

Amisha, Amisha, Graduate, Information Technology

Mentor: Professor Elahe Javadi

Navigating the services and resources of university fitness centers can give challenges to both students and staff. This project introduces a creative solution: *an AI-driven chatbot designed specifically for the Redbird Recreation Center at Illinois State University*. By using one of the commonly used Python libraries for working with large language models (Lang chain), known for its efficiency in constructing intelligent chatbots, we aim to develop a prototype capable of delivering coherent, context-aware interactions.

Our approach involves gathering information from various sources including documents, staff and student interviews, and user feedback. Through this comprehensive approach, we plan to address usual questions about fitness programs, schedules, and personal recommendations.

Along with this, we prioritize privacy and security measures, ensuring compliance with university policies to safeguard user data.

While this project serves as a proof of concept, future deployment of such a chatbot system will enhance user engagement within the fitness center. It will also increase efficiency and accessibility by providing a user-friendly interface for accessing information and automating routine inquiries. Staff will not be answering repetitive inquiries, but will have time to attend to unique, more complicated services and activities that the student may need assistance with.

The project also includes a user experience test to assure information usability. Although our project will be a prototype and will not be alive, we compile a list of methods with which a live version can safeguard user data and assure privacy and security.

In the symposium, we will explain the process for making a chatbot using available large language models. We will also have the system available for interacting with visitors chatbot with sample inputs and collect user feedback during testing phases to identify areas for improvement and iterate on the chatbot's functionality, and will provide a do-it-yourself documentation for anyone who may be interested in exploring this topic further.

KINESIOLOGY AND RECREATION

BIOPHILIC DESIGN AND PROGRAMMING

Presenter(s): Collins, Amber, Graduate, Kinesiology and Recreation

Mentor: Dr. Mike Mulvaney

Authorship: Amber Collins, Mike Mulvaney

Biophilia refers to the human tendency to seek out connections with nature and other forms of life. Since biophilia's introduction almost forty years ago, there has been a significant amount of research dedicated to discovering the ways in which nature can be utilized as a potential remedy for improving mood, state of mind, and physical health. Despite the prominence of biophilia research, the amount of biophilia research within the field of parks and recreation is surprisingly limited. As a field that regularly utilizes nature-based spaces to deliver its programs and services, it could be argued that the parks and recreation field should be a leader in the development of recreation experiences that are grounded in a biophilic framework. The tenets of biophilia would suggest biophilic design and programming offers the opportunity for recreation professionals to leverage the benefits of nature-based experiences to create long-lasting impact amongst participants and their communities. Drawing from these findings, the purpose of this project was to propose a biophilic framework to be considered when designing recreation programming and facilities. Biophilic elements and factors to consider when designing and developing these recreation experiences are presented and potential implementation barriers are identified.

EVALUATING A RESILIENCE PROGRAM TO SUPPORT STUDENT-ATHLETES DURING THE TRANSITION FROM HIGH SCHOOL TO COLLEGE

Presenter(s): Deer, Nina, Graduate, Kinesiology and Recreation
Haffner, Brett, Graduate, Kinesiology and Recreation
Sangalang, Melvin, Graduate, Kinesiology and Recreation
Cain, Ellie, Graduate, Kinesiology and Recreation
Jackson, Kennedi, Graduate, Kinesiology and Recreation
Ramos, Megan, Graduate, Kinesiology and Recreation
Kisvari, Lilla, Graduate, Psychology

Mentor: Dr. Scott Pierce

Authorship: Ellie Cain, Nina Deer, Brett Haffner, Kennedi Jackson, Lilla Kisvari, Megan Ramos, Melvin Sangalang, Lindsay Maxson, Scott Pierce

The “Resilience for the Rocky Road” program is a strengths-based resilience program to support student-athletes during the transition from high school into their first year of college. The program was designed using guidelines from Fletcher and Sarkar’s (2016) mental fortitude training framework alongside contextually relevant recommendations from college athletics stakeholders (Pierce et al., 2020). The program features evidence-based content and activities on four topics to support student-athletes in their transition into college sport and life: (1) “Starting the Journey with a Balanced Student-Athlete Identity”; (2) “Coping with Bumps Along the Road”; (3) “Who’s got my Back?”; and (4) “Focus on the Road Ahead”. The purpose of this presentation is to provide evaluate the impact of the resilience program on student-athlete transition experiences and outcomes. In 2023, the program was delivered to 75 first year student- athletes at a Division I university, with a total of 24 workshops presented by nine mental performance coaches. Participants completed surveys at pre- and post-program, to assess changes in Athletic Identity Measurement Scale (AIMS; Brewer et al., 1993) and Connor- Davidson Resilience Scale (CD-RISC2; Connor & Davidson, 2003) and to evaluative participants perceived enjoyment and the personal impact of the program. Evaluation findings have established that participants experienced optimal shifts in athletic identity (i.e., increase in social identity and decrease in exclusivity), maintenance in psychological resilience, and a belief that they utilize coping skills and support. Furthermore, gamifying learning in workshops was found to be valuable in actively engaging student-athletes in reflection, learning, and application of skills. In an ever-changing collegiate athletic environment, practitioners should seek to provide psychological support during the student-athlete transition into college and provide continuity in this support throughout careers and transitions.

RESTING METABOLIC RATE AND PHYSICAL ACTIVITY IN COLLEGE STUDENTS

Presenter(s): Dosemagen, Rori, Graduate, Kinesiology and Recreation
Agudelo, Jerecho, Undergraduate, Kinesiology and Recreation
Mentor: Dr. Kristen Lagally

The transition to University is associated with decreases in physical activity levels and increases in body mass. The purpose of this descriptive study is to evaluate university students' resting metabolic rates and physical activity levels.

Participants are college student volunteers who self-report physical activity levels and undergo resting metabolic rate measurements using open-circuit spirometry. Resting metabolic rate is measured following a minimum of a four-hour fast, with no caffeine or physical activity within 12 hours prior to the measurement.

Participants recline for a minimum of 20 minutes while wearing a respiratory mask over the nose and mouth to capture oxygen consumption and carbon dioxide production. Physical activity levels are reported as number of days/week and number of minutes/day. These values are multiplied to determine an overall value for minutes of weekly physical activity. The results provide useful information for participants on health and for maintenance of body mass. Low levels of physical activity can be addressed by participation in campus physical activity opportunities such as those provided by Exercise is Medicine on Campus, Campus Recreation, and Health Promotion and Wellness. Knowledge of resting metabolic rate is useful for managing caloric intake and can be increased through physical activity and addition of muscle mass.

DETERMINING THE BEST PREDICTOR VARIABLES FOR CMJ PERFORMANCE IN NCAA DIVISION 1 FOOTBALL PLAYERS

Presenter(s): Konkell, Jadon, Graduate, Kinesiology and Recreation

Mentor: Dr. Marcel Lopes dos Santos

Co-Mentor: Dr. Michael Torry

Authorship: Jadon Konkell¹, Michael Torry¹, Samantha McDonald¹, Chris Carter¹, Marcel Lopes dos Santos¹

1 - Illinois State University, Normal, IL

INTRODUCTION: Countermovement jumps (CMJ) are among the most implemented tests for assessing the performance capacity of the lower body, specifically in the context of sports. The simplicity of both the movement and testing protocol, as well as the broad spectrum of kinematic, kinetic, and performance variables that are measurable during the test with the implementation of force plates make this modality a broadly advantageous and utilized tool in assessing athletes. The metrics calculated from CMJs are particularly valuable to sports such as football given lower-extremity power and force development translate to success many facets of the game. While the objective of the test is to achieve the greatest vertical displacement (jump height), it is equally important to understand which of the many subsequent variables are the best predictors of performance. Understanding the correlations between test variables and jump height can provide athletes and strength coaches insight into designing training protocols that will enhance athletic capabilities. **PURPOSE:** To evaluate which countermovement jump (CMJ) metrics were the strongest predictors of performance (jump height). **METHODS:** Sixteen NCAA Division 1 football players (height: 190.18 ± 5.32 cm, weight: 106.43 ± 16.59 kg) participated in this study. Following a 5min low-intensity warmup protocol, subjects performed three bi-lateral CMJs with hands placed on hips to control for advantages due to arm swing. All variables were calculated in a custom Excel spreadsheet and exported to SPSS for statistical analysis. Ten variables were selected based on a review of literature to predict jump height: takeoff velocity; peak propulsive, braking force; braking, propulsive impulse; peak propulsive, braking power; modified reactive strength index (mRSI), and propulsive, braking asymmetry. Power, force, and impulse variables were all normalized to subject weight. Alpha value was set at 0.05. **RESULTS:** Jump height: 0.42 ± 0.08 m appeared to be normally distributed. Of the ten variables studied, six of them were significant. Takeoff velocity: $R = 0.99$ $\rho = <0.001$ was the best predictor of jump height, followed by peak propulsive power $R = 0.953$ $\rho = <0.001$, propulsive impulse $R = 0.755$ $\rho <0.001$, and peak propulsive force $R = 0.755$ $\rho <0.001$. **CONCLUSION:** All variables that were statistically significant occurred during the propulsive phase. Optimizing takeoff velocity may lead to improving CMJ height, and therefore performance in football players.

