University Undergraduate
Research & Arts Forum

April 17, 2026

ACKNOWLEDGEMENTS

The 28th University Undergraduate Research and Arts Forum (UURAF) at Michigan State University was held at the Jack Breslin Student Events Center and online at Symposium by ForagerOne on April 17, 2026. This program book recognizes the outstanding research and creative endeavors by over 1,100 undergraduate students. These students represent 14 different colleges and were mentored by more than 720 faculty, staff, post-doctoral fellows, graduate students, and government / industry partners. UURAF is sponsored by the Office of Undergraduate Education and the Honors College.

Behind the Scenes

UURAF would not be possible without a team of dedicated individuals in the Undergraduate Research Office who coordinate logistics, respond to inquiries, and support students and mentors. Many thanks to…

- Our student and support staff: Genevieve Henry, Amandeep Jangra, Anisha Maheshwari, Elle Mun, Rukmini Mitra, and Martina Yen
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We appreciate the work of numerous associate and assistant deans for identifying faculty, staff, post-doctoral fellows, and graduate students to evaluate student presentations. Finally, we thank the hundreds of dedicated mentors who guided the research projects and creative activities presented in this program book. We encourage you to learn about the impressive work of our next generation of scholars and researchers.

About the Cover

Cover Art was designed by Henri Barths, 25'BFA in Graphic Design from the College of Arts & Letters, Department of Art, Art History, and Design.

Undergraduate Research Ambassador Program

Our student ambassadors facilitate workshops about undergraduate research, provide guidance on programming and initiatives, and represent the office at campus events. They frequently are invited to present to classes and at student academic organization meetings. The 2025-26 Undergraduate Research Ambassadors include:

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Undergraduate Research
MICHIGAN STATE UNIVERSITY

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Abstracts

Abstracts are organized by category.

Agriculture & Animal Science

ROOT CHARACTERISTICS OF CELERY AND HERBICIDE RESISTANT LARGE CRABGRASS IMPLICATIONS FOR MECHANICAL CULTIVATION

Presenter(s): Aiden Mullaney
Category: Agriculture and Animal Science
Mentor(s): Akane Takenaka (College of Agriculture & Natural Resources), Daniel Brainard (College of Agriculture & Natural Resources), Stephen Stresow (College of Agriculture & Natural Resources), Zachary Hayden (College of Agriculture & Natural Resources)

Herbicide resistant weeds, such as large crabgrass (Digitaria sanguinalis), are becoming more prevalent in Michigan specialty crops, including celery (Apium graveolens). To improve integrated weed management strategies, some growers are exploring alternative methods like mechanical cultivation. This study investigates potential 'fitness costs' associated with Acetyl-CoA Carboxylase (ACCase) herbicide resistant crabgrass. By examining differences in root morphology and biomechanical trends between celery and susceptible or resistant crabgrass biotypes, we aim to gain insight into the optimal timing and cultivation mechanism (uprooting or burial) for crabgrass control. Over a four-week period, celery, herbicide resistant and susceptible crabgrass were grown in pots in a greenhouse and destructively harvested to obtain anchorage force, height, and dry biomass data. We found that celery maintained a height and anchorage force advantage relative to both susceptible and resistant crabgrass biotypes until approximately 3 weeks after transplanting (WAT). In a separate experiment, celery transplants and crabgrass biotypes were grown in rhizoboxes and scanned weekly to capture root system images for analysis in RhizoVision Explorer Software. Celery accumulated more root and shoot biomass than either crabgrass biotype, while herbicide resistant crabgrass produced less root and shoot biomass than its susceptible counterpart. Based on image analysis, roots of resistant crabgrass had approximately 60% less surface area and volume than susceptible crabgrass at 4 WAT. Our results suggest a potential fitness cost associated with ACCase resistance in large crabgrass, which may make resistant biotypes more vulnerable to control by mechanical cultivation within 3 WAT.

DEVELOPMENT OF AN IOT-BASED SAP FLOW SENSOR FOR MONITORING PLANT WATER UPTAKE

Presenter(s): Gary He
Category: Agriculture and Animal Science
Mentor(s): Younsuk Dong (College of Agriculture & Natural Resources)

Accurate monitoring of plant water consumption is vital for sustainable agriculture and efficient resource management. However, many commercial sap flow sensors are expensive or lack the durability required for extended field studies. This research focuses on the design and prototyping of a low-cost, Internet of Things (IoT) enabled sap flow sensor tailored for agricultural crops such as corn. The primary goal of this project is to create an affordable device capable of long-term deployment to monitor the rate of xylem

movement within plant stems, which can be related to plant water uptake. The research process involved designing the sensor's hardware, prototyping for reliability, and integrating IoT technology to ensure reliable data transmission from the field to the user. This presentation will consist of the iterative engineering design process, the technical challenges of creating a field-ready sensor, and the potential impact of this technology on improving agricultural water-use efficiency.

ANALYSIS OF PHYSICAL, BIOLOGICAL, AND CHEMICAL MECHANISMS CONTRIBUTING TO EMITTER CLOGGING IN DRIP IRRIGATION SYSTEMS
Presenter(s): Stewart Tucker
Category: Agriculture and Animal Science
Mentor(s): Younsuk Dong (College of Agriculture & Natural Resources)

Drip irrigation is a form of precision irrigation that delivers water directly to the rootzone. In Michigan, where center pivot style irrigation is common, growers of specialty crops on sandy soils have been using drip irrigation to significantly save on water. Drip irrigation can not only increase water use efficiency but can also reduce fertilizer leaching leading to higher nitrogen use efficiency. However, the precise emitters on the drip line are prone to clogging challenging some farmers. This clogging can be cause by physical, biological, and chemical factors such as sediments, salts, and algae respectively. Clogged emitters can cause uneven watering, shorten the systems life, and increase required maintenance. Previous research has identified these three factors as the main source of the emitter clogging, noting that interactions between the three are most common rather than one alone. A pilot scale drip irrigation system was built to test the different types of clogging and trial ways to remedy it. Three main lines, each containing five drip emitters, are connected to a pump and fertilizer injector. The fertilizer injector provides the ability to insert biologicals and chemicals to cause clogging. Pressure, electric conductivity, and pH sensors are also installed on the line to track the quality of the experiment. These lines will be run for 10 hours a day for three weeks to simulate they typical Michigan growing season.

AUTOIMMUNE REGULATOR DEFICIENCY'S EFFECT ON SOCIAL AND MATING BEHAVIORS IN MALE MICE
Presenter(s): Sophie Monolidis
Category: Agriculture and Animal Science
Mentor(s): Alexandra Yaw (College of Agriculture & Natural Resources), Margaret Petroff (College of Veterinary Medicine), Soo Hyun Ahn (College of Osteopathic Medicine)

Autoimmune regulator (Aire) is a transcription factor expressed in the thymus that is responsible for ensuring immune self-tolerance. The deletion of Aire results in Autoimmune Polyglandular Syndrome Type -1, an autoimmune disease that has been associated with infertility in men. In a mouse model that targets Aire, Aire-deficient (Aire-/-) mice exhibit severe subfertility compared to wild-type counterparts. Rodent mating behavior is driven by pheromone detection through the vomeronasal organ (VNO), and in Aire-/- males, the VNO is heavily targeted by autoreactive immune cells. We hypothesized that Aire-/- males may be subfertile due to olfactory disruption, resulting in a lack of copulatory behavior. To test this, we analyzed the mating behavior of control and Aire-/- mice in response to a sexually receptive

(estrous) female conspecific. In the trial, a male was habituated to a clean cage and video recorded for 45 minutes, following the introduction of an estrous female. Videos were scored by an experimenter blinded to mouse genotype using Behavioral Observation Research Interactive Software (BORIS). Male behaviors were scored and categorized as contact (affiliative and agonistic) or non-contact, with affiliative behaviors further characterized to include mating attempts and successful mating (completion of mounting, intromission, and ejaculation). Interestingly, several males engaged in agonistic behaviors towards the female, including attack and threatening behaviors (tail rattle, lateral threat). Next steps include identifying treatment groups to determine if agonistic behaviors are linked to Aire and determining if disrupted behavior is linked to anosmia or a pheromone-specific disruption to olfactory processing.

REMOTE SENSING APPROACHES FOR PRE-HARVEST DETECTION OF ROOT DISEASE IN SUGAR BEETS
Presenter(s): Ariel Ooms
Category: Agriculture and Animal Science
Mentor(s): Erin Bunting (College of Social Science)

Sugar beets are a critical crop for sugar production in the United States and globally. However, root diseases, which often remains undetected until harvest, can severely reduce yield and quality resulting in unavoidable economic losses. Early detection methods are therefore essential for improving crop management and minimizing losses. This study aims to identify effective remote sensing approaches for detecting Rhizoctonia solani in sugar beets before visible symptoms become severe. Grounded in time series geospatial methodologies, this study employs data fusion of high-resolution RGB, multispectral, and hyperspectral imagery collected using unoccupied aerial vehicles (UAVs) to assess plant health throughout the growing season. A wide range of predictor variables are derived, including vegetation indices, spectral reflectance values across multiple bands, and temporal metrics from repeated flights. Machine learning and spatial statistics are conducted to evaluate how spectral responses change over time in diseased versus healthy plants. Particular attention is given to identifying consistent trends in vegetation indices and shifts in reflectance within key spectral regions associated with plant stress. To determine the most influential variables for disease detection, a random forest classification model is implemented. Variable importance metrics are used to refine the feature set and develop an optimized methodology for early disease identification. Results from this research will contribute to precision agriculture strategies aimed at improving yield, reducing economic losses, and supporting sustainable crop management practices.

IDENTITY OF MASTITIS PATHOGENS THAT WERE NOT IDENTIFIED USING MALDI-TOF
Presenter(s): Isabella Stoutenburg
Category: Agriculture and Animal Science
Mentor(s): Pamela Ruegg (College of Veterinary Medicine)

Mastitis is a leading cause of economic loss and animal welfare concerns in commercial dairy herds and is almost always caused by bacteria. Accurate identification of mastitis pathogens is essential to guide

effective treatment and prevention strategies. Matrix-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF) is widely used for bacterial identification; however, some isolates recovered from milk samples remain unidentified using this method. The objective of this study is to characterize mastitis pathogens that were previously cultured from milk collected from cows with subclinical mastitis on commercial dairy herds but not identified using MALDI-TOF. Frozen quarter milk samples (n = 74) that had previously had bacterial isolates recovered but had failed identification using MALDI-TOF will be thawed and recultured. Viable bacteria will again be ran through MALDI-TOF. Isolates that fail to be identified again will be re-cultured on blood agar and MacConkey agar. And evaluated for colony morphology, hemolysis, lactose fermentation, and Gram stain characteristics. Additional testing will be performed based on Gram classification, including catalase and coagulase. All isolates that fail to be identified using MALDI-TOF, will be subjected to molecular identification by extraction of DNA and 16S rRNA gene sequencing. Results from this study will improve understanding of mastitis pathogens that are difficult to identify using routine diagnostic methods and may contribute to improved diagnostic accuracy in dairy herd health management.