AN EXPLORATION OF TEAM COHESION IN COLLEGIATE ESPORTS CONTEXTS

Presenter(s): Kresina, Kenneth, Graduate, Kinesiology and Recreation

Mentor: Dr. Liz Sattler

As the esports industry approaches adolescence, research on esports environments is only beginning. Despite the plethora of work done on team cohesion and coaching in traditional sports, current esports coaches are ill-equipped to lead and mentor a team of young adults. The present study aims to lay the groundwork for developing the coach-player relationship in esports through a team cohesion and leadership personality perspective. A qualitative approach featuring semi-structured interviews from individual collegiate esports players across a variety of university-affiliated teams was adopted to explore players' perceptions regarding their team environment experiences. The study aims to verify the plausible validity in applying previous team cohesion models to esports contexts, despite differences to traditional sports and the breadth of experiences possible given the current state of collegiate esports.

MATHEMATICS

MYTH OR FACT? AN ANALYSIS OF COVID-19 DEATHS IN RED VERSUS BLUE STATES OF AMERICA

Presenter(s): Mozid, Nishat Ara, Graduate, Mathematics

Duku, Kwabena S., Graduate, Mathematics

Mentor: Dr. Olcay Akman

Authorship: Nishat Ara Mozid, Kwabena S. Duku, Olcay Akman

This study examines the correlation between political leanings and COVID-19 mortality across Republican and Democratic states. Employing Emergent Self-Organizing Map (ESOM), Cluster Analysis, and the Logistic Algorithm, we group states based on COVID-19 properties, identify risk patterns, and assess risk levels. Factors considered include poverty rate, education rate, vaccination rate, and demographics. The Logistic Algorithm succinctly summarizes findings, integrating ESOM, Cluster Analysis, and Logistic Regression results. This multi-method approach aims to offer a concise, yet comprehensive understanding of the COVID-19 risk landscape in politically diverse states, shedding light on potential associations between political affiliations and pandemic outcomes.

A MATHEMATICAL APPROACH TO MOTION TRACKING USING LIE ALGEBRA AND COMPUTER VISION

Presenter: Skudnig, Bob, Undergraduate, Mathematics
Soltermann, Christian, Undergraduate, Mathematics
Mentor: Dr. Gaywalee Yamskulna

Computer vision is the field of computer science concerned with extracting meaningful information from videos and images. An important sub-field of computer vision is motion tracking, where the position and orientation of moving objects are tracked over time. Tracking techniques have found application in areas such as sports, self-driving vehicles, and security systems. In this project, we approach the problem from a mathematical standpoint and utilize the structure of Lie algebras. A Lie algebra describes the transformation of an object in terms of the structure of infinitely small transformations. In this project, we created a model for tracking faces using affine transformations to approximate three dimensional motion. An affine transformation (described by an affine matrix) is a distortion of an image that preserves parallel lines. We randomly transformed a dataset of face images using affine matrices and created several models to predict the transformation given the transformed image. Instead of directly predicting the affine matrices, our models work inside of the affine Lie algebra. Working inside of a Lie algebra should provide better predictions as a Lie algebra provides a flat and linear space, unlike the original space of transformations. The models were able to predict transformations with relatively high accuracy. This concept is investigated further with various models, alternative data, and other potential applications.

EXPLORATION AND ANALYSIS OF FAKE REVIEWS

Presenter(s): Swaggerty, Gracy, Undergraduate, Mathematics

Mentor: Dr. Olcay Akman

Recently, for consumer shopping, Amazon has become the central place for customers to purchase everything and reviews are now more important than ever for sellers as they can quickly sway customers away or toward a product. Reviews hold this influential weight because they are authentic, coming from real customers with real experiences with the product. Fake review detection has been a growing interest of Amazon and they have implemented Amazon Vine to verify reviewers. In this project we collected 40 Amazon reviews ranging from good, bad, and mixed, for Apple AirPods 2nd Generation. Putting them into a text analyzer, we found strings up to length 8 being repeated up to 4 times throughout all the reviews, which is quite an unusual case. By using hypothesis testing, comparing these findings graphically, plotting repeated string length versus frequency, with the review findings, we found that the reviews are not being generated authentically. Our hypothesis testing shows there is a statistically significant difference between the expected frequency of 7-word strings using the English Brown Corpus and the actual frequency found in the collected reviews. This outcome solidifies our assumption that these reviews are being manipulated and phrases reused to create fake reviews.

MUSIC

DIVERSITY REPRESENTATION IN ILMEA ALL-STATE BAND PROGRAMMING, 1990-2023

Presenter: Boucher, Lucy, Graduate, Music

Mentor: Dr. Phillip Hash

Authorship: Lucy Boucher

The purpose of this study was to examine the diversity of ILMEA All-State band programming from 1990 to 2023. This study compiled information regarding the composers and arrangers of the pieces selected, and the conductor for each ensemble. The study showed that 2.13% of all composers and arrangers ($N = 329$) were female ($n = 7$). Composers and arrangers of color ($n = 9$) was slightly higher at 2.74% ($N = 329$). An increase in diverse (females and people of color) composers and arrangers ($n = 8$) was shown between 2020 and 2023, with diverse composers making up 29.63% of all composers and arrangers selected ($N = 27$). This drastic difference is a welcome change from the previous decades. Out of all the ensembles in the past 33 years ($N = 66$), 15.15% conductors were diverse ($n = 10$). While ILMEA is statistically showing an increase in diversity, there is still room for growth and improvement in representation.

NURSING

DIET'S IMPACT ON ORAL MICROBIOMES IN CHILDREN

Presenter(s): Block, Mary, Undergraduate, Biological Sciences

Charlton, Samantha, Undergraduate, Nursing

Mentor: Dr. Susana Calderon

Authorship: Mary Block, Samantha Charlton, Susana Calderon

The oral microbiome is the ecological community of microorganisms living in our oral cavity. The diverse group of microorganisms play an important role in maintaining both oral and systematic health. The composition of these microorganisms can be impacted by environmental factors such as: diet, oral hygiene, smoking, disease, and more. The composition of our oral microbiome can also impact and be indicative of our overall health and well-being. Therefore, researchers are increasingly using oral microbiomes to better understand human health and wellness.

Our study aims to better understand factors impacting the oral microbiome compositions in children ages 5-6 years old. We believe that early dietary interventions can help maintain homeostasis in the oral microbiomes of children, improving their oral health and weight management.

To test this, we created a survey for people with children ages 5-6 years old to gather information on their child's demographics, lifestyle, and oral health history. Next, we plan to collect, sequence, and analyze the oral microbiome compositions of children ages 5-6 years old before and after eating yogurt two-times a day for three weeks. We will collect saliva samples from the children, extract microbial DNA from the saliva, and send the DNA to be sequenced. Using genomic data and bioinformatic techniques, we can determine the compositions of microorganisms before and after the 3-week period. We plan to report preliminary data. The data will help us better understand the impact yogurt has on the oral microbiome composition of children. In the future, we plan to continue researching the oral microbiome to better understand human health and disease.

PHILOSOPHY

PLATO AND TIME – CAN TIME EXIST WITHOUT THE MATERIAL WORLD?

Presenter: Reckamp, Robert, Undergraduate, Philosophy

Mentor: Prof. Daniel Breyer

This poster compares the views of two different modern scholars, Thomas Seissl and David Guetter, on Plato's view of time as discussed in the *Timaeus*. Seissl examines the views of the ancient philosophers Plotinus, Simplicius, and Aristotle who held different views on what Plato says in the *Timaeus*, whether he (Plato) refers to time or number as the "image of eternity" (Plato, Ti. 37d). As Seissl explains in his paper, Plotinus thinks that time *per se* exists separately apart from change and motion of bodies, because time is always active. Simplicius, on the other hand, thinks that number rather than time is the moving image of eternity. Aristotle, famously, takes Plato's statement that time began with the universe literally. He thinks that motion and time are inseparable and that time is the number of motion; therefore, both time and motion are eternal. Seissl effectively compares all these ancient philosophers and agrees with Aristotle's interpretation, arguing that if Aristotle disagreed with Plato he would have said so, as evidenced by his other critiques of Plato.

Guetter, who has a different interpretation, argues that time rather than number is the mirror of eternity referred to in the *Timaeus*. He looks at eternity's relationship to time and how time and eternity relate to the present, past, and future. This presentation shows why Seissl's argument of why number is the "image of eternity" (Plato, Ti. 37d) also implies that Plato thought that the universe and time a simultaneous beginning literally. It also shows how Guetter's research indicates that the present and eternity are the only forms of time that "are". This is because the past and future cannot be in a state of "are", only in states of "was" or "will be", respectively. The past and future are only memory or anticipation to our perception. Guetter shows how the universe and time were created simultaneously and how understanding of number is necessary for all other understanding, since we cannot know anything without a numerical basis.

PHYSICS

AN ANALYSIS OF RESULTS REGARDING HOW COMPUTATIONAL EXERCISES CAN IMPROVE ACTIVE LEARNING IN A GENERAL EDUCATION ASTRONOMY COURSE

Presenter(s): Marquez, Jose, Undergraduate, Teaching and Learning
Nevin, Miranda, Undergraduate, Teaching and Learning
Mentor: Mr. Raymond Zich, Physics
Authorship: Jose Marquez, Miranda Nevin, Katherine Moser

This study investigated the effectiveness of computational exercises in a general education astronomy class to determine if students' learning gains increased over the course of six semesters. We are interested in how computations can offer more classroom engagement in a cross-disciplinary STEM-related course, as well as how computations can improve student solutions to conceptual and contextual problems. In order to test this, each cohort of students were given at least twelve computational-related exercises to complete using online spreadsheets to incorporate active learning with STEM practices. This was done to improve students' ability to collaboratively make predictions based on models, as well as connect mathematical concepts with scientific phenomena. By conducting our research through a long-term assessment, we were able to make a claim more conclusively about the effectiveness of computations through extensive data collected over a variety of students and different learning modalities. Students' learning gains were compared in a pre and post TOAST (Test of Astronomy Standards) and LPCI (Lunar Phases Concept Inventory) to test their knowledge before and after the course. Each cohort was also given a survey to learn about their pre and post attitudes to mathematics, science, and their overall expectations/feelings toward the general education astronomy classroom. These assessments revealed that there were TOAST correctness gains of up to 20%, an LCPI correctness gains of up to 29%, and overall attitudes towards working collaboratively on computational exercises in science were positive and there was evidence learned more conceptually.