IMPROVING WATER SUSTAINABILITY WITH AN IOT-BASED IRRIGATION EARLY WARNING SYSTEM
Presenter(s): Nicholas Bray
Category: Agriculture and Animal Science
Mentor(s): Ashley Fleser (MSU Agbioresearch), Emily Lavely (Michigan State University Extension), Nawab Ali (College of Agriculture & Natural Resources), Younsuk Dong (College of Agriculture & Natural Resources)

Irrigation system failures such as leaks, valve malfunctions, clogging, and abnormal pressure can result in significant water losses, reduced irrigation uniformity, and lower water use efficiency. Conventional irrigation monitoring often relies on manual inspection, which provides delayed or incomplete information about system performance. This research developed and evaluated an Internet of Things (IoT)-based irrigation water pressure monitoring and early warning system designed to provide real-time diagnostics of irrigation system behavior. The pressure sensor was successfully calibrated using air pressure, achieving an R2 value of 0.99.The system integrates low-cost pressure sensors installed across multiple irrigation lines with cloud-based data collection and hydraulic modeling to continuously track pressure changes throughout the field. Real-time pressure data were analyzed to identify deviations from expected pressure patterns that may indicate leaks or operational faults. Field testing demonstrated that the system was capable of detecting abnormal pressure events and capturing spatial differences in system performance across irrigation lines. Overall, the proposed IoT-based monitoring framework provides a scalable and cost-effective approach for improving irrigation system reliability, enhancing water use efficiency, and supporting early detection of hydraulic issues. Future work will focus on integrating additional data sources, such as flow rate, soil moisture, and weather conditions, and applying predictive analytics to enable automated alerts and improved irrigation management.

DEFINING THE RELATIONSHIP BETWEEN JUDGE SCORING AND HORSE-RIDER BIOMECHANICS IN THE PIAFFE
Presenter(s): Stephanie Hadley
Category: Agriculture and Animal Science
Mentor(s): Jane Manfredi (College of Veterinary Medicine)

In high-level dressage, the piaffe is a movement that is a highly collected, elevated trot, in which the horse appears to be remaining in place. Judge scoring can shape horse piaffe training, thus impacting equine welfare. Judges subjectively score based on a set of standards, but what aspects of horse or rider kinematics during the piaffe influence the score the most is unknown. Video footage of the piaffe from 17 competitors' rides during the 2022 FEI Leipzig Finals was analyzed with a dedicated software program. Horse kinematic measurements included height of the forelimb and hindlimb; angles of the hip, back, head, forearm, forelimb, and hindlimb; hindlimb distance forward; and distance travelled during the piaffe. Rider position measurements included forearm, leg, and seat angles, and leg extension. Statistics included a linear regression analysis with significance set at $p < 0.05$ to determine which horse or rider kinematics have the greatest influence on judge scores. Results indicated that the height of the hindlimb, hip angle, hindlimb distance forward, distance travelled during the piaffe, and rider leg angle significantly influenced scoring. Higher scores were associated with larger angles or distances, with the exception that horses behind the vertical obtained high scores. Some rewarded findings were consistent with judging imperatives, while others were counter to the standards, all of which have implications for training and welfare.

COMPOSTING ON CAMPUS: DEVELOPING A SCALABLE COMPOSTING PROTOCOL
Presenter(s): David Hartman, Lilly Stevens, Tabitha Bartrum
Category: Agriculture and Animal Science
Mentor(s): Jorhie Beadle (Office of Undergraduate Education), Mariia Bespalova (College of Engineering), Ramani Narayan (College of Engineering)

Michigan State University's current method of composting food waste requires the waste to be loaded onto a truck and shipped to an off-campus site, resulting in serious carbon emissions and reducing the waste-reduction impact that was originally intended. Under the research of Dr. Ramani Narayan, our project sought to maintain the benefits of composting while reducing the waste in this process. To do this, we tested in-home devices called Reencle Bioreactors, which mix food waste with a provided pack of bacterial microorganisms and activated charcoal, creating a pre-compost substrate that is much lighter and easier to ship. Testing these paves the way for us to create a protocol that allows for the unit to be scaled up into bigger areas of impact like college dining halls and grocery stores. During this process, we collected food waste from Brody Dining Hall and added it in 1.3kg increments five times weekly for three weeks. The control group added only food waste, and the experimental group added craft paper equal in volume to the food waste to manage moisture. The control group's bioreactor entered an anaerobic respiration state, while the experimental group found that the craft paper added carbon and managed moisture. Considering how our protocol could be used on a larger scale, we have concluded that high-

moisture, low-carbon food will not be adequate for these units. Therefore, a dry carbon source is needed for these to be an effective potential solution to the University's waste management issue.

EFFECTS OF THIGH-BLOCK ON RIDER POSITION AND HORSE MOVEMENT DURING PIAFFE
Presenter(s): Josephine Parish
Category: Agriculture and Animal Science
Mentor(s): Jane Manfredi (College of Veterinary Medicine)

Saddle design features such as thigh block style may alter rider alignment and change horse biomechanics by shifting the rider's balance and pressure distribution. The study's objective was to investigate how different thigh blocks influence rider position and horse movement during piaffe (a highly collected trot in place with minimal forward movement). We hypothesized that soft thigh blocks would improve rider leg stability and alignment, creating more consistent contact and producing a more regular, symmetrical piaffe with steadier horse posture and less head/neck motion. Seven horse-rider pairs were evaluated during piaffe under four saddle conditions using video and a pressure-sensitive saddle mat: (1) the owner's saddle; (2) an EQ Saddle Science saddle (ESSS) with flat thigh blocks; (3) ESSS with soft thigh blocks; and (4) ESSS with hard thigh blocks. Pressure data quantified overall magnitude and distribution across the saddle, while video analysis assessed rider position to link pressure patterns with changes in seat and lower-limb placement. Horse biomechanics were assessed from video by tracking rhythm and symmetry to determine whether pressure and rider-position changes corresponded with movement quality. Statistics will include a repeated-measures ANOVA with significance set at $p < 0.05$. We expect decreased saddle-mat peak pressures and variability in the soft thigh-block condition, along with more consistent step timing, improved symmetry, and reduced head/neck movement in the horse. These findings will improve understanding of how saddle features affect rider posture and mechanical demands on the horse, with implications for saddle fitting, performance, and equine welfare.

EFFECTS OF REHABILITATIVE WHOLE BODY RESISTANCE BAND WRAP ON THE GAIT, POSTURE, CORTISOL, AND MUSCULAR FUNCTION IN EQUINE
Presenter(s): Ruby Rockburn
Category: Agriculture and Animal Science
Mentor(s): Jane Manfredi (College of Veterinary Medicine)

Traditional resistance bands wrap partially around equine, and their benefits such as increased muscle activation, stability, or symmetry are only achievable with a handler actively working them. The Eagle ProSix equine system is a whole-body resistance band wrap (RBW) that is believed to improve proprioception, gait symmetry, posture and muscle function without a handler. The whole-body system applies deep touch pressure around the entire horse which is thought to relieve anxiety. This study hypothesized that horses experiencing varying gait asymmetries would experience improvements in lameness, muscular function, range of motion, posture, and cortisol following a short-term use of RBW. Nine lame adult horses were evaluated with and without the RBW. Assessments included objective gait analysis, acoustic myography, postural analysis, gait kinematics, and salivary cortisol concentrations.

Statistical analyses included Shapiro-Wilk Test, Paired Student T-Tests, or non-parametric Wilcoxon Signed-Rank Tests (significant at p?

DEVELOPMENT OF MOBILE SOLAR TRAILER FOR IMPROVING IRRIGATION ENERGY USE
Presenter(s): Janus Grivins
Category: Agriculture and Animal Science
Mentor(s): Younsuk Dong (College of Agriculture & Natural Resources)

Michigan has more than 8,000 center-pivot irrigation systems, and over half of them operate on electricity. Typical irrigation pumps range from 10 to 50 horsepower and deliver between 50 and 1,000 gallons per minute. Because these pumps require substantial electrical power, they can place significant strain on rural electrical infrastructure. In many communities, this demand contributes to voltage drops and flickering issues that affect nearby residents. As Michigan experiences hot and dry growing seasons, it drives greater reliance on irrigation, which further increases electrical load from agricultural pumping systems. Thus, the grid is experiencing growing and persistent stress. Most irrigation pumps use electric motors, which draw especially high wattage during startup. When a motor is at rest, it offers very low electrical resistance because the electromagnetic fields that normally create counter-current have not yet formed. This leads to extremely high inrush current as the motor begins to turn, amplifying the strain on the grid. The goal of this project is to address that challenge by developing a mobile solar-powered trailer that can be deployed on farms to support the high starting current required by irrigation pumps and improve overall grid stability. The trailer integrates 16 solar panels capable of producing approximately 6080 watts, is fully mobile, and can be easily connected to existing pump systems.

STERILE INSECT TECHNIQUE: SPOTTED WING DROSOPHILA RELEASES IN MICHIGAN TART CHERRY
Presenter(s): Edward Peterson
Category: Agriculture and Animal Science
Mentor(s): Juan Huang (College of Agriculture & Natural Resources), Julianna Wilson (College of Agriculture & Natural Resources)

Drosophila suzukii, also known as spotted wing drosophila or SWD, targets and damages soft-skinned fruit. This results in significant amounts of economic stress for growers. Control of fruit fly pests using the sterile insect technique (SIT) has proven successful in the past. Utilization of SIT in SWD involves gene-edited, sterile males; Reproduction with wild SWD females produces no viable offspring. Understanding how releases of sterile spotted-wing drosophila may suppress reproduction is beneficial for combating the pest. Agragene's proposed trial explored sterile males released in the field through kits strategically placed throughout two cherry orchards. Following release, susceptible cherries were collected and filtered to assess larval infestation. The remaining fruit was transferred to plastic containers and incubated, where emerging flies would be monitored and counted. Cup traps containing a soap-based drowning solution were placed to ensure sterile flies did not bypass study boundaries. Assessment of collected fruit one week after the first deployment showed little larval infestation, though numbers increased following 2nd deployment. Perimeter traps concluded the study after sterile males

were caught. These results help inform how the SIT affected cherry infestation, as well as how SWD interacts with boundary limitations.

MATERNAL INSULIN DYSREGULATION AND EQUINE PLACENTAL PATHOLOGY
Presenter(s): Mckenna Gould
Category: Agriculture and Animal Science
Mentor(s): Jane Manfredi (College of Veterinary Medicine)

Insulin dysregulation is increasingly recognized in broodmares and may alter maternal metabolism during pregnancy. However, its prevalence and potential impacts on placental structure and mare and foal health remain poorly understood. Because the placenta is the sole interface for nutrient and oxygen exchange between the mare and foal, structural alterations may contribute to compromised fetal development and adverse neonatal outcomes. The objective of this study was to assess the prevalence of insulin dysregulation in broodmares and examine its association with microscopic placental changes and perinatal health outcomes. Thirty placentas from Arabian and Thoroughbred broodmares were collected and systematically sampled from five standardized regions: the nongravid horn, gravid horn, cervical star, placental body, and the umbilical cord. Tissue sections were evaluated using a standardized grading rubric to ensure consistent assessments. Placental features were scored on a standardized 0-3 scale to quantify the severity of structural and vascular abnormalities observed within each tissue section. Descriptive statistics and student's t-tests with significance set at $p < 0.05$ were performed. Outcomes included the prevalence of insulin dysregulation in the study population and comparison of histology scores between mares with and without insulin dysregulation.

A COMBINED SUBMAXIMAL AND MAXIMAL EXERCISE FITNESS TEST TO ASSESS CONDITIONING IN BEAGLES
Presenter(s): Emma Horne
Category: Agriculture and Animal Science
Mentor(s): Jane Manfredi (College of Veterinary Medicine)

Exercise fitness test regimens have primarily been described for elite canine athletes and have described submaximal or maximal fitness assessments on separate occasions. Conditioning protocols for moderate exercise in the pet dog are lacking. The objectives were to describe a combined submaximal and maximal treadmill exercise test and to assess a conditioning regimen for previously unfit beagles. The hypothesis was that moderate treadmill exercise would increase fitness as demonstrated by improvements in various parameters during a combined exercise test. Eight adult beagles underwent two combined exercise tests 12 weeks apart (PRE and POST). In between tests, they were either exercised five days a week (15% incline, gradually increasing speed) or snuggled for 30 minutes/day. Treadmill exercise tests were broken into submaximal and maximal components. Heart rate and lactate levels were monitored. Statistics included Student's t-tests (significant at $P \leq 0.05$). Maximum lactate was not different PRE versus POST (1.5 versus 1.0 mmol/L exercised; 2.7 versus 1.7 mmol/L snuggled) in either group (all $P > 0.34$) but was significantly higher in snuggled versus exercise dogs at POST ($P = 0.05$).

Exercise speeds during the submaximal component were not different PRE versus POST or between groups (all P>0.2), but exercise dogs were able to attain higher speeds than snuggle dogs at POST (3.2 versus 1.9 mph, P<0.001) and had higher POST versus PRE max speeds within their group (2.5 versus 3.2 mph, P=0.01). The combined exercise test effectively assesses fitness improvements. A 12-week progressive treadmill exercise regimen is sufficient to condition previously unfit beagles.

BLACK BEANS AS AFOOD COLARANT IN WHEAT BASED NOODLES
Presenter(s): Mary Geoghegan
Category: Agriculture and Animal Science
Mentor(s): Jeffrey Swada (College of Agriculture & Natural Resources)

My research is based on if Black beans can be used as a colorant in wheat-based noodles.

EFFECTS OF CORTISOL LEVELS AT PARTURITION ON FITNESS OF SWINE PROGENY
Presenter(s): Laura Santos e Silva
Category: Agriculture and Animal Science
Mentor(s): Janeen Salak-Johnson (College of Veterinary Medicine)

This research project investigates whether cortisol levels transferred from sow to piglet influence piglet fitness over time. Specifically, the study investigated whether elevated cortisol concentrations in piglets 24 hours after birth are associated with survival or thriving success. We hypothesized that piglets exhibiting higher cortisol levels will have lower survivability and overall fitness. Cortisol is the stress hormone released by the adrenal glands that can be beneficial to survival at moderate levels. High cortisol in swine can affect growth, behavior, and overall health, therebyl affecting their physiological state and chances of thriving in their environment. To quantify cortisol levels, colostrum samples will be collected from sows within one hour post-delivery of first piglet, and serum samples from a subsample of their piglets 24 hours after birth. Cortisol concentrations will be measured using the QuicKey Pro Porcine Cortisol ELISA Kit (ELABSCIENCE). Litters with similar liminting conditions will be selected to minimize inconsistent variables, considering that cortisol can affect stillbirth rates, birth weights, and infection rates, due to impaired immune function. Mean cortisol levels will be compared among groups and correlated with litter success metrics (weight, height, length, and abdominal circumference) to assess relationships between cortisol levels and fitness. Potential outcomes may reveal that elevated cortisol levels are correlated with reduced survivability and thriving success or alternatively, that no significant relationship between cortisol levels and piglet survival. Ultimately, this study aims to enhance animal welfare.

INTERACTIONS BETWEEN CRY PROTEINS AND STEINERNMA CARPOCAPSAE NEMATODES IN THE BIOLOGICAL CONTROL OF FALL ARMYWORM (SPODOPTERA FRUGIPERDA)
Presenter(s): Sophia Bradley
Category: Agriculture and Animal Science
Mentor(s): David Mota-Sanchez (College of Agriculture & Natural Resources), Shatrughan Shiva (College of Agriculture & Natural Resources)

Spodoptera frugiperda, also known as fall armyworm (FAW), is a lepidopteran pest of many economically valuable crops, including maize and sorghum. FAW has spread to continents outside of North and South America, including Africa, Asia, Oceania, and Europe, leading to widespread crop destruction and economic losses that reach billions of dollars. Some FAW populations have also evolved insecticide resistance to many different synthetic and biological pesticides. Therefore, innovative approaches in Integrated Pest Management are critical to managing this pest. Cry proteins are derived from the bacteria Bacillus thuringiensis and act as an insecticidal agent by being broken down into smaller compounds by insect proteases and binding to the midgut cells, causing ion leakage. In contrast, entomopathogenic nematodes (EPNs) act by penetrating into the insect host's main body cavity, releasing species of symbiotic bacteria to infect and kill the insect. Both the use of S. carpocapsae nematodes and the use of Bt derived Cry proteins are well documented organic pest control methods. However, there is a gap in scientific literature on whether S. carpocapsae nematodes and Cry proteins have synergistic benefits when used together in the control of FAW. In this study, diet-overlay bioassays were utilized in order to determine the efficacy of the use of several Bt products, commercially available S. carpocapsae nematodes, and a combination of the two treatments. The results from this study can be used to further inform pest management decisions against FAW, especially in regions where insecticide resistance against multiple compounds is present.

BODY CONDITION, METABOLIC INDICATORS, AND BLOOD-PARASITE INFECTION OF EUROPEAN STARLINGS (STURNUS VULGARIS) ACROSS AGRICULTURAL LANDSCAPES IN EAST LANSING, MI ELLA FALLER, EMMA GUZA, VICTOR AGUIAR DE SOUZA PENHA, KEVIN J. MCGRAW
Presenter(s): Ella Faller, Emma Guza
Category: Agriculture and Animal Science
Mentor(s): Kevin McGraw (College of Natural Science), Victor Aguiar de Souza Penha (College of Natural Science)

Farm environments can alter wildlife health by modifying resource availability, energetic demands, and exposure to pathogens and parasites. Body condition is widely used as an integrative measure of avian health, yet its mechanistic links to physiological status and pathogen/parasite presence remain poorly resolved for birds inhabiting farmland. Circulating metabolites such as plasma glucose and ketones provide insight into short-term energetic balance, while enteric bacteria and blood-borne parasites can impose physiological costs through immune activation and resource diversion. Understanding how metabolic indicators and pathogen presence jointly relate to body condition is essential for interpreting avian health in agricultural landscapes. Here, we examined variation in body condition and its associations with metabolic indicators and pathogen/parasite detection in European starlings (Sturnus

vulgaris) sampled across four Michigan State University farms (Beef, Dairy, Sheep, and Horse) in East Lansing, Michigan from May-August 2025. We captured, banded, sexed, aged, and sampled 57 starlings for morphometric and blood-based analyses. We estimated body condition as the residuals from a regression of body mass on tarsus length. We measured blood glucose and ketone concentrations with point-of-care devices as indicators of current metabolic state. We assessed pathogen and parasite burden through bacterial growth of cloacal swabs to detect Escherichia coli and through blood-smear microscopy to screen for haemosporidian parasites (Haemoproteus spp.) and microfilariae. We found that body condition differed significantly among agricultural sites, with birds from the Beef site exhibiting the highest average condition and birds from the Dairy site the lowest, while Sheep and Horse sites were intermediate. In multivariate models, body condition was negatively associated with plasma glucose concentration, consistent with elevated glucose reflecting increased energetic demand or physiological strain rather than enhanced nutritional condition. Ketone concentrations, pathogen detection, age class, and sampling month were not significantly associated with body condition. These results demonstrate strong context dependence of avian body condition across agricultural environments and suggest that metabolic indicators may provide more immediate insight into physiological and health status than pathogen detection alone. Ongoing completion of blood-smear screening and planned molecular diagnostics will improve detection of blood-borne parasites and enable more comprehensive assessments of how metabolic stress and infection jointly shape wildlife health in agricultural landscapes.

COMPARATIVE RISK ASSESSMENT OF PESTICIDES IN LIVESTOCK PRODUCTION
Presenter(s): Jessica Rowe
Category: Agriculture and Animal Science
Mentor(s): Karen Chou (College of Agriculture & Natural Resources)

Exposure to pesticides in farm settings can pose significant health risks to farm workers. Farmers often face uncertainty when selecting pesticides that minimize risks, as toxicological information is complex and not always readily accessible. The purpose of this project is to expand the Sustainable Ag Management (SAM) Tool, a mathematical comparative risk analysis model that helps grape growers evaluate the relative risks of different pesticides to livestock production, promoting safer and more sustainable agricultural practices. Toxicological and exposure data for EPA approved pesticides used against Avian Influenza, Classical Swine Fever, and Duck Virus Hepatitis were assessed. Occupational exposure to active ingredients in pesticide products was evaluated using an exposure surrogate reference table. The amount of active ingredient handled was calculated from the product dilution rate, percentage of active ingredient, and total estimated solution prepared. Dermal and inhalation exposure was calculated by multiplying the amount of active ingredient handled by the route-specific unit exposure values given in the exposure surrogate reference table. Hazard quotients were calculated by dividing each exposure pathway by the ingredient's NOAEL or RfD value. Then, aggregate risk was determined using the sum of the hazard quotients of all exposure pathways. Hazard quotients were interpreted as low risk (<0.001), medium risk (0.001-0.01), high risk (0.01-1), and extremely high risk (>1). These were then used to assess comparative risk based on different PPE used and across pesticides.