POLITICS AND GOVERNMENT

DISTRIBUTIONAL VIOLENCE IN THE FACE OF ECOLOGICAL CRISES: A STUDY OF APOCALYPTIC NARRATIVES, CLIMATE REFUGEES, AND RIGHT-WING POPULISM

Presenter: Giles, Porter, Undergraduate, Politics and Government

Mentor: Dr. Kam Shapiro

Authorship: Porter Giles, Kam Shapiro

The objective of this paper is to examine the linkages between representation of zombies in apocalyptic media and dehumanizing rhetoric employed by right-wing populists to describe migrants. In particular, AMC's *Fear the Walking Dead* (2015) is examined for its modeling of far-right responses to resource scarcity in fictional media. Previous studies have found that apocalyptic thinking and "zombie experts" have been incorporated into policymaking, influencing institutional responses to crises associated with climate change. As climate change is projected to fuel mass migration, resource scarcity, and conflict, it is necessary to investigate where (or on whom) the consequences of crises are unleashed. In digital media and political rhetoric, refugee and migrant bodies are frequently dehumanized when referred to as "swarms" or "hordes". This dehumanizing rhetoric is reflected through the apocalyptic metaphor of the zombie. Climate refugees are positioned to be the scapegoats of resource scarcity due to the discursive frames present in apocalyptic media, driving support for far-right populists and their chauvinist platforms. I use the phrase "distributional violence" to capture this combination of physical and discursive violence, particularly in the contexts of visible resource distribution.

EVALUATING STUDENT ENGAGEMENT IN STEM SUMMER CAMPS

Presenter(s): High, Allie, Undergraduate, Politics and Government

Mentor: Dr. Rachel Waring-Sparks, Center for Civic Engagement

Co-Mentors: Dr. Ashley Waring-Sparks, Center for Mathematics, Science, and Technology
Dr. Will Lewis, Information Technology

Science, technology, engineering, and mathematics (STEM) education encourages creativity, problem-solving skills, and critical thinking among students. However, there remains a significant gap in representation within STEM. This disparity highlights the need for programs that attract diverse STEM learners at early ages. Research indicates that informal educational programs such as summer camps have shown promise in capturing interests in STEM. In 2023, a team from Illinois State University and local community partners organized several STEM camps in Bloomington-Normal to engage students in interdisciplinary STEM activities.

This study evaluates the impacts of these STEM camps on students' feelings of identity, efficacy, and belonging within STEM. This research is informed by survey data from campers and caregivers, including insights regarding STEM accessibility in the community. The surveys were adapted from existing literature and focused on measuring changes in campers' affective outcomes relating to STEM engagement and perceptions of STEM.

Our findings indicate positive impacts on efficacy and belonging among campers. Data from caregiver surveys also highlight the importance of community-based STEM programming. Caregivers recognize the significance of early exposure to STEM and express positive attitudes towards the camps' contributions to their camper's STEM learning. Collaborative efforts with community partners are also essential in providing inclusive and engaging STEM opportunities. Our poster will summarize the survey results across multiple camps and further explore improvements for future programming.

OPIOID MORTALITY AND CORRUPTION IN THE UNITED STATES

Presenter(s): Khurshid, Saqlain, Graduate, Politics and Government

Mentor: Dr. Oguzhan Dincer, Economics

Authorship: Saqlain Khurshid

The US faces a severe rise in opioid-related overdose deaths, prompting a shift in perception towards an epidemiological crisis. Extensive research links this crisis to complex interactions between public health, economic conditions, and corruption. Corruption manifested through socio-economic and political channels exacerbates opioid prescription rates and mortality.

Regulatory failures, notably by the FDA, worsen the situation. This paper aims to explore the link between corruption and opioid mortality rates across US states, shedding light on this multifaceted issue at the intersection of public health, economics, and governance.

HOW DO INTERNATIONAL ORGANIZATIONS INFLUENCE THE ADAPTATION OF SOCIAL PROTECTION NORMS IN LOW-INCOME COUNTRIES

Presenter: Ziem, Cindy Wawiema, Graduate, Politics and Government

Mentor: Dr. Mike Hendricks

Co-Mentor: Dr. Noha Shawki

This research investigates the influence of international organizations on the adoption of social protection norms in low-income nations. With a focus on addressing extreme poverty, increasing inequality, and various risks, the study explores the role of organizations in fostering and contributing to the implementation of social protection programs and norms. In this context, social protection norms can be defined as the accepted standards and actions that address risks, vulnerabilities, inequalities, and poverty among individuals. The paper argues that accessibility to socialization, facilitated through dialogue, capacity-building, and knowledge transfer, enhances the likelihood of adapting to social protection norms. Emphasizing intangible methods employed by international organizations, the study utilizes a comparative case study approach, focusing on the United Nations (UN) and the International Monetary Fund (IMF). The chosen qualitative research methodology involves in-depth interviews with representatives from these organizations, providing insights into their perspectives and approaches. Document analysis of legal documents, reports, and agreements from the UN, IMF, and national governments complements the data collection. The research aims to enhance understanding of the correlation between international organizations, socialization, and the adaptation of social protection norms. By uncovering strategies employed by these organizations, the study offers valuable insights for scholars and policymakers working on social protection initiatives in low-income countries.

PSYCHOLOGY

EMPOWERING RECOVERY: FEMINIST APPROACH TO CPTSD TREATMENT FOR WOMEN

Presenter(s): Bychowski, Jaylen, Graduate, Psychology

Mentor: Dr. Caitlin Mercier

There has been a growing recognition of the significant impact of complex traumatic experiences on mental health outcomes, with research indicating an overall prevalence rate of 3.8% in the United States and women experiencing rates twice as high as men (Cloitre et al., 2019; Knefel et al., 2015). Complex Post-Traumatic Stress Disorder (CPTSD), or disturbances in self-organization (DSO) attributable to exposure to extreme or multiple forms of trauma, has been associated with severe impairment, relational functioning, and poor quality of life (Simon et al., 2019; Brewin, 2020), yet with little research on psychological therapies for treatment. Despite CPTSD stressors (e.g., prolonged domestic violence, repeated childhood sexual or physical abuse) being interpersonal in nature, traditional therapies often utilize an individualistic approach to trauma with the role of sociocultural factors in women's psychological well-being and development of DSO symptoms (e.g., affect regulation, negative self-concept, disturbances in relationships) rarely mentioned. Women are placed at risk of victimization, underscoring the importance of utilizing a feminist lens to conceptualize their trauma. Feminist therapy challenges patriarchal forces and practices that are oppressive and psychologically damaging to women (Enns, 2004; Brown, 2010). By externalizing distress and fostering a sense of empowerment, feminist therapy can help women with CPTSD feel validated and supported. Guided by relevant literature and feminist theory, I offer strategies for CPTSD treatment among women, particularly DSO symptoms.

EMOJIS IN DISCOURSE: LINKED / UNLIKED EMOJIS AND BACKCHANNELING

Presenter(s): Ervin, Will, Graduate, Psychology

Mentor: Dr. Allison Nguyen

Authorship: Will Ervin, Allison Nguyen, Andrew J. Guydish, Jean E. Fox Tree

Backchannels, which are verbal and non-verbal cues of understanding given in conversation, are essential to reaching a mutual understanding between speech partners. Backchannels provide cues in spontaneous communication as to whether the listener has understood the speaker and can help guide the speaker in forming common ground with the listener (Clark & Brennan, 1991). Visual backchannels, such as nods or smiles, are also particularly good at demonstrating emotions and all other backchanneling functions (Bavelas, et al., 2000). Like visual backchannels, emojis can be used to demonstrate emotional states and facial expressions that do not occur in online, text-based communication. (Kaye, et al., 2017; Dresner & Herring, 2010; Walther & D’Addario, 2001). Emojis have many similarities with backchanneling, and thus, it is assumed that emojis operate like backchannels. One problem in this research area is the difficulty in eliciting backchannels in the lab. We developed five different methods for emoji backchannel elicitation. Firstly, when subjects interact with the experimenter, they will be exposed to the usage of emojis by the experimenter, such as saying “hello 🤝” when they enter the Zoom room. Once the study begins, subjects will be given briefing instructions containing emojis. Subjects will then engage either with exemplary images demonstrating emoji usage in text-based conversations or will be asked to fill out a basic questionnaire while using select emojis to answer each question. Lastly, subjects will be put in a chat room with a confederate that will use emojis frequently. We expect these conditions to increase emoji usage. Being able to elicit emoji in the lab will allow for creation of an emoji corpus, as well as provide opportunities for future research on emoji usage.