Preliminary data suggests that as PPE is increased, aggregate risk is reduced. Cross-product comparisons are ongoing to compare relative occupational risk.

COMPETITIVENESS OF GENETICALLY ALTERED STERILE MALE SWD FLIES AGAINST WILD TYPE SWD
Presenter(s): Barman Nasirpour
Category: Agriculture and Animal Science
Mentor(s): Juan Huang (College of Agriculture & Natural Resources), Julianna Wilson (College of Agriculture & Natural Resources)

Gene-edited sterile male spotted wing drosophila (SWD) Drosophila suzukii were paired with wildtype females and evaluated for their mating frequency, mating duration, and competitiveness compared to wild type males. Sterile males are being evaluated as a tool for population suppression prior to commercially available releases as part of a sterile insect technique program.

SUSPECTED METABOLISM OF GLYPHOSATE IN JOHNSONGRASS (SORGHUM HALEPENSE)
Presenter(s): Sarah Robinette
Category: Agriculture and Animal Science
Mentor(s): Connor Purvis (College of Agriculture & Natural Resources), Erin Burns (College of Agriculture & Natural Resources)

Johnsongrass (Sorghum halepense) is an aggressive perennial species that spreads through underground rhizomes, causing significant economic and environmental damage worldwide. Through repeated, heavy use of glyphosate (Roundup) as effective control for johnsongrass invasions, the species has evolved multiple mechanisms of resistance to glyphosate. Johnsongrass absorbs glyphosate through the leaves and is translocated throughout the plant. Johnsongrass is becoming problematic due to the rise of glyphosate resistant biotypes to glyphosate through multiple mechanisms.Therefore, the objective of this study was to characterize the mechanism(s) that could be causing resistance in a glyphosate resistant biotype of johnsongrass. To evaluate target-site resistance mechanisms, quantitative PCR was used to assess EPSPS copy number variation. Liquid chromatography mass spectroscopy (LC/MS) was used to evaluate non-target site resistance mechanisms. Ourresults indicate that there were no significant differences in EPSPS copy number or any amino acid substitutions between the resistant and susceptible biotypes. This indicates that the target-site resistance mechanisms investigated do not confer resistance in this biotype. We found that there was a significant difference in glyphosate concentration between the susceptible and the resistant populations. Seven days after treatment, the resistant population had 50% less glyphosate in above ground tissue compared to the susceptible population. In the below ground tissue, there was notsignificant differences in glyphosate concentration between biotypes. These results suggest that translocation to below ground tissue was limited, and that non-target site resistance is the possible mechanism of resistance in this biotype, possibly through the metabolism of glyphosate.

USE OF NITROGEN INHIBITORS TO SUPPRESS NITROUS OXIDE EMISSIONS IN LTAR ASPIRATIONAL CORN CROPPING SYSTEMS
Presenter(s): Clara Ives
Category: Agriculture and Animal Science
Mentor(s): Kevin Kahmark (Research & Innovation)

Nitrous oxide (N2O) is a long-lasting greenhouse gas, the production of which has risen significantly in recent years due to increased reliance on synthetic fertilizers. The majority of global N2O emissions are emitted from agricultural land use practices from nitrification and denitrification processes in the soil. In the KBS LTAR in 2024, cumulative N2O emissions were much greater in aspirational (ASP) corn cropping systems than in other treatments including business-as-usual corn. The ASP corn cropping system contains a forage cover crop which is terminated prior to planting, roughly 30 lbs of available nitrogen (N) from composted manure at preplant, and 30 lbs of available N from 28% Urea-Ammonium Nitrate (UAN) at preplant, at planting and as a side dress. Nitrogen inhibitors-commercial agronomic products-may lower N2O emissions from this LTAR ASP corn cropping system by slowing the nitrogen cycle. Nitrification inhibitors (NIs) slow nitrification by killing bacteria that convert ammonium into nitrite. Urease inhibitors (UIs) slow urea volatilization by targeting urease enzymes that convert urea into ammonia. To test nitrogen inhibitor efficiency, 2.25 m2 plots containing two rows of corn were treated with different N (28% UAN, composted manure, or both) and inhibitor (NI, NI + UI, or neither) application. Plots with no nitrogen or inhibitor applied were also measured as controls. Treatments were replicated 4 times. Greenhouse gas samples were collected weekly using static (closed cover) stainless steel chambers, which were analyzed via gas chromatography and used to determine N2O flux. On average, NI plots emitted less N2O.

POST-HARVEST QUALITY OF STRAWBERRIES: FIELD VS. GREENHOUSE
Presenter(s): Oscar Huang
Category: Agriculture and Animal Science
Mentor(s): Cholani Weebadde (College of Agriculture & Natural Resources)

The comparison of post-harvest shelf-life of strawberries grown in a field vs a greenhouse. We would track the overall deterioration and the quality of the fruit per harvests. The findings could allow better optimization of business models on production and post-harvest care.

THE EFFECT OF AGE ON FELINE RESPONSES TO ARTIFICIAL F3 PHEROMONES
Presenter(s): Lily Staal
Category: Agriculture and Animal Science
Mentor(s): Jacquelyn Jacobs (College of Agriculture & Natural Resources)

The feline facial pheromone F3 has been artificially synthesized and used for therapeutic purposes in cats. Treatment with synthetic F3 pheromones has been shown to decrease cortisol levels and reduce stress related behaviors, such as hiding. However, one study showed no significant effect on cat stress.

The conflicting results of these studies indicate that more research is needed to determine what factors contribute to the varying effectiveness of F3 pheromones. Cats sense these pheromones through the vomeronasal organ, which decreases in cell volume as cats age. This could reduce cats' ability to sense F3 pheromones and experience stress reduction. Currently, there are a lack of studies investigating the potential correlation between cat age and pheromone effectiveness in shelter environments. We hypothesize that the effectiveness of artificial F3 pheromones will decrease as age increases, which will result in a decreased degree of change to feline stress levels. The subjects of this study are the shelter cats housed in individual cages at Ingham County Animal Control and Shelter (ICACS), which will be continuously enrolled in this study for 4-6 weeks. They will be sorted into one of three categories: juvenile (6 months to 2 years), mature (2 to 8 years), or senior (8 to 16 years). Information about sex will be collected for later analysis. The cats' hiding behavior with and without F3 pheromone treatment will be captured by cameras and analyzed through a linear mixed model including age and gender as covariates. Data collection is expected to be completed in April.

EFFECTS OF BACILLUS SUBTILIS COMBINED WITH PLANT EXTRACTS ON SYSTEMIC IMMUNITY IN WEANLING PIGS

Presenter(s): Charlotte Ludorf
Category: Agriculture and Animal Science
Mentor(s): Kwangwook Kim (College of Agriculture & Natural Resources)

Our previous study demonstrated that dietary supplementation with Bacillus subtilis and plant extracts improved growth performance and reduced post-weaning (PW) diarrhea in weanling pigs. The present study aimed to further investigate the effects on immune and antioxidant responses. Two hundred and forty pigs were allotted to 4 dietary treatments in a randomized complete block design (6 pigs/pen). The dietary treatments were: (1) Control (CON): Basal nursery diet; (2) BPS: 500 mg/kg Bacillus subtilis and plant extracts; (3) BPD: 1000 mg/kg Bacillus subtilis and plant extracts; and (4) Antibiotic (ATB): 50 mg/kg carbadox, and pigs were fed for 28 days. Blood samples were collected from six pigs per treatment every seven days to assess serum inflammatory and antioxidant biomarkers, including C-reactive protein (CRP), tumor necrosis factor-α (TNF-α), haptoglobin, glutathione peroxidase (GPx), and total antioxidant capacity (TAC), using commercial ELISA kits. On day 7 PW, serum CRP concentrations were lower ($P < 0.05$) in BPS, BPD, and ATB compared with CON, and BPD significantly decreased ($P < 0.05$) TNF-α levels compared with CON. On day 21 PW, serum haptoglobin was lowest ($P < 0.05$) in BPD, while GPx activity was highest ($P < 0.05$) and comparable to ATB. On day 28 PW, GPx activity remained highest ($P < 0.05$) in BPD and ATB groups. In conclusion, dietary supplementation of Bacillus subtilis combined with plant extracts modulated inflammation and enhanced antioxidant capacity during the early post-weaning period, suggesting potential as a natural alternative to antibiotic growth promoters in nursery pigs.

MILK COMES AT A PRICE: ASSOCIATIONS BETWEEN TEAT LOCATION, LITTER SIZE, INJURY PATTERNS, AND GROWTH IN NURSING PIGLETS
Presenter(s): Cora Wegner, Eva Calderon
Category: Agriculture and Animal Science
Mentor(s): Madonna Benjamin (College of Veterinary Medicine)

Piglets exhibit strong teat fidelity, consistently nursing from one or two teats throughout lactation. This is valuable because young piglets don't waste time finding teats and can avoid injuries. However, as litter sizes increase, competition among larger littermates during nursing may result in physical injuries that reflect competitive interactions. This study examined associations between piglet teat location, litter size, injury patterns, and growth metrics. Data were collected from piglets within a cohort of 21 lactating sows and gilts participating in a concurrent study. Piglet weight, height, length, abdominal circumference, injuries (categorized as face scuffing, knee scuffing, or sternal bursitis development), and teat location during feeding were recorded at three developmental time points (day 3, day 10, and day 20). Control litters were assigned one piglet per functional teat, while experimental litters were assigned one piglet per functional teat plus two additional piglets. Sow teats were numbered, and the piglet teat location (which teat they suckled from) was observed during lactation. Analysis indicated that teat location showed no strong correlation with injury patterns or growth metrics. Litter size was not correlated with injury patterns. However, a strong negative correlation was observed between experimental litter size and teat fidelity, likely due to greater competition for teat positions. Understanding competition and outcomes for preferred teats and expression of fidelity may provide insight into piglet social dynamics and inform strategies to improve piglet welfare in swine production systems.

USING CAMERA TRAPS TO DOCUMENT WILDLIFE AT COREY MARSH
Presenter(s): Kate Wood
Category: Agriculture and Animal Science
Mentor(s): Jeremy Hartsock (College of Agriculture & Natural Resources)

A network of game cameras was deployed across multiple habitat types at the Corey Marsh Ecological Research Center to capture wildlife diversity and behavior. These cameras provide a cost-effective, non-invasive approach to monitoring wildlife and tracking population changes over time. Here, we summarize general trends in wildlife observations and highlight notable images captured at the marsh. The most compelling images will be used to support future outreach efforts and shared with the public through social media platforms.

Anthropology & Archaeology

NO ONE IS ILLEGAL ON STOLEN LAND: ICE, THE TRUMP ADMINISTRATION, AND COLLECTIVE RESISTANCE
Presenter(s): Laila Komis
Category: Anthropology and Archaeology
Mentor(s): Eric Montgomery (College of Social Science)

Immigration and Customs Enforcement and the Trump administration have reinforced systems of segregation, white supremacy, and the idea of othering. Anthropological analysis is "people centered" and the families and individuals denied their constitutional rights and their stories are paramount for establishing a more sane, just, and effective immigration system. The rhetoric and tactics from The Trump Administration have demonized Black and Brown citizens and allies. American Democracy and democratic values themselves are at stake. And the collective resistance has been a siren call, with 6-7 out of 10 Americans disapproving of ongoing ICE tactics. "Othering" and racialized outcomes occurs through physical borders, cultural narratives of barbarism and savagery, overt racism, and linguistic hierarchies that frame immigrants as undeserving of belonging. These ideas have circulated for decades in political and media echo chambers and have accelerated into policy and action under the Trump administration. ICE has engaged in racial profiling, illegal detentions, and the violation of due process, disproportionately targeting non-white communities. This project examines how the administration reflects and enforces these barriers, the specific policies and practices that sustain them, and the ways society can resist through collective, nonviolent action, including the No Kings and Portland anti-I.C.E. protests, advocating that no one is illegal on stolen land. The March 28th nationwide protests are projected to be the largest protests in American history.

3D ARCHITECTURAL RECONSTRUCTION OF ISTHMIA'S ANCIENT ROMAN BATH
Presenter(s): Mckenna Long
Category: Anthropology and Archaeology
Mentor(s): Jon Frey (College of Arts & Letters)

Based on existing architectural plans, sections, and elevations, this project explores the spatial reality of the Roman Bath at Isthmia through three-dimensional modeling. Although excavation has produced a ground plan and substantial structural remains, these datasets have never been systematically interpreted together. As a result, these proposed technical drawings and interpretations have remained largely hypothetical. This study develops a three-dimensional digital rendering that integrates archaeological evidence, technical architectural plans, and 3D scans of existing remains. By cross-referencing records, suggestions, and physical evidence the models reveals spatial irregularities and inconsistencies in idealized proposals while simultaneously establishing a working model of reference.

HOUSING AS A POLITICAL DETERMINANT OF HEALTH IN POST-CONFLICT SUDAN
Presenter(s): Ceco Maples
Category: Anthropology and Archaeology
Mentor(s): Najib Hourani (College of Social Science)

This project situates itself within larger anthropological debates on trauma, housing, global health interventions, the social determinants of health models, and conflict-affected and postconflict societies. Specifically, it explores how housing and home become political determinants of mental health, specifically in contexts of ongoing trauma. The project engages in a critical examination of how international organizations (i.e., the World Bank and United Nations) and allied NGOs conceptualize trauma in the development and evaluation of housing interventions with a particular focus on refugees and displaced persons in post-conflict Sudan. Although housing is increasingly recognized as a social determinant of health, little attention has been paid to the ways it is shaped by and reproduces political, economic, and social inequities-an issue this project addresses through the adoption of Dawes' (2020) model of the political determinants of health and a focus on the ongoing conflict-displaced populations in Sudan. Additionally, post-conflict trauma scholarship which adopts PTSD models often miss or misapprehend cultural manifestations of trauma in ways that anthropologists are equipped to address.

Ultimately, this project seeks to not only identify shortcomings in dominant models of trauma and housing interventions, but to also address them by developing an anthropological framework for studying housing as a political determinant of mental health in conflict and post-conflict settings.

ASSOCIATIONS BETWEEN ENERGY DENSITY AND IMMUNE RESPONSIVENESS IN MATURE HUMAN MILK
Presenter(s): Elizabeth Brazelton, Kiley Willian
Category: Anthropology and Archaeology
Mentor(s): Masako Fujita (College of Social Science)

Human milk (HM) is a dynamic biological fluid providing essential macronutrients to an infant. Specifically, the fat concentration of HM contributes greatest to the energy that will be passed to an infant. Previous research has demonstrated that energy content and immune capacity of HM are counterbalanced. Early in postpartum, colostrum provides more concentrated immune protection. As HM matures, it begins providing higher energy to the infant, but immune content decreases. The relationship between energy content and immune responsiveness in mature milk is not well understood. To explore this relationship further and in correlation with maternal conditions, data were drawn from the study, Exploring Human Milk Immune Specificity, which enrolled 77 Mid-Michigan postpartum mothers who donated mature HM samples. Samples were then stimulated with Salmonella overnight, and the concentrations of pre- to post-inflammatory cytokine Interleukin-6 (IL-6) response was quantified. IL-6 is used as an indicator of the milk pro-inflammatory immune response capacity. To assess milk energy content, the Creamatocrit technique is used to quantify the milk fat and energy content. Creamatocrit levels are used as the characteristic for milk energy density. Maternal condition variables

were available from questionnaires, and the relationship between immune response capacity and energy/fat content was evaluated using scatter/boxplots and statistical tests.

VISUALIZING SARTENEJA: GIS MAPPING OF BELIZE'S ARCHAEOLOGICAL HERITAGE
Presenter(s): Melissa Teja
Category: Anthropology and Archaeology
Mentor(s): Gabriel Wrobel (College of Social Science)

Sarteneja, an ancient Maya settlement in the Corozal District of northeastern Belize (18° 22'N, 88° 10'W), covers roughly four-square kilometers, much of it now under farmland and forest. Building off earlier maps by Sidrys (1983) and Boxt (1980s), a drone-based LiDAR survey in summer 2025 produced the first complete high-resolution digital map of Sarteneja's urban core and surrounding settlement. The survey revealed clusters of structures and broader spatial organization extending beyond earlier maps. This poster presents the results of the LiDAR analysis and demonstrates how the integration of these data into a GIS framework expands the known boundaries of the settlement and refines our understanding of its spatial organization. With modern development threatening the area, this LiDAR-based GIS mapping provides a critical foundation for future excavation, comparative analysis, and long-term preservation of Sarteneja's archaeological landscape.

ETHICS AND BIAS IN MODERN FORENSIC ANTHROPOLOGY
Presenter(s): Holly Sawyers
Category: Anthropology and Archaeology
Mentor(s): Carolyn Isaac (College of Social Science), Jerielle Cartales (College of Social Science)

This project explores ethical concerns in modern forensic anthropology, with a focus on the use of population affinity as a potentially controversial method of categorizing unidentified human remains. I will examine why population affinity remains significant in forensic identification, while also considering its scientific limitations and its intersection with socially constructed ideas of race. Because biological anthropology has a history shaped by racist and ethnocentric frameworks, this research asks how contemporary forensic anthropologists can move toward more responsible and equitable practices. The project also briefly considers how emerging technologies, including digital databases and AI-assisted analysis, may influence the future of forensic identification and raise ongoing ethical questions about accuracy, representation, and bias.

SANTA BARBARA NIHONMACHI CERAMICS
Presenter(s): Deanna Peterson, Megan Cook
Category: Anthropology and Archaeology
Mentor(s): Stacey Camp (College of Social Science)

The identification and analysis of 19th- and 20th-century Japanese ceramics is a field which is commonly overlooked by many archaeologists and other researchers in the United States, even though it can offer great insight into the lives of Japanese Americans during these times. The ceramics in this project specifically come from the Nihonmachi community of Santa Barbara, California, the first Japanese community in the city. What this project is focusing on is why these pieces in particular might have been left behind when the community's residents were forced out of their homes in 1943 to be sent to incarceration camps. Further, we are studying the convenience and affordability of Japanese export wares for the United States' Japanese citizens, and their importance in establishing a sense of comfort and community when so far away from home.

SLEEP VS. SALMONELLA: INVESTIGATING THE ASSOCIATION OF SLEEP QUALITY WITH MATERNAL INFLAMMATION AND MILK IMMUNE RESPONSE
Presenter(s): William Kuiper
Category: Anthropology and Archaeology
Mentor(s): Masako Fujita (College of Social Science)

Poor sleep quality has been increasingly linked to inflammation; however, its relationship with the inflammatory characteristics of human milk remains understudied. This study examined whether maternal sleep disturbance was associated with inflammatory biomarker levels in the mother's bloodstream and pro-inflammatory characteristics of maternal milk, specifically Interleukin-6 (IL-6) response to bacterial stimulation in vitro. Data from 77 Michigan mothers participating in the study, Exploring Human Milk Immune Specificity, were used. Maternal sleep disturbance was assessed using a questionnaire to self-rate their sleep quality. Mothers were then classified into three levels of sleep disturbances. Serum C-reactive protein (CRP) concentrations in finger stick dried-blood spots were used to determine elevated maternal inflammation. To assess milk immune responsiveness, donated milk samples were divided, with one portion stimulated with Salmonella and the other frozen immediately as a baseline control. The ratio of the IL-6 concentration in stimulated milk to baseline milk was used to quantify pro-inflammatory immune response. Linear regression models were used to evaluate the sleep disturbances associated with maternal CRP and milk pro-inflammatory immune response. Higher sleep disturbance was associated with elevated maternal CRP levels ($p = 0.002$). Higher sleep disturbance was associated with a lower pro-inflammatory immune response ($p = 0.014$). These findings suggest that poor maternal sleep quality is associated with increased inflammation and diminished immune responsiveness in maternal milk. Sleep quality may represent a factor influencing maternal inflammation and human milk immune function.

AN OSTEOBIOGRAPHICAL ANALYSIS FROM CAYE COCO, BELIZE
Presenter(s): Nayelli Martinez
Category: Anthropology and Archaeology
Mentor(s): Gabriel Wrobel (College of Social Science)

This osteobiographical analysis examines the life history of a human skeleton recovered from the post classic period in Caye Coco, Belize. Through detailed skeletal analysis conducted over several weeks, this study reconstructs aspects of the individual's biological profile, health, diet, and cultural practices. Examination of preserved skeletal elements allowed for the assessment of age, sex, and possible lifestyle indicators reflected in bone morphology and wear patterns. Particular attention was given to cranial features, including evidence of cranial modification, which may suggest cultural practices and social identity within the individual's community. Patterns of preservation across skeletal elements provided insight into post-depositional processes and the environmental conditions affecting the remains. By integrating osteological observations with archaeological context, this osteobiographical approach moves beyond simply identifying skeletal characteristics and instead seeks to reconstruct the lived experiences of the individual. Each preserved bone contributes information about daily activity, health, and cultural influences present during the individual's lifetime. Ultimately, this research demonstrates how osteobiography can humanize skeletal remains by telling the story of a person rather than just documenting biological data. The findings contribute to a broader understanding of past lifeways in the region of Caye Coco, Belize, while highlighting the value of detailed skeletal analysis in interpreting the lives of individuals from the archaeological record.