STRUGGLE IN THE STACKS: INVESTIGATING IMPOSTER PHENOMENON AMONG ARCHIVISTS

Presenter(s): Flinn, Taylor, Graduate, Psychology

Mentor: Mrs. April Anderson-Zorn, Interdisciplinary Studies

Authorship: Taylor Flinn, April Anderson-Zorn, Tiffany Cole, Jane LaBarbara

Have you ever had a moment in your professional life where you felt fraudulent? Perhaps you've feared being discovered as a fake in your field. Often triggered by a negative professional experience such as bullying in the workplace, lack of administrative leadership, or being the target of a racial microaggression, this feeling of inadequacy can lead to poor workplace performance, low workforce retention, and mental health concerns for employees (Bravata, 2020; Clance & Imes, 1978). The purpose of the present study is to examine a recent survey conducted to identify trends of impostor phenomenon from an understudied profession, archivists. Based on previous research conducted in the larger librarian profession, survey authors expected results to concur with those findings. However, our results showed far different results, suggesting the impostor phenomenon may be prevalent in all demographics and career levels (Kimble-Hill et al., 2020; Simmons, 2016). The poster will discuss the results and suggest ways to combat impostor phenomenon in the workplace. The sample included 325 archivists recruited from the membership of the Society of American Archivists (SAA). *Imposter Phenomenon* was measured using the Clance IP Scale, a 20-item questionnaire (Clance, 1985). A mean score of the questionnaire was computed for each participant. Based on their mean, each participant was separated into one of four impostor experience categories: few, moderate, frequent, and intense. The 29 participants who were placed in the few category had an average scale result of 33.44 (SD = 3.77), the 84 participants in the moderate category obtained an average of 50.67 (SD = 5.96), 149 participants in the frequent category obtained an average of 70.67 (SD = 5.74), and the 63 participants in the intense category had a mean of 88.33 (SD = 5.50). The impostor phenomenon levels were significantly different, $F(3,321) = 901.501$, $p < .001$. The present study provides evidence that impostor phenomenon may occur at high rates within the archives industry and partially supports previous literature that impostor phenomenon does not adhere to specific demographic characteristics. Over 65% percent of our sample experience frequent to intense feelings of impostor phenomenon. Practical implications include that organizations should consider adding training to help employees recognize feelings of impostor phenomenon and equip them with strategies to overcome them.

UNDERSTANDIGN THE ROLE OF RESPONSE EXPECTANCY ON PELVIC FLOOR PAIN DURING SEX

Presenter(s): Fontes, Camila, Undergraduate, Psychology

Mentor: Dr. Kelly Clemens

Authorship: Camila Fontes, Joy Jeronimus, Kelly S. Clemens

According to the American Congress of Obstetricians and Gynecologists (ACOG; 2023) 75% of people who were assigned female at birth (AFAB) suffer from pain during sex at some point during their lifetimes. While this pain may have gynecologic or physiological causes, it may also occur or be worsened or complicated by psychological factors. Much of the literature regarding psychological correlates of pelvic and gynecologic pain focuses on the role of psychological distress, including depression, anxiety, and catastrophizing (e.g., Till et al, 2020). One potentially important, but understudied, psychological construct that may contribute to gynecologic pain is response expectancies. Response expectancies refer to an individual's expectancies for internal, automatic, non-volitional responses (e.g., sensations of pain). Response expectancies have been demonstrated as an important predictor of self-reported pain across a variety of studies and pain types (see Peerderman et al., 2016). Few sources, however have studied the influence of response expectancy on gynecologic pain.. The present study aims to further the literature on psychological factors that may influence gynecologic pain during sex by determining the relationship between response expectancies and painful sex experiences. Participants (N = 150) who were assigned female at birth will be recruited from Prolific, an online participant recruitment platform. Participants will respond to measures of response expectancy for pain during sexual activity (Clemens, 2022), experiences of pelvic pain during sexual activity, and control variables including depression, anxiety, and stress (Henry & Crawford, 2005), pain catastrophizing (Sullivan et al., 1995), pain anxiety (McCraken & Dhingra, 2002), descriptive and prescriptive social norms around sexual activity, sexual health awareness, and pelvic sexual pain history and diagnoses. Data will be submitted to a multiple regression including the predictor variable, response expectancy, and covariates which correlate with dependent variable, self-reported experiences of sexual pain. It is expected that response expectancy will predict painful sex experiences, even in the presence of control variables. Understanding the role that response expectancy plays in sexual pain may present new ways to intervene and reduce pain experiences.

EDUCATOR WELLBEING AND TURNOVER INTENTIONS

Presenter(s): Goebel, Derek, Graduate, Psychology

Mentor: Dr. Adena Meyers

Authorship: Derek Goebel, Katie Hindman, Adena Meyers, Emily Jones

Since the COVID-19 pandemic, educator attrition is on the rise with over half of teachers surveyed by National Education Association (NEA) stating the pandemic influenced their likelihood to remain in education (2022). Educator stress was increasing before the pandemic, and evidence shows the situation is not improving (Farley & Chamberlain, 2021). In addressing educators' wellbeing to prevent turnover, school districts need to understand how staff feel about their work experiences. The National Teacher and Principal Survey (NTPS) is a nationally representative survey created for teachers and administrators of K-12 schools that includes many items related to wellbeing (Taie & Lewis, 2022). This study compares responses to NTPS survey items among educators in a Midwestern district to national norms (NTPS, 2021), and examines correlations between survey items and educator turnover intentions. University researchers collaborated with district administrators to select items from the NTPS to include in a districtwide staff workforce wellbeing survey, which included 25 items focusing on teacher wellbeing, perceptions regarding administration, and feelings about the profession. There were 254 responses from 10 schools. Items were measured on a four-point likert scale from strongly disagree to strongly agree. Chi-squared tests compared district responses to the NTPS national norms, and correlations were used to examine associations between work-related wellbeing items and turnover intentions. Chi-squared tests revealed more than half of the district level responses reflected significantly more unfavorable experiences and attitudes compared to national norms, meaning either higher agreement with negatively worded items or higher disagreement with positively worded items. There were, however, four items for which the district responses were more favorable than national norms, and seven items with no statistically significant difference between the two. Correlations indicated that work-related wellbeing significantly predicted turnover intentions. Teacher responses at the district level were generally less favorable than national norms, especially regarding student behavior negatively affecting teaching, though salary satisfaction and job security were rated favorably compared to national norms. Importantly, the most recently published norms were collected pre-pandemic so differences between the current sample and national norms may reflect historical trends in educator wellbeing rather than differences between this district and the rest of the country. Correlations revealed associations between educators' work-related wellbeing and turnover. Overall, the results indicate possible problem areas that district administrators can focus on in an effort to improve educator wellbeing and decrease attrition.

THEY SAY I'M TOO SENSITIVE: SUPERVISORS' RESPONSES TO MICROAGGRESSIONS ENACTED TOWARDS GRADUATE STUDENTS OF COLOR

Presenter(s): Goins, Rochelle, Graduate, Psychology
Concepción Cabán, Lourdes D., Graduate, Psychology
Flint, Arielle N., Graduate, Psychology
Mentor: Dr. Brea M. Banks

Racial microaggressions are interpersonal instances of racism enacted against individuals holding minoritized identities that are at times unintentional and subtle. Research suggests that graduate students who hold racially marginalized identities in mental health service programs experience microaggressions in classes or as part of their practicum experiences. No research to date has explored how faculty, supervisors, or advisors respond to these experiences (e.g., support, validate, minimize) when students disclose these occurrences. As part of the current study, we (a) explore students' experiences with microaggressions in graduate school, (b) examine the degree to which they report these occurrences to faculty, supervisors, and advisors, and (c) explore faculty, supervisors, and advisors' responses to these transgressions.

We recruited Graduate students of Color from mental health service fields such as school, counseling, and clinical psychology. Participants engaged in 30 min interviews with our research team, during which time they discussed their experiences with disclosing microaggressions to supervisors in their program. Using thematic analysis, we transcribed recorded interviews. Two members of our research team who did not engage in data collection coded about 25% of the interviews to develop a codebook that includes definitions. They coded independently before working together to discuss and agree on developed codes. Other members of our team are soon going to audit the codebook to ensure that codes are consistent and well-represent content discussed in interviews. We will then apply the codes to all transcripts and will identify themes with definitions among codes. We will discuss and agree on their independent work and the current authors will audit developed codes and themes throughout the process. We will report ICR data as part of the results.

#BICULTURAL: SOCIAL MEDIA USE, NEEDS SATISFACTION, AND WELL-BEING OF IMMIGRANTS

Presenter(s): Hecke, Raquel, Graduate, Psychology

Mentor: Dr. Suejung Han

Authorship: Raquel Hecke, Suejung Han

Purpose. This study examines the associations between immigrant's bicultural social media use, satisfaction of psychological needs, and well-being outcomes (i.e., bicultural identity integration & life satisfaction) applying Self-Determination Theory (Ryan & Deci, 2000).

Immigrants and their decedents experience increased acculturative stress (i.e., difficulties from adjusting to a new culture; Sanchez et al., 2015) and bicultural stress (i.e., difficulties from navigating two different cultures; Huynh et al., 2011). This additional stress has been linked to negative outcomes (Nguyen & Benet-Martínez, 2012) and to difficulty with fulfilling their basic psychological needs (i.e., needs for relatedness, competence, autonomy; (Kunyu et al., 2021). More research is needed to address ways to reduce this stress, fulfill their needs, and increase well-being of immigrants. Building an integrated bicultural identity has been linked to positive adjustment outcomes (Nguyen & Benet-Martinez, 2012), suggesting bicultural identity integration (BII) is an immigrant-specific well-being outcome. In the increasingly connected global society like ours, social media use may be particularly relevant for immigrants who need to be connected to two cultures, one of which can be geographically distant from them. We propose that social media use within both cultural contexts may be useful for immigrants by allowing for connections to both cultures, thereby fulfilling their psychological needs, subsequently promoting their well-being (i.e., BII & life satisfaction). We hypothesize that bicultural social media use will be associated with BII and life satisfaction, which will be mediated by both general psychological needs satisfaction and bicultural psychological needs satisfaction among immigrants.