THE CLASSIFICATION OF WEATHERED BONE USING THREE-DIMENSIONAL MODELS
Presenter(s): Kayleigh Andrews
Category: Anthropology and Archaeology
Mentor(s): Joseph Hefner (College of Social Science)

Bone weathering is an important form of taphonomic analysis in forensic and archaeological contexts, used to estimate time since death based on cracking and exfoliation of the outer layers of exposed bone. In 1978, bone weathering was first formally organized into six distinct stages; however, the original photographs documenting these stages are limited in their use due to the three-dimensional nature of bone. Moreover, these photographs represent some of the few visual representations available, meaning that researchers and students have only a small number of static, two-dimensional images to reference when learning to recognize weathering patterns. Three-dimensional surface models representing the bone weathering stages can address these limitations. Both digital and physical 3D models provide researchers with visual and tactile aids for analysis beyond photographs, improving training, standardization, and inter-observer consistency. Bones exhibiting the different weathering stages were digitally recreated using a handheld structured light scanner to capture surface geometry, color, and texture. These digital models were then reproduced physically using high-resolution resin 3D printing to maintain the fine details present. These models provide an alternative to typical photographic representations, allowing a more effective way for researchers to learn about and recognize the different

stages of bone weathering. This project supports improvement in the recognition of bone weathering stages in taphonomic research through offering a standardized and accessible set of 3D examples.

PHYTOLITHS FROM THE DENTAL CALCULUS OF TEETH FOUND IN THE CAVES BRANCH ROCKSHELTER, BELIZE
Presenter(s): Krystin Nelligan
Category: Anthropology and Archaeology
Mentor(s): Aubree Marshall (College of Human Medicine)

Comparing and contrasting the phytoliths found in dental scrapings from the teeth of skeletons, all found in one rock shelter in Belize. We will compare and contrast the phytoliths that were found with their gender (male or female) and their age (sub-adult, young adult, and middle adult). These factors can result in a conclusion of their social and class status as well as the food and medicinal herbs consumed during the pre-classical period.

USK 8190: A CASE STUDY IN JUVENILE RESILIENCE
Presenter(s): Kaitlyn Szarenski
Category: Anthropology and Archaeology
Mentor(s): Allyson Simon (Institute for Research and Learning in Archaeology and Bioarchaeology)

The Harrison Township Cholera Cemetery (HTCC) in Pickaway County, Ohio was used from 1804 to 1859. In Central Ohio, this was an era of development and extreme struggle with bouts of illness and devastation. Through historical sources HTCC is associated with the cholera epidemics of 1833 and 1849. Here, we analyze the skeletal remains of individual USk 8190 to understand how this environment affected lived experiences during childhood. USk 8190, a child buried at HTCC, reveals evidence of prolonged environmental stress. USk 8190 was estimated to be approximately 6.5 years of age when they died based on dental eruption and development. Age estimates were also formed using skeletal length measurements and epiphyseal fusion, which provided a slightly younger age estimate. The discrepancy between dental and skeletal ages may be related to growth delays due to physiological stress. This is further supported by the presence of cribra orbitalia and significant cranial porosity, which indicate USk 8190 suffered from nutritional deficiency. According to historical sources, the primary canal that transported goods into local community was still under development and it would have been quite difficult to maintain a nutritionally beneficial diet in this environment. These skeletal markers indicate long term metabolic stress and USk 8190's resilience to survive for a period of time before death. Analysis of Usk 8190 underscores the impact of poor environmental conditions on childhood experiences in early 19th century Ohio, contributing to high infant and child mortality rates.

SKELETAL ANALYSIS AND BIOLOGICAL RECONSTRUCTION OF BURIAL 13
Presenter(s): Jack Meier
Category: Anthropology and Archaeology
Mentor(s): Gabriel Wrobel (College of Social Science)

This study aims to construct a biological profile using standard osteological methods to better understand the demographic and health characteristics of the individual. The remains analyzed in this study derive from the Postclassic Maya occupation of the Freshwater Creek drainage in northern Belize. Mortuary practices in this region have been interpreted as reflecting household-level organization and shifting sociopolitical structures.

ESTABLISHING A BIOLOGICAL PROFILE FOR A BURIAL FROM THE ARCHAEOLOGICAL SITE OF CAESAREA MARITIMA
Presenter(s): Alicia Spittler
Category: Anthropology and Archaeology
Mentor(s): Gabriel Wrobel (College of Social Science)

This research presents a biological profile, which was conducted using skeletal remains to complete a standard osteological analysis. For this study, a thorough inventory of the bones was collected to determine the number of individuals. Using standard methods, we were able to identify the estimated age, sex, stature, and ancestry of the skeletal remains. This research provides insight into the ways in which biological profiles are conducted, as well as the ability to learn more about the individual(s) being researched.

A MICROSCOPIC ANALYSIS INTO THE RELATIONSHIP BETWEEN DIETARY INTAKE AND BONE PHYSIOLOGY
Presenter(s): McKenna Kosciolek
Category: Anthropology and Archaeology
Mentor(s): Aubree Marshall (College of Human Medicine)

Human teeth were examined microscopically to identify organisms resulting from different types of food consumption. Following the investigation of the teeth, the associated human remains were analyzed for markings indicative of the individual's diet.

THE RELATIONSHIP BETWEEN INFANT GROWTH AND PROTEIN CONTENT IN MOTHERS' MILK.
Presenter(s): Hannah Jue
Category: Anthropology and Archaeology
Mentor(s): Intan Kumbayoni (College of Social Science), Masako Fujita (College of Social Science)

Among exclusively breastfed infants, human milk provides essential nutrients for infant growth and development. Of milk macronutrients, protein has been well established to support somatic growth,

such as length and weight gain; studies report a positive correlation between human milk protein content and infant growth z-score, primarily on length and weight z-scores. However, the contribution of protein to head growth is less understood. This project examines whether protein content in human milk has a greater influence on head growth than on other dimensions of growth, such as length and weight, by comparing z-scores. We used the data and milk specimens from 68 participants in the study, Exploring Human Milk Immune Specificity. Growth z-scores have been calculated from anthropometric measurements and infant age. These include length-for-age z (LAZ), weight-for-age z (WAZ), and head-circumference-for-age z (HCAZ). The protein content in milk is determined using the Novagen BCA (Bicinchoninic Acid) protein assay kit using microplate procedures. Our prediction is that the correlations between HCAZ and milk protein will be the strongest out of all the correlations studied, particularly in younger infants, because head growth is connected to brain growth, and brain growth is faster in early infancy. In our results, we saw a negative correlation between all types of growth and protein concentration in human milk. Protein concentration in milk may not be the driving force of somatic growth in infants.

BONES OF THE MAYA: AN OSTEOBIOGRAPHICAL CASE STUDY FROM THE MARCO GONZALEZ SITE, BELIZE

Presenter(s): Adrianna Semioli
Category: Anthropology and Archaeology
Mentor(s): Gabriel Wrobel (College of Social Science)

This case study examines an osteobiographical study of human skeletal remains from the time period of the Maya civilization, recovered from an archaeological site in present day Belize. By analyzing skeletal marks such as age, sex, pathology and possible trauma, this study reconstructs the aspect of the once lived and experienced life. Osteobiography and bioarcehlogy allow the integration of biology data with archaeological and historical knowledge, which can show us health, possible activity patterns, and social identity throughout the Maya. These findings overall help to a better understand daily life and mortality in the Maya society, and demonstrate the value of skeletal evidence for interpreting past human experiences.

Biochemistry & Molecular Biology

APPLICATION OF E. COLI EXPRESSION SYSTEMS FOR THE PURIFICATION AND ANALYSIS OF GIANT VIRUS PROTEINS
Presenter(s): Alaina Pabbathi
Category: Biochemistry and Molecular Biology
Mentor(s): Kathryn Brittain (College of Natural Science), Kristin Parent (College of Natural Science)

As climate change leads to detrimental environmental effects across the globe, the risk of human exposure to previously frozen microbes drastically increases. An example of such microbes are Giant Viruses (GVs), notable for their incredibly large genomes of over 1 mega-bps. Samba Virus (SMBV) is part of the Mimiviridae family of GVs, and approximately half of its genome encodes for proteins of unknown function. SMBV is an icosahedral virus and contains a unique fivefold vertex that, together with an external protein seal, forms the "stargate" opening. Previous studies have shown that under low-pH conditions, GV particles open at the stargate and release a membranous protein sac, simulating the early structural transitions of infection required for viral factory assembly. The unknown proteins present in the sac must be investigated to learn more about GV infection mechanisms. To identify hypothetical protein functions, a reliable method for producing, expressing, and purifying large quantities of GV proteins must be established. Therefore, the development and application of E. coli expression systems using inducible expression vectors containing hypothetical SMBV genes is imperative for future characterization of SMBV proteins. In this study, SMBV genes were PCR-amplified, cloned into a maltose-binding protein fusion expression vector (pMal,) and transformed into E. coli BL21(DE3)pLysS cells optimized for protein expression. The resulting proteins were successfully expressed and purified through cell lysis, amylose affinity chromatography, and size-exclusion chromatography. Verified protein samples were then prepared for negative staining, cryo-EM analysis, and preliminary characterization studies, such as pull-down assays for assessing potential protein interactions.This work establishes a reproducible SMBV protein expression and purification system that can support future studies of GV proteins.

EFFECTS OF ALCAM ON THE COSTIMULATORY MOLECULE(S) EXPRESSION IN MACROPHAGES
Presenter(s): Balaji Venkatesh
Category: Biochemistry and Molecular Biology
Mentor(s): Jennifer Jacob (College of Natural Science)

Macrophages are immune cells that phagocytose other cells and present antigens through MHC II and CD86 to activate T-cells. Their involvement in the tumor microenvironment leads to differential cancer progression. Activated Leukocyte Cell Adhesion Molecule (CD166) is a cell adhesion molecule of the immunoglobulin superfamily. ALCAM is expressed in most epithelial cells, activated T-cells, the central nervous system, endothelial cells, and most stem cell populations. It is a ligand that simulates LILRB4, a macrophages checkpoint molecule. By treating macrophages with various concentrations of ALCAM, we

hope to uncover trends present between ALCAM concentration and the presence of other costimulatory molecules using flow cytometry, which would explain why LILRB4 is correlated with differential cancer outcomes.

FUNCTIONAL ANALYSIS OF RIM15 IN SACCHAROMYCES CEREVISIAE REVEALS ITS ROLE IN VIABILITY RESURGENCE DURING QUIESCENCE
Presenter(s): Tyree Coleman
Category: Biochemistry and Molecular Biology
Mentor(s): Kai-Ching Hsiao (College of Natural Science)

RIM15 encodes a conserved serine/threonine kinase that integrates nutrient-sensing pathways to regulate entry into quiescence and stress responses in Saccharomyces cerevisiae. In this study, we investigated the contribution of RIM15 to viability resurgence in quiescent time (VRQT), a phenomenon in which aged, stationary-phase yeast cultures exhibit transient increases in clonogenic capacity RIM15 knockout strain was generated and assessed alongside wild-type controls using spot assays to monitor population viability over time under starvation conditions. Comparative analysis of colony-forming ability revealed altered patterns of survival and resurgence in the absence of RIM15, indicating its involvement in coordinating stress adaptation and mitotic re-entry during quiescence. These findings suggest that RIM15 plays a regulatory role in maintaining long-term population viability and modulating collective survival responses in nutrient-depleted environments.

ASSEMBLY OF A CYTOCHROME C NITRITE REDUCTASE BACTERIAL MICROCOMPARTMENT USING SPYTAG/SPYCATCHER WITH STABILITY ASSAYS OF NRFA UNDER DIFFERENT STORAGE CONDITIONS
Presenter(s): Olivia White
Category: Biochemistry and Molecular Biology
Mentor(s): Eric Hegg (College of Natural Science), Joel Landa (College of Natural Science)

Cytochrome c nitrite reductase (NrfA) is a key enzyme in the Dissimilatory Nitrate Reduction to Ammonia (DNRA) pathway. NrfA catalyzes the six-electron reduction of nitrite to ammonium, and ammonium can act as a potential carbon-neutral energy source. Bacterial microcompartments (BMC) are protein-based compartments that encapsulate enzymes with a selectively permeable membrane. The BMB compartmentalization of metabolic pathways allows for increased enzyme efficiency and sequestering of harmful intermediates. Using the SpyTag and SpyCatcher peptides, which covalently bind to each other, the aim is to construct an NrfA-BMC. We have successfully cloned pBAD vectors containing NrfA from Geobacter lovleyi and Escherichia coli with SpyCatcher. Following this was the construction of an NrfA-BMC with NrfA from Geobacter lovleyi using the SpyCatcher and SpyTag system. The current research focuses on characterizing the functional advantages of compartmentalization with the BMC. We are currently conducting biochemical assays to evaluate the storage stability and thermal resilience of encapsulated NrfA compared to NrfA in its free form. By subjecting the NrfA-BMC to controlled heat treatments and extended storage periods, we aim to determine if the protein shell provides an

environment that preserves the catalytic activity under stress. These results will provide insight into the viability of BMCs for sustainable biofuel production and metabolic engineering.

TARGETING THE PI3K PATHWAY USING MULTI-TARGET TYROSINE KINASE INHIBITORS IN A DISCOIDEUM MODEL OF METASTASIS
Presenter(s): Bianca Miller
Category: Biochemistry and Molecular Biology
Mentor(s): Elizabeth Duckett (Lenawee ISD Tech Center)

Dictyostelium Discoideum is a slime mold that transitions from unicellularity to multicellularity through chemotaxis using the cAMP/PI3K signalling pathways. Upon starvation, Dictyostelium cells secrete higher levels of cAMP and PI3K. This signals the cells to begin chemotaxis, which is the movement of cells towards a chemical attractant. During chemotaxis, the cells ignore all other biological signals and begin dividing uncontrollably because of the increased and unregulated signals. Normally, the PI3K cycle regulates cell growth. However, its regulatory subunit is lost once chemotaxis starts, leading to uncontrollable cell division and movement. Chemotaxis can be inhibited by adding Anlotinib, a multi-target tyrosine kinase inhibitor. This interrupts the cellular signals in the PI3K cycle needed for chemotaxis. The same concept can be applied to metastatic cancer cells, as the uncontrollable cell division and movement in Dictyostelium cells mimic metastasis in the tumor microenvironment. In cancerous environments, the PI3K cycle is commonly overactivated and drives metastasis. This occurs because the PI3K regulatory subunit (p85) binds to PTK (protein tyrosine kinase) receptors, activating the cycle and causing uncontrollable cell division, growth, and metastasis. To prevent this, Anlotinib is added and binds to the upstream tyrosine kinase receptors. This suppresses the phosphorylation and activation of downstream components. The addition of Anlotinib promotes apoptosis and reduces tumor growth and metastasis. The malignancy of a tumour is directly affected by the reduction of phosphorylation levels of PI3K. Eliminating hyperactive PI3K will inhibit the growth, division, metastasis, and survival of cancerous cells.

INTEGRATING MOLECULAR DYNAMICS WITH DEEP-LEARNING STRUCTURE PREDICTION AND EMPIRICAL DOCKING FOR SCALABLE COMPUTATIONAL DRUG DISCOVERY
Presenter(s): Abdolla Hegazy
Category: Biochemistry and Molecular Biology
Mentor(s): Josh Vermaas (College of Natural Science)

Computational drug discovery pipelines have grown increasingly efficient, yet the physiological plausibility of their predictions remains an open question. Co-folding models such as AlphaFold 3 and Boltz-2 have dramatically accelerated large-scale protein-ligand structure prediction, while empirical docking engines like AutoDock-Vina remain widely used for binding-pose scoring. Each approach, however, captures only part of the picture: co-folding methods predict static snapshots that may not reflect physiological conformational ensembles, and empirical docking scores neglect the dynamic flexibility of the protein receptor. Molecular dynamics (MD) simulations can bridge this gap by sampling

conformations, yet current screening workflows rarely incorporate MD due to computational cost. We present SMBA (Small Molecule Binding Affinity), a modular pipeline that unifies deep-learning-based structure prediction, MD simulation, and empirical docking. SMBA makes MD tractable at screening scale by restricting equilibration to the apo-protein rather than simulating every protein-ligand complex individually. SMBA predicts apo-protein structures with AlphaFold 3, equilibrates them with NAMD to generate conformational ensembles, identifies binding pockets on each sampled conformation using DeepSurf, and docks ligands into those pockets with AutoDock Vina-grounding binding-affinity estimates in realistic receptor flexibility rather than a single static fold. We benchmark the pipeline across four species, approximately 2000 target proteins, and 24 small-molecule ligands, comparing SMBA docked affinities against Boltz-2 predicted affinities. To further validate predictions, we run extended MD simulations of complexes selected by greatest docking-pose divergence between SMBA and AlphaFold 3, and by greatest affinity disagreement between SMBA and Boltz-2, assessing structural stability as an independent measure of binding plausibility.

ENGINEERING A MEMBRANE TRANSPORT PROTEIN TO IMPROVE UPTAKE AND SELECTIVITY OF MRI CONTRAST AGENTS.

Presenter(s): Carolynn Calin
Category: Biochemistry and Molecular Biology
Mentor(s): Brianna Ricker (College of Engineering), Erik Shapiro (College of Osteopathic Medicine)

Accurate MRI visualization depends on contrast agents that are transported into hepatocytes by organic anion transporting polypeptides (OATPs). However, OATPs differ among mammalian species, which affects their ability to transport clinically used contrast agents. Human OATP1B3 efficiently transports the contrast agent Eovist, whereas rat OATP1B2 preferentially transports Multihance, suggesting that specific structural regions of the protein influence contrast agent recognition. To identify these regions, a panel of chimeric OATP proteins was generated by exchanging selected transmembrane domains and extracellular loops between the human and rat transporters. These constructs were expressed in HEK293T cells, treated with contrast agents, pelleted, and imaged using MRI to quantify uptake. Comparing uptake across the panel of chimeras identified transmembrane domains 6, 7, and 8 and their preceding loops as key contributors to species-specific differences in contrast agent transport. Building on these findings, site-directed mutagenesis is being used to introduce targeted amino acid substitutions within transmembrane domains 7 and 8 to determine the minimal sequence changes that improve Multihance uptake. Identifying the specific residues that influence contrast agent recognition will improve understanding of OATP substrate specificity and may inform the design of improved imaging agents or engineered transport strategies for MRI studies.

DETERMINING THE ATTO QUENCHING RATE BY TRYPTOPHAN
Presenter(s): Niall Martin
Category: Biochemistry and Molecular Biology
Mentor(s): Lisa Lapidus (College of Natural Science)

The quenching of the fluorescent dye Atto655 by Tryptophan can be utilized to measure intramolecular diffusion times in peptides. This process has previously been found to be diffusion limited, but this work extends what is known by parameterizing the quenching rate, allowing for greater precision in certain experiments. By using a confocal microscope to detect a microscopic volume of solution and analyzing the fluorescence signal fluctuations, intramolecular dynamics can be observed. By varying the viscosity of a dilute protein solution, we were able to find a lower limit on the reaction limited rate. Further, analyzing measurements of a crowded protein system and solving the diffusion equation provide an estimate of the quenching rate.

INVESTIGATING THE PERMEABILITY OF PDU BMC COMPLEX TO LONGER CHAIN SUBSTRATES THROUGH MOLECULAR DYNAMICS
Presenter(s): Andrew Strong
Category: Biochemistry and Molecular Biology
Mentor(s): Josh Vermaas (College of Natural Science)

Bacterial microcompartments, or BMCs, are large polyhedral protein complexes found in approximately 20% of bacterial species. These complexes serve to isolate specific metabolic substrates, sequester hazardous intermediates, and, ultimately, to increase the efficiency of key metabolic pathways. Previous work on propanediol utilization (Pdu) pathways in Citrobacter freundii have shown that metabolites similar to 1,2-propanediol can also be assimilated by Pdu BMCs. Using protein structures from Citrobacter freundii, all-atom molecular dynamics simulations were performed to investigate the permeability of the Pdu BMCs to seven key metabolites that could be assimilated by the BMC complex. Systems containing these metabolites were created using a periodic protein tile structure designed to mimic a BMC shell at a much lower computational cost. Transition events across the simulations were recorded and converted into permeability coefficients. Overall, all seven metabolites in this study displayed relatively high levels of permeability across most of pore types in the Pdu BMC structure. While smaller, standard metabolites like glycerol and 1,2-propanediol displayed the highest levels of permeability, longer diols and triols like 1,2-pentanediol and 1,2,6-hexanetriol displayed permeability levels within an order of magnitude of most permeable metabolites. These findings indicate that Pdu BMCs do not inherently preclude longer chain metabolites from assimilating and that these BMCs may have a wider range of metabolic flexibility than expected.