Procedure. This study will be conducted via online surveys. Participants will be self-identified bicultural immigrants and recruited through the university SONA system, the snowball method, the platform Prolific. The survey will include demographics, bicultural social media use measure developed for this study, Bicultural Identity Integration Scale-II (Huynh et al., 2018), Basic Psychological Need Satisfaction Scale (Deci & Ryan, 2000), Bicultural Needs Satisfaction Scale (adapted from Deci & Ryan, 2000), and the Satisfaction with Life Scale (Diener et al., 1985). Upon IRB approval, data collection will occur from December 2023 to February 2024. A structural equation modeling analysis will be conducted using the SPSS AMOS to test the hypothetical mediation model of the study in March 2024. Results and discussion will be ready to present in April 2024.

Expected Implications. The results could inform of a potential intervention target (i.e., effective bicultural use of social media) as a way to promote well-being of immigrants.

EFFECTS OF CHILDREN'S INTERNET KNOWLEDGE ON ONLINE CRITICAL THINKING

Presenter(s): Hicks, Travis, Graduate, Psychology
Cripe, Jada, Undergraduate, Psychology
Brandon, Jaina, Undergraduate, Psychology
Mentor: Dr. Alycia Hund
Co-mentor: Dr. Laura Finan
Authorship: Travis Hicks, Jada Cripe, Jaina Brandon

The internet is becoming an increasingly common source of information for school-age children. Children take many factors into consideration when deciding to trust or mistrust an informant, several of which are applicable to online information as well. For example, children are more trusting of people and things with which they have abundant experience. As children grow older and gain more experience using the internet, they tend to be more trusting of online information than they are at younger ages. Children also take informants' intentions and benevolence into account. No research has been dedicated to studying if children's understanding of the internet's social complexity (capacity to house a variety of good and bad intentions) affects the amount of trust they place in online information.

It is hypothesized that children's age will positively predict the amount of trust they have in the internet. It is also hypothesized that the relationship between age and internet trust will be weakened as children's understanding of the internet's social complexity increases.

At least 92 children ages 5 to 11 years will be recruited to examine the relationship between age and trust in the internet, as well the influence of social complexity understanding on said relationship. Participating parents provide children's age and the time they spend online. Participating children are interviewed about their internet experience, understanding of the internet's social complexity, and their trust in the internet. Data collection is projected to be complete by March 15th. Completed interviews are being coded numerically and will be analyzed using simple linear regression with moderation.

Findings from this study have implications for how internet education and interventions are designed. Interventions for children could benefit from a focus on the internet's social complexity if it is found to be a major influence on children's trust in online information.

THE EFFECT OF INSTRUCTION MODE ON LEARNING RETENTION

Presenter(s): Ingold, Madison, Undergraduate, Psychology

Mentor: Dr. Dawn McBride

Authorship: Madison Ingold, Dawn McBride

The different instructional modes used in classrooms have been connected to a significant difference in student outcomes. The aim of the current study is to examine the differences in lecture-based learning and discussion-based learning and how it applies to overall knowledge retention in the classroom. Specifically, this study is a quasi-experiment where research methods in psychology students at Illinois State University either experienced a lecture or discussion in a review of course concepts. They were instructed to fill out a multiple-choice pre-test and post-test regarding their knowledge of the material. The results of this research may benefit student learning as well as instructor teaching choices.

PERSONALITY AND JOB PERFORMANCE ACROSS DIFFERENT CONTEXTS

Presenter(s): Jacobsen, Sarah, Graduate, Psychology

Mentor: Dr. Dan Ispas

Co-Mentor: Dr. Alexandra Ilie

Authorship: Sarah Jacobsen, Taylor Flinn, Dan Ispas, Alexandra Ilie, Dragos Iliescu

A. Purpose:

Most of the research on the relationship between personality and job performance used participants measured in low-stakes samples, usually as job incumbents already employed by the organization. When assessed in high-stakes contexts, there is the possibility of response-distortion which can impact the relationship between personality and job performance (Mueller-Hanson et al., 2003). The purpose of this study is to directly compare job applicants and job incumbents using both a broad (conscientiousness) and a narrow (achievement motivation) measure of personality. We will explore the criterion and incremental validity (over cognitive ability) in both contexts.

B. Procedure:

The participants were 159 job applicants and 184 incumbents of an organization who participated in a validation study. Cognitive Ability was measured using the GAMA (Naglieri & Bardos, 1997) a 66-item non-verbal cognitive ability test. Achievement Motivation was measured using the 170-item Achievement Motivation Inventory (Byrne et al., 2004).

Personality – Big Five traits were measured with the 60-item NEO-FFI (Costa & McCrae, 1992). Job Performance was measured one year later using supervisor ratings from organizational records.

C. Results:

Cognitive ability had predictive power in both applicants and incumbents ($r = .40$ and $.43$). Both conscientiousness (C) and achievement motivation (AMI) showed a decrease in their predictive power in the applicant sample, with C dropping below the significance level. C

showed incremental validity over cognitive ability in the incumbents sample: $\Delta R^2 = .08$, $p < .001$; as did AMI: $\Delta R^2 = .11$, $p < .001$. In the applicants sample, AMI showed incremental validity: $\Delta R^2 = .04$, $p < .01$ but C did not $\Delta R^2 = .02$, $p = .08$.

D. Conclusions:

It appears that the validity of personality measures is impacted by their use in a high-stakes context. However, the narrow measure (AMI) showed a stronger relationship with job performance than C and it was still predictive in the applicant sample while C was not.

Further research is needed especially using participants assessed in high-stakes contexts.

THE IMPACT OF RACE ON EXPERIENCES OF RACISM AT A PREDOMINANTLY WHITE INSTITUTION

Presenter(s): Johnson, CJ, Undergraduate, Psychology

Mentor: Dr. Dawn McBride

Authorship: CJ Johnson

Predominantly institutions (PWIs) unfortunately tend to turn a blind eye to certain instances of racism. White supremacy tends to be in the framework in many PWIs, which means beneficial change often is not implemented until it is beneficial to the powers that be. The current study is a mixed methods study which looks at the experiences of racism, as microaggressions or more direct forms of racism, towards students of color at Illinois State University. Beyond direct experiences of racism, this study also looks at witnessed acts of racism from any student demographic, as well as how welcomed and included students at ISU feel. Using an anonymous self-report survey will allow students to share their experiences of racism and feelings of alienation or disillusionment, without fear of repercussion.

DOES WORKING MEMORY PREDICT PRECRASTINATION?

Presenter(s): Liew, Ryan, Graduate, Psychology

Mentor: Dr. Dawn McBride

Authorship: Sanaii Masih

Precrastination is the tendency to complete a task earlier than needed even when it will cost extra effort, (Rosenbaum et al., 2014). One possible explanation of precrastination is the reduction of cognitive load needed to remember future tasks – completing the task early reduced one’s mental to-do list (i.e. the CLEA hypothesis, VonderHaar et al., 2019). The current study investigated aspects of working memory in relation to precrastination. In two studies, we measured inhibition and updating aspects of working memory and precrastination rates in cognitive tasks. Despite the expectation that working memory would predict precrastination rates in a conscious effort to reduce cognitive load, no correlation between working memory scores and precrastination rates was evident in the results. One possible explanation of the results is that precrastination is a default, automatic response in most individuals when facing tasks that tax cognitive abilities that are not affected by one’s working memory abilities.

EXPLORING SHAME AND GUILT IN THE OSTRACISM–SELF-ISOLATION LINK

Presenter(s): Lim, Zhi Quan, Graduate, Psychology

Mentor: Dr. Eric Wesselmann

Co-Mentor: Dr. Matthew Hesson-McInnis

Authorship: Zhi Quan Lim, Eric Wesselmann, Matthew Hesson-McInnis

Previous studies that examine behavior responses to ostracism (i.e., being ignored and excluded; Williams, 2009) typically focus on either antisocial or prosocial responses. However, recent studies (Ren et al., 2016; 2021) have found a third behavioral response: an increased tendency to self-isolate or desire solitude. These findings are still relatively new compared to their counterparts. Our study replicates and extends these previous findings using a different method of inducing ostracism. The previous study manipulated ostracism in real-time social interactions (both in-person and virtually). These manipulations are powerful but intensive in terms of resources and involve complex stories or deception. We will use the less intensive autobiographical recall tasks, which ask participants to recall a past ostracism event. We further extend this research by examining the potential mediating role that shame and guilt may have in the ostracism-self isolation link. Past research demonstrates that shame motivates avoidance behaviors which should include self-isolation. We choose guilt as a comparison emotion because though it often correlates positively with shame, it typically promotes approach behaviors, which run counter to self-isolation. By accounting for both emotions concurrently, we can tease apart the effect of any potential emotional ambivalence on participants' desire to self-isolate. Our power analysis (anticipating a medium size for a path and our b path with .8 power) suggests that 116 participants should be sufficient. The study is currently in progress with an anticipated completion date of March 15, 2024. We will assign the participants randomly to either the ostracism memory group or the control group (i.e., recalling the last time they ate a meal). Participants then will answer items indicating their current emotional state, including shame and guilt. Finally, participants will indicate their preference for solitude-seeking using a measure from our replicated studies. We hypothesize that individuals who recall being ostracized will indicate a higher desire to self-isolate than individuals who recall a control event. We also hypothesize that recalling ostracism memories should increase feelings of both shame and guilt, with shame then predicting an increased desire to self-isolate. We will explore the potential mediating role that guilt may have on self-isolation. This study will replicate and expand on research examining the ostracism-self-isolation link. It will provide evidence using a different paradigm, as well as providing an initial exploration of potential psychological mechanisms.

SELF-OBJECTIFICATION AND DISORDERED EATING: THE ROLE OF FATHERS

Presenter(s): Mangold, Aleena, Graduate, Psychology

Mentor: Dr. Suejung Han

Authorship: Aleena Mangold, Suejung Han

The purpose of this study is to examine the links between disordered eating and body/weight related comments and messages from fathers through the lens of objectification theory (Fredrickson & Roberts, 1997). Chronic dieting and restrictive eating behaviors are highly prevalent for women and young girls, and these behaviors tend to be encouraged by parents' direct comments on the girl's body and weight and indirect messages that overvalue thinness and appearance (Rodgers & Chabrol, 2009). In a patriarchal society, fathers may be a critical messenger of such objectifying messages about women's bodies to their daughters. However, previous studies have focused on mothers extensively or examined parents/parental figures. The specific role of fathers in shaping their daughter's disordered eating behaviors has not been extensively examined together. We hypothesize that self-objectification will be associated with messages from fathers about dieting and appearance. We also hypothesize that the relationship between fathers' messages and their daughter's disordered eating habits would be mediated by self-objectification.

THE ROLE OF TEAM SUPPORT AND SELF-EFFICACY ON PERFORMANCE ANXIETY IN COLLEGE ATHLETES

Presenter(s): McLarty, Allie, Undergraduate, Psychology

Mentor: Dr. Suejung Han

Authorship: Allie McLarty, Dr. Suejung Han

Self-efficacy, defined as one's confidence in their ability to succeed in a specific task, has previously been shown to decrease performance anxiety in athletes (DePero et. al, 2013). This study examines how team support may influence an athlete's self-efficacy in performing their sports and how this may subsequently decrease state anxiety and improve overall performance. We hypothesize that the more support an athlete receives from their teammates, the higher self-efficacy, and the less performance anxiety they will experience. Team sport athletes from a Midwestern university having been recruited to participate in an online survey of this study that includes the Athletic Self-Efficacy Scale (ASES) (Kocak, 2020), the Sport Competitive Anxiety Test (SCAT) (Badruzaman et. al, 2022), the Sport Perceived Performance Scale (SPPS) (Almagro et. al, 2020), and the Perceived Athletic Support Questionnaire (PASS-Q) (Freeman et. al, 2021) that ranked levels of perceived team support, self-efficacy, performance anxiety, and overall athletic performance. Data collection is underway (current n= 21) and full results will be reported at the University Research Symposium in April. The results of the study may have implications for the importance of a supportive environment for the wellbeing and success of an athlete. We may further use the results of this study to support coaching and team bonding methods in college team sports.

ANIMALIZATION OF BLACK WOMEN: A BLACK FEMINIST APPROACH

Presenter(s): Nalule, Sharitah, Graduate, Psychology
Duong, Michelle, Graduate, Psychology
Sharp, Trinity, Graduate, Psychology

Mentor: Dr. Caitlin Mercier

Authorship: Caitlin Mercier, Michelle Duong, Sharitah Nalule, Trinity Sharp

Black women face inimical consequences attributable to misogynoir, or discriminatory behavior and prejudicial attitudes towards Black womanhood and femininity (Bailey, 2010). Despite scholarship that documents animalistic dehumanization of Black women (Anderson et al., 2019; Turner, 2011), few theoretical frameworks link misogynoir to devaluation of nonhuman animals. As Black feminist thought (BFT) contends to the interlocking nature of systemic oppression and dialectical images that contour the lives of Black women (Collins, 2000; Evans-Winters, 2019), it is a cogent framework to address animalistic dehumanization of Black women. Guided by relevant literature and BFT, we offer conceptualizations and recommendations for methodologies aimed to further the knowledge of the enmeshment of misogynoir and speciesism.

WELCOME TO OTHERLAND! A GAMIFIED APPROACH TO UNDERSTANDING CHOICES, BORDERS, AND 'OTHERING'

Presenter(s): Orthy, Maisha Tahsin, Graduate, Psychology
Lim, Zhi Quan, Graduate, Psychology
Dow, Michael, Graduate, Psychology

Mentor: Dr. Scott Jordan

Authorship: Scott Jordan, Maisha Tahsin Orthy, Zhi Quan Lim, Michael Dow

Otherland is an online course that teaches students the 'border-creating' nature of choices through the lens of Wild Systems Theory-WST; Jordan, 2013). WST conceptualizes living systems as energy-transformation systems (instead of as minds and bodies) that necessarily create and sustain borders at multiple levels, from the molecular to the biological, psychological, sociological, and cultural. We used a gamification approach to design Otherland to encourage the students to discover and understand the 'othering-like' nature of the multi-scale borders and their impact on people's lives. The students navigate Otherland by choosing and creating their path through a curriculum of quests (assignments) that involve culturally informed graphic novels. The process of having the choice of making their own curriculum and completing those assignments empowers students and requires self-regulation. The students complete bi-weekly papers on Graphic Novels, a term paper, a paper on Wild Systems Theory, and weekly strategy reports, which include their current points, target points, and assignment plans to get them to their target. Such repeated self-evaluation promotes the development of healthy habits for optimal learning. We also arrange weekly graphic novel discussions to discuss othering and WST using the frames from those graphic novels as tools. The Otherland has been offered as a senior seminar course for three semesters. After completing each semester, we qualitatively evaluated the graphic novel assignments using three dimensions- Application, Introspection, and Ubiquity. Our analysis of Spring 2023 data found a significant relationship between the scores on the dimensions with the Wild System Paper and there is a significant difference in Ubiquity scores as a function of Graphic Novel. Student scores on Wild System Paper better predicted the frequency of Dimensions scores for students who completed the first two graphic novel papers compared to those who completed later graphic novel papers. In addition, their Dimension scores are better predicted Term Paper scores. We did not find any of these results with our Summer 2023 data while our analysis of the Fall 2023 data is still underway.

#BLACKINTHEIVORY TWEETS: SHARING RESOURCES AND COPING WITH EXCLUSION

Presenter(s): Peterson, Kierra, Graduate, Psychology
Willaims, Sarah, Undergraduate, Psychology
Prondzinski, Kaitlyn, Undergraduate, Psychology
Earll, Olivia, Undergraduate, Psychology
Tyler, Cory, Undergraduate, Psychology
Pennington, Jasmine, Undergraduate, Psychology
Reed, Lea, Undergraduate, Psychology

Mentor: Dr. Kimberly T. Schneider

Authorship: Kierra Peterson, Sarah Williams, Kaitlyn Prondzinski, Olivia Earll, Corey Tyler, Jasmine Pennington, Leah Reed

Purpose:

#BlackInTheIvory trended on Twitter during June 2020 and highlighted discrimination faced by Black, Indigenous, and people of color (BIPOC) academics. Such experiences range from micro-aggressions to exclusion and ostracism, all of which are linked to negative consequences (e.g., job stress; Duffy et al., 2002). In the current study, we examined tweets reflecting the experiences of BIPOC academics who used #BlackInTheIvory to disclose discrimination. We aim to summarize and describe both the experiences and the coping strategies described in these tweets. We began by coding tweets using five dimensions specified by Sue et al. (2008) in describing race-based experiences: incident, perception, reaction, interpretation, and consequence. We extended our coding to include Settles et al.'s (2019) categories of tokenism, exclusion, and (in)visibility experiences (see Table 1). We expected BIPOC academics to report race-specific types of harassment (e.g., invasions of personal space, the experience of being perceived as 'feared'; see Inman et al., 2020). Finally, we coded coping strategies described in these tweets based on the problem-focused and emotion-focused strategies from Fitzgerald's (1990) Coping with Harassment Questionnaire.

Project Methodology:

We gathered #BlackInTheIvory tweets (N = 13,057) using the Meltwater Outside Insight social media analytics application during the 4-week period after the hashtag first appeared in June 2020. We used sentiment extraction packages for R to analyze the mean sentiment of tweets. We content-coded a random 1,000 tweets using three BIPOC coders and obtained high internal consistency (> 95% agreement). We also coded coping strategies based on the Coping with Harassment Questionnaire (see Table 2).

Results:

Most incidents described were microaggressions, with microinsults as the most frequent experience (22.4%). The second-most frequent use (14.2%) of #BlackInTheIvory was not to describe personal incidents but to publicize resources that might be helpful to BIPOC academics. Initial and ongoing coding focused on analyzing coping responses indicated that sharing resources and social support were the most common coping strategies (4.7% of all tweets), followed by amplifying colleagues and sharing their work and accomplishments (1.9% of all tweets). We will also present additional ongoing analyses focused on coping using analyses of bigrams (words that typically co-occur in tweets).

Implications:

BIPOC academics' experiences of discrimination in higher education are important to assess. Their descriptive responses of any coping strategies can also be insightful, particularly when linked to important work-related and well-being correlates. Such narratives are critical in developing best practices for inclusive workplaces.

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

Presenter(s): Studdard, Madison, Undergraduate, Psychology

Kosiek, Megan, Undergraduate, Psychology

Liew, Ryan, Graduate, Psychology

Mentor: Dr. Dawn M. McBride

Authorship: Ryan Liew, Megan Kosiek, Madison Studdard

In our study, we investigated the relation between precrastination and cognitive offloading. Precrastination is a behavior where people complete a task earlier than needed to reduce their mental load. Cognitive offloading is the reducing of mental load through writing down information or using some other kind of external reminder. We examined precrastination and cognitive offloading through several cognitive tasks. We predicted that there would be correlation between cognitive offloading and precrastination. This research provides insight into the importance of precrastination and cognitive offloading and why people precrastinate in cases where doing so involves extra effort.

WHAT'S AGE GOT TO DO WITH IT? THE COGNITIVE EFFECTS OF RACIAL AND GENDERED MICROAGGRESSIONS AMONG BLACK WOMEN AND THE ROLE OF AGE, COLORBLINDNESS, AND RACIAL IDENTITY

Presenter(s): Towner, Jazmine, Graduate, Psychology
Smith, Makayla, Graduate, Psychology

Mentor: Dr. Brea Banks

Racial microaggressions are brief, everyday derogatory interactions in the form of subtle insults, gestures, or slights (Sue et al., 2007). Microaggressions often are intentional or unintentional interactions that communicate denigrating messages to individuals holding marginalized identities. Previous research suggests that exposure to microaggressions directly results in cognitive depletion. Specifically, participants have displayed diminished functioning from pre- to post-test on the Stroop (1935) color-naming task after experimental exposure to microaggression as compared to those not exposed (Banks & Landau, 2021). The purpose of this study is to examine the impact of exposure to racial microaggressions on Black women's cognitive functioning. Using an experimental design, I will examine the impact of racial microaggressions on cognitive depletion. I hypothesize that condition assignment will predict changes in cognitive functioning for Black women. Also, racial centrality and age will moderate the relation between condition assignment and cognitive depletion. Last, I hypothesize that perceptions of colorblindness will mediate the relation between condition assignment and cognitive depletion.

THE MEDIATING OR MODERATING EFFECTS OF ADHD MEDICATION ON EFFECTIVE STUDY SKILLS AND GPA

Presenter(s): Walsh, Matthew, Undergraduate, Psychology

Mentor: Dr. Suejung Han, Psychology

Authorship: Matthew Walsh

Prior research has established that college students with diagnosed ADHD show lower levels of academic achievement than those without an ADHD diagnosis (Jangmo et al, 2019). It is essential to identify ways to support those students to accomplish their academic potential. Research demonstrates that ADHD medication appears to improve academic performance among students (Jangmo et al, 2019), but it is not clear that pharmacological treatments alone are enough to bolster student learning outcomes (Advokat, Lane & Luo, 2011; Boland, DiSalvo & Fried, 2020). There is also research documenting the efficacy of effective study habits on academic performance in general (Smith & Weinstein, 2023). It is not clear whether ADHD medication improves the use of effective study skills, which then improves academic performance. It is also possible that ADHD medication can be particularly effective for academic achievement if and when students are knowledgeable and able to use effective study skills. To my knowledge, only one study examines the impact of both medication usage and study habits on academic performance of students with ADHD (Advokat et al, 2011). I aimed to explore the association between specific study skills use and academic performance among those with ADHD medication. Participants were college students who were 18 or older. Students were recruited through the Psychology Department SONA system for research participation credits and through online flier posting for various student clubs. Participants were 44 college students who were diagnosed with ADHD. Of those students, 30 students reported that they were taking ADHD medication. The online survey of the study includes the following measures: the Academic Self-Efficacy Scale (Pintrich & de Groot, 1990), Study Habits Scale (The Learning Scientists), GPA, and questions about ADHD diagnosis and medication. Among the ADHD-diagnosed students who were taking ADHD medication, the correlation between study skills use and GPA was not significant ($r = .067$, $p = 0.695$), but that between study skills use and academic self-efficacy was ($r = .337$, $p < 0.001$). The implications will be discussed.

EFFECTS OF DELAY ON SHORT- AND LONG-TERM FALSE MEMORIES FOR SEMANTIC AND PHONOLOGICAL LISTS

Presenter(s): Yuksel, Ece, Graduate, Psychology

Mentor: Dr. Dawn M. McBride

Authorship: Ece Yuksel, Dawn M. McBride, Jennifer H. Coane

The Deese/Roediger-McDermott (DRM) paradigm was developed to investigate false memory using lists of words related to an associated, non-present lure. The purpose of the present study was to examine the differences in memory errors for semantic and phonological lists across delays using the DRM paradigm. Previous studies have shown that the higher rates of false memories for semantic than phonological lists typically seen at longer delays is reversed for very short delays (McBride et al., 2019). Delays, 750 ms, 30 s, 90 s, and 3 min, were included to examine the delay at when the cross-over from primarily phonological errors in the short-term to semantic errors in long-term memory takes place. We hypothesized that the change in errors from one list type to the other at about a 90 second delay between study of the lists and the test item and to increase for semantic errors for delays longer than 90 seconds. The results showed significant false memories across all delays with two exceptions: no false memories were found for semantic lists at the shortest delay (750 ms) or for phonological lists at the 90 s delay. These results suggest a crossover from short-term to long-term memory processes in this time frame

SOCIAL WORK

JOB FLEXIBILITY, ACCESS TO PAID SICK LEAVE, AND ACCESS TO CHESTNUT'S MENTAL HEALTH SERVICES

Presenter(s): Bianco, Alyssandra, Graduate, Social Work

Mentor: Dr. Christopher Gjesfjeld

Authorship: Alyssandra Bianco

Background Info: Studies have shown there is a positive correlation between an individual's perceived job flexibility, their access to paid sick leave, and their access to healthcare.

Additionally, an individual's perceived job flexibility and access to paid sick leave is largely dependent on a multitude of factors related to their socioeconomic status, age, and level of education (Cook et al., 2009; DeRigne et al., 2016; Hegland & Berdahl, 2022; Heymann et al., 2009; Moss et al., 2022; O'Connor et al., 2014; Panther, Gleason & Kneipp, 2004; U.S. Department of Labor, 2022; U.S. Bureau of Labor Statistics, 2023). Though little research exists measuring the relationship between these variables and access to mental health care, the correlations are likely similar.

Study Design: This will be an explanatory study that uses quantitative data to understand if there was a relationship between job flexibility, access to paid sick leave, and client access to Chestnut's mental health services.

Sample: The sample for this study will be a convenience sample of new and existing clients in Chestnut's outpatient behavioral health department, with various referral sources.

Methods: A Qualtrics survey has been developed for this study that asks participants to answer demographic questions, questions about their job's perceived flexibility using the Job Flexibility Instrument (Gallagher, 2004), whether they have access to paid sick leave, and whether they have experienced difficulty accessing Chestnut's mental health services as a result of their job's lack of flexibility or their lack of access to paid sick leave. Both electronic and paper copies of the survey will be distributed throughout Chestnut's Martin Luther King Jr. Drive location to encourage clients to participate. The survey will be active for two months.

Results: Based on the findings in the existing literature, it is anticipated that the results of this study will indicate there is a correlation between the flexibility of clients' jobs, their access to paid sick leave, and their access to Chestnut's mental health services. Discussion: If there is a positive correlation between these variables, it is advantageous for the organization to look into solutions such as altering business availability, providing career services, and partnering with local employers to develop agreements that allow employees to seek Chestnut services without jeopardizing their jobs.

WELLNESS DAYS: A PROGRAM'S IMPACT ON BURNOUT, WORK-LIFE BALANCE, AND TURNOVER INTENTION AMONG COMMUNITY BEHAVIOR HEALTH EMPLOYEES

Presenter(s): Deetz, Marty, Graduate, Social Work

Mentor: Dr. Christopher Gjesfeld

When working in behavioral healthcare it can be challenging to balance the stressors of work with the stressors of daily life. This often results in higher-than-average turnover rates for community behavioral health facilities and higher rates of burnout for the clinicians working there. It has been argued that these factors may lower the quality of care given to the individuals these facilities serve (Brabson et al., 2020; De Hert, 2020; Johnson-Kwochka et al., 2020). Considering the potential impact both personally and professionally, it is important to explore policies and programs that can ameliorate these effects.

The purpose of my research is to evaluate one such intervention, a pilot program implemented by Heritage Behavioral Health Center in Decatur, IL known as "Wellness Days." Wellness Days give every full-time Heritage employee every other Friday off, paid. My goal is to utilize qualitative survey questions to explore the effect Wellness Days has on feelings of burnout, quality of work-life balance, and turnover intention among mental health professionals employed at a community behavioral healthcare facility.

THE EFFECTIVENESS OF A SOCIAL SKILLS GROUP TO TACKLE RELATIONAL AGGRESSION

Presenter(s): Engelmeyer, Alexandra, Graduate, Social Work

Mentor: Dr. Christopher Gjesfjeld

Authorship: Alexandra Engelmeyer, Christopher Gjesfjeld

Relational aggression, a subtle form of social manipulation and bullying, poses significant challenges in educational settings, particularly in middle school. This study investigates the effectiveness of a small social skills group intervention in easing relational aggression behaviors.

Literature highlights the nuanced nature of relational aggression, extending beyond stereotypical bullying behaviors. Research suggests that factors such as friendship insecurity, jealousy, and social dominance motivations contribute to relational aggression (Pronk & Zimmer-Gembeck, 2009). Furthermore, its detrimental effects on self-esteem, peer relationships, and academic performance highlight the urgency of intervention efforts (Demol et al., 2021).

Employing a pre- and post-test design with both control and experimental groups, this study assesses changes in relational aggression behaviors over eight weeks. Data collection utilizes the Loudin, Loukas, and Robinson Relational Aggression Subscale, along with the Multidimensional Peer-Victimization Scale. The intervention, based on "The Ophelia Project" curriculum, incorporates sessions on peer aggression awareness, bystander roles, social norms, leadership, and cyberbullying.

Participants, selected through convenience and voluntary response sampling, provided parental and student consent before data collection. The intervention, which includes five students in a five-week lunch group, targets relational aggression and social skills with an emphasis on peer dialogue.

Preliminary findings from previous studies support the potential efficacy of such interventions (Wright et al., 2012; Splett et al., 2014). By addressing root causes and equipping participants with conflict resolution tools, this study predicts this intervention will foster healthier peer interactions and mitigate the impacts of relational aggression.

TEACHING AND LEARNING

GLOBAL CITIZENSHIP ONE STEP AT A TIME: STARTING WITH YOUR CLASS

Presenter: Fisk, Ashlyn, Undergraduate, Teaching and Learning

Mentor: Prof. Miranda Lin

I am doing a content analysis of the book, "If Kids Ran the World," by Diane and Leo Dillon published in 2014, and creating a learning activity accompanying the book. My research questions around this topic are: 1) Why is creating a community important? 2) What does it mean to be a citizen? 3) Why does being a citizen matter? As a future elementary education teacher, I strive to emphasize developing a healthy class community, which should instill the ideals of citizenship and inclusivity in students. Multiple theories will be used to analyze the book, such as elements from Piaget's theory of Constructivism, the Critical Multicultural Education theory, and the Situated Learning Theory. The story chosen is appropriate for grades K to 3. It shows how children can have critical thoughts and ideas about homelessness, hunger, schooling, social-emotional awareness, inclusivity, money, the environment, religion, social hierarchy, and more. Along with the content analysis of the book, I will also provide an activity to incorporate into the class community lesson. This activity would partially take place before reading and then finish after reading. It will begin with students individually noting how they would positively change the class, the community, and the world. After this discussion, the whole class would physically create a project of their community with new incorporations of their ideas. The students and teacher would work together to explain the reason for the changes. The overall goal of this activity would be to get students thinking about what is important to them, to hear what is important to others, and to see how change can be effectively made through collaboration. This activity promotes a healthy class environment because everyone's ideas are heard and acknowledged, creating a new community together. This activity and book will help shift the students' perspective to a more "global citizenship" way of thinking. And when trying to create change, you need to start small. With the book and activity, I believe students could understand their place and value in the world and amongst the global citizens by beginning to understand their own class community and local community.

WHO CREATES THE CLT IMPLEMENTATION CHALLENGE? THE EFL CURRICULUM DESIGNERS OR THE EFL TEACHERS?

Presenter: Somé, Kountiala Jean de Dieu, Graduate, Teaching and Learning

Mentor: Dr. Carolyn S. Hunt

An extended number of inquiries on the implementation of Communicative Language Teaching (CLT) curricula consistently conclude that English as a Foreign Language (EFL) teachers heavily rely on traditional teaching methods rather than communicative approaches (Some-Guiébré, 2020; Han, 2016; Lee, 2014). As for why they resist change, some articles conclude that CLT-based curricula lack pedagogical resources to facilitate implementation at the school level. Others point at teachers' lack of training or preference for traditional approaches. Those findings indicate different levels of challenges in implementing CLT-based curricula in foreign contexts. In this selective literature review, I questioned curriculum designers' efforts to domesticate CLT principles and facilitate their implementation in the classroom. From the articles reviewed, I found that curriculum designers sometimes fail to formulate contextual pedagogical recommendations for EFL teachers. In other cases, CLT-based curricula are provided with a call for considering local contexts in instruction practices while assessments of teaching and learning remain standard-based. Socio-reconstructionist and constructivist views are generally used to inform CLT curricula content without clear orientation on differentiated pedagogical approaches for implementation in urban and rural areas. I then recommend that CLT curriculum design follow a collaborative process of domestication of general CLT principles to give them national colors and flavors.

Keywords: CLT, Communicative Language Teaching, Constructivism, ESL, EFL

TECHNOLOGY

EXPERIENTIAL EDUCATION FOR SUSTAINABLE LEADERSHIP

Presenters: Bediaku, Mavis, Graduate, Technology

Mentor: Prof. Sundeep Inti

Authorship: Mavis Bediaku, Sundeep Inti

This study explores innovative instructional strategies in Construction Management programs, focusing on teaching sustainable construction. While traditional approaches emphasize understanding sustainability principles, the benefits of sustainable construction, and green building assessment systems, they often need to pay more attention to theoretical content. These activities have resulted in decreased classroom engagement and significant challenges in the long-term retention and practical application of the material, hindering students' transition to the professional world. This research seeks to revitalize the teaching of sustainable construction by designing and implementing a course that engages students and significantly enhances their learning experience. We introduced a variety of hands-on classroom activities that are both enjoyable and intellectually stimulating, encouraging students to interact and exchange ideas. These activities include solving tangram puzzles and playing concept- application games designed to bring theoretical concepts to life. Employing a mixed methods approach that integrates both qualitative and quantitative analyses, we evaluated the impact of these course activities. The findings are promising: students reported that the innovative activities facilitated a deeper understanding of sustainability concepts and fostered greater active participation in classes compared to traditional, theory-heavy lectures. This study underscores the potential of interactive and applied learning experiences in enhancing educational outcomes in sustainable construction.

MULTIFACETED DATA ENGINEERING AND MACHINE LEARNING PIPELINE FOR DATA-DRIVEN UNDERSTANDING OF BRIDGE CONDITIONS

Presenter: Gandla, Sai Ram, Graduate, Information Technology

Mentor: Dr. H. Sally Xie

Enhancing the National Bridge Inventory (NBI) database to include detailed information on bridge ownership, traffic patterns, and structural details is crucial for advancing maintenance and safety protocols.

This approach involved a multifaceted data engineering and machine learning pipeline to identify the trends and patterns of bridge conditions. Initially, we conducted data acquisition from the NBI, followed by preprocessing steps including data cleaning, normalization, and deduplication to ensure data integrity. We then applied unsupervised learning techniques, specifically k-means clustering, to segment the bridges into homogenous groups based on characteristics such as geographic location, traffic volume, and structural attributes. For each cluster, we developed a custom Artificial Neural Network (ANN) model, optimizing its architecture for predictive accuracy through hyperparameter tuning and cross-validation. Feature engineering was also a critical component, allowing us to extract and select the most relevant features for predicting bridge conditions effectively.

The incorporation of granular data and machine learning models enabled a refined analysis of bridge conditions, integrating weather and traffic data for comprehensive insights. Our ANN models, trained on clustered data, achieved notable predictive accuracy, enhancing our ability to estimate the critical maintenance needs and safety vulnerabilities. The analysis highlighted the significant impact of traffic intensity and structural characteristics on bridge wear and tear, underscoring the importance of targeted maintenance strategies.

The project's application of advanced data analytics and machine learning techniques significantly improves the capability of the NBI database to inform infrastructure management decisions. By enabling a deeper, data-driven understanding of bridge conditions, these enhancements support more strategic maintenance planning, policy development, and contribute to ensuring public safety. Through this research, we demonstrate the capacity of machine learning to transform infrastructure assessment and management practices.

ADDRESSING IOT VULNERABILITIES: AN ANALYSIS OF RISKS FACING SMART HOMES

Presenter(s): Peterson, Erik, Undergraduate, Technology

Mentor: Dr. Stephen Mujeye

The integration of Internet of Things (IoT) devices in smart homes has surged in recent years, accompanied by significant security vulnerabilities. This research project proposes a meticulous analysis of these vulnerabilities and the development of mitigation strategies. The attacks that can be executed are often dependent on the method of infiltration. By conducting a systematic literature review, we aim to explore the current landscape of IoT security, identifying prevalent vulnerabilities and emerging trends. We will attempt to discover the most common methods of attacks and what exploits are used. Subsequently, employing surveys and controlled experiments, we will quantitatively assess the prevalence of IoT devices among students and analyze their susceptibility to data attacks. The anticipated outcomes include the documentation of existing security issues, quantification of device prevalence, and evaluation of susceptibility to attacks. Furthermore, through analysis of our findings, we aim to raise awareness about IoT risks and empower users with actionable insights for safeguarding their smart homes. By bridging the gap between research and practice, this research holds implications for enhancing cybersecurity in everyday environments and promoting responsible IoT adoption.

LEARNING THROUGH COMPETITION. POPULARIZE REINFORCEMENT LEARNING AT ISU THROUGH AWS DEEPRACER

Presenters: Syed, Yaqoob Ayaan Ishaqui, Graduate, Information Technology
Gupta, Dolly, Graduate, Technology
Mentor: Dr. Isaac Chang
Authorship: Yaqoob Ayaan Ishaqui Syed, Dolly Gupta

Reinforcement learning (RL) is a technique that trains software to make decisions for optimal results. It mimics human's trial-and-error process to achieve the set goals. While RL can be applied to various aspects of our lives, such as automation, transportation, business, and healthcare, the learning threshold seems high to the public.

We will discuss an ongoing project for fostering a competition-based learning environment for RL at ISU. This project intends to develop RL-related curricula and activities for ISU by utilizing AWS DeepRacer, a track-racing platform. With critical features like cloud-based simulation, reward systems, and adaptable RL algorithms, DeepRacer could provide an accessible venue for enthusiasts, both novices and professionals, to pick up RL essentials while sharing the excitement of competitions.

Our presentation will highlight this platform's versatility and potential applications in creating autonomous systems. Findings of experimentations on the effectiveness of different training strategies and hyperparameter tuning techniques for DeepRacer models will be reported. We will conclude with the outlook of future research, providing a road map for campus-wide implementation and community engagement.