IN SILICO INVESTIGATION OF PFAS COMPOUNDS AND PERMITTIVITY ACROSS THE BLOOD BRAIN BARRIER

Presenter(s): Jason Thieu
Category: Biochemistry and Molecular Biology
Mentor(s): Angela Wilson (College of Natural Science), Deepak James (College of Natural Science), Narasimhan Loganathan (College of Natural Science)

The blood brain barrier is a highly selective barrier that regulates the homeostasis of the environment of the brain. It is meant to protect the brain from pathogens and toxins, while still permitting the delivery of oxygen and necessary nutrients to the brain. However, increasing evidence suggests that certain environmental contaminants, including per- and polyfluoroalkyl substances (PFAS), may accumulate in the central nervous system and contribute to neurotoxicity. This work investigates the molecular interactions between selected PFAS compounds that have been reported in the literature to occur in neonatal blood-brain barrier environments. We use steered molecular dynamics (SMD) and umbrella sampling to characterize the free-energy profile associated with PFAS translocation across a membrane model representative of the blood-brain barrier. The results were then compared with prior computational studies to evaluate consistency in predicted permeation energetics and to better understand the thermodynamic favorability and mechanistic features governing PFAS interaction with membrane environments representative of the blood-brain barrier.

USING ZEBRAFISH EMBRYOS TO IDENTIFY SMALL MOLECULES THAT INDUCE CARDIOMYOCYTE PROLIFERATION

Presenter(s): Dalila Livadic
Category: Biochemistry and Molecular Biology
Mentor(s): Aaron Wasserman (College of Human Medicine)

Cardiovascular disease remains the leading cause of mortality, and once a human heart goes through trauma, its ability to regenerate is limited. During a myocardial infarction, up to 25% of cardiomyocytes (CMs) are lost, and if left untreated, this condition can lead to heart failure. Human CMs hardly divide, about 1% per year, which is insufficient for cardiac damage that occurs after MI. Previous studies from our lab demonstrate small molecules DF6 and LRN9 have the ability to increase CM proliferation in 2D human induced pluripotent stem cell (hiPSC)-derived CMs and 3D cardiac organoids. Zebrafish are a model used in cardiovascular research due to their transparent embryos, rapid development, and genetic similarities to humans. Unlike mammals, zebrafish CMs can proliferate autonomously, and their hearts can fully regenerate after a loss of up to 20% ventricular area, making them an ideal system to recapitulate our in vitro findings. Here, we conduct a zebrafish study that involves breeding and collecting embryos, treating with DF6 and LRN9, and comparing to a control, dimethyl sulfoxide (DMSO). When zebrafish were treated with these compounds, we observed a 40% increase in mean ventricle area, length, and nuclei count compared to DMSO. Additionally, we observed no effect on morphology and embryo toxicity at 3 days post-fertilization. Our results demonstrate that LRN9 and DF6 successfully induce proliferation without any toxicity to zebrafish. Combined with our prior evidence of proliferation

in hiPSC-derived CMs, these small molecules make promising candidates for further investigation and potential therapeutic interventions in humans.

SURFACE CHARACTERIZATION OF ENAMEL THROUGH TOOTHPASTE EXPOSURE
Presenter(s): Serena Li
Category: Biochemistry and Molecular Biology
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

This study investigates how repeated exposure to toothpaste affects the surface morphology and elemental composition of enamel. Bovine teeth were used as enamel samples in a control and experimental group to test the effect of toothpaste elements interacting with the enamel surface. Three samples were treated with a toothpaste suspension at a ratio of 1:3 toothpaste to water for two minutes 6 days per week, for approximately 6 weeks, while another two samples were left submerged in distilled water. The tooth samples were subsequently documented using scanning electron microscopy (SEM) and energy-dispersive spectroscopy (EDS) prior to the treatment and following treatment period.

STRUCTURAL AND FUNCTIONAL ANALYSIS OF THE BMPR2 CYTOPLASMIC DOMAIN IN SMAD-INDEPENDENT SIGNALING
Presenter(s): Kunal Patel
Category: Biochemistry and Molecular Biology
Mentor(s): Erik Martinez Hackert (College of Osteopathic Medicine)

Bone Morphogenetic Protein Receptor Type II (BMPR2) is a critical component of the TGF-β/BMP signaling pathway. While the structure of the conserved serine/threonine kinase domain has been resolved, the extended 508-amino acid cytoplasmic tail remains structurally uncharacterized. Mutations in this tail region have been linked to familial pulmonary arterial hypertension, but these mutations often retain normal SMAD signaling, suggesting that the tail has unknown functions in SMAD-independent pathways. To investigate these mechanisms, we are generating an expression construct containing the full-length cytoplasmic domain of BMPR2 and expressing it in HEK293 suspension cells. The cytoplasmic domain also interacts with various signaling proteins, so analyzing this could provide insight into future research studying the disease mechanisms and potential therapeutic targets.

DESIGNED SYNTHESIS OF SMALL MESOPOROUS SILICA NANOPARTICLES FOR NUCLEIC ACID DELIVERY
Presenter(s): Sasha Stoyanovich
Category: Biochemistry and Molecular Biology
Mentor(s): Maggie Lee (College of Engineering), Taeho Kim (College of Engineering)

Efficient delivery of nucleic acids and gene-editing proteins remains a major challenge in biomedical research due to their instability and poor cellular uptake. In this study, we developed a new synthesis method to produce small mesoporous silica nanoparticles with high porosity and good biocompatibility.

A modified Stöber method was used in which the amino acid L-arginine served as a biocompatible template to control particle size (~45-50 nm), morphology, and pore structure (pore size: 5-7 nm). To monitor nanoparticle behavior in biological systems, the particles were further tagged with a fluorescent dye for bioimaging and cellular tracking. The porous structure of these nanoparticles enables efficient loading of the Cas9 protein (loading efficiency of 3.1%), outperforming other delivery methods. The nanoparticles were further evaluated as carriers for Cas9 delivery to mouse-derived embryos, and fluorescence imaging confirmed their successful uptake. Overall, this study demonstrates a promising mesoporous silica nanoparticle platform for Cas9 delivery while enabling fluorescence-based monitoring of nanoparticle uptake in biological systems. In future studies, this platform will be further optimized for targeted gene-editing delivery and real-time imaging in embryos, and the gene-editing efficiency will be evaluated using PCR-based analysis.

TAU-TEV: DESIGNER TEV PROTEASE TO CLEAVE PATHOLOGICAL TAU
Presenter(s): Amir Habib
Category: Biochemistry and Molecular Biology
Mentor(s): Hsin Ying Lin (College of Natural Science), Min Kuo (College of Osteopathic Medicine)

Tau protein plays a role in the stabilization of microtubules to facilitate neuronal functioning and proper cell signaling across synapses with its microtubule?binding repeat (R) domains. Driven by hyperphosphorylation, tau dissociates from the microtubules and nucleates the aggregation at the R domain into neurofibrillary tangles (NFTs), which linked to Alzheimer's disease. TEV protease, an enzyme derived from Tobacco-Etch virus, recognizes protein sequence similar to the sequence in tau R repeat domain but does not digest tau, due likely to sequence variations between tau and the TEV cleavage consensus sequences. Given the causal contribution of tau in AD, we hypothesize that a protease that specifically cleaves a pathogenic tau species can help the design of efficacious therapeutic regimens and the understanding of the mechanisms of the disease. Thus, we propose to generate engineered TEV protease mutants that can selectively recognize and cleave pathological tau isoforms to reduce tau aggregation and cytotoxicity. To achieve this, we utilize yeast two hybrid system, which allow us to detect the recognition and cleavage activity of designer TEV protease to targeted tau isoform by three reporter assays. Successful engineered TEV proteases would provide tools to dissect isoform-dependent contributions to tau cytotoxicity and offer proof-of-principle for protease-based strategies to mitigate pathological tau aggregation.

PCR AND IMMUNOHISTOCHEMICAL CHARACTERIZATION OF OSTEOSARCOMA TISSUE IN NSG MICE IMPLANTED WITH PROSTATE EPITHELIAL CELLS OVEREXPRESSING RSAD2
Presenter(s): Siti Khaula Nurazizah
Category: Biochemistry and Molecular Biology
Mentor(s): Olorunseun Ogunwobi (College of Natural Science)

RSAD2 (Radical S-adenosyl methionine domain-containing 2), also known as Viperin, is an interferon-inducible gene present during exposure to a viral infection and is rarely implicated as an oncogenic

model. Our previous data suggested RSAD2 oncogenic role in castrate-resistant and neuroendocrine prostate cancer (NEPC). To validate our findings about RSAD2 being an oncogene, a mouse xenograft experiment was performed in which prostate-epithelial cells overexpressing the coding region of RSAD2 were implanted. Approximately 45 days post-injection, a palpable ocular tumor reported as osteosarcoma was observed, and therefore, we hypothesized that RSAD2 is involved in tumor formation. After the tumor collection, we utilized immunohistochemistry staining (IHC) and polymerase chain reaction (PCR) to characterize the nature of the tumor. IHC staining indicated that cells contained both human RSAD2 and the GFP-tag that was inserted into the overexpression of the model. Additionally, we found an expression of osteocalcin in the tissues, as a marker for mesenchymal stem cells (MSC) undergoing osteogenic differentiation, which implicates RSAD2 involvement in the activation of this MSC pathway and possibly the transformation of differentiated epithelial cells to bone cells. Future directions would include examining RSAD2 role in mice osteosarcoma, or even in humans, and identifying whether its overexpression is the mediator of bone metastasis in prostate cancer.

IN SILICO INVESTIGATION OF PFAS COMPOUNDS IN A LIVER XENOBIOTIC SENSOR

Presenter(s): Jason Thieu
Category: Biochemistry and Molecular Biology
Mentor(s): Angela Wilson (College of Natural Science), Deepak James (College of Natural Science), Narasimhan Loganathan (College of Natural Science)

The constitutive androstane receptor (CAR) is an orphan nuclear receptor (NR) that functions as a xenobiotic sensor and regulates hepatic detoxification pathways. Experimental studies show that several per and polyfluoroalkyl (PFAS) compounds can activate CAR, but the molecular mechanisms are still poorly understood. This work investigates the molecular interactions between selected PFAS compounds and the CAR-retinoid X receptor α (RXRα) heterodimer using computational approaches. We use molecular docking to find potential binding orientations of PFAS within the ligand-binding domains of CAR and RXRα, which were then evaluated through molecular dynamics simulations. Aspects that were studied included the structural stability, ligand-receptor interactions, binding affinities, and conformational changes associated with the activation of the receptor. These simulations aim to identify key residues involved in PFAS binding, assess potential indirect activation via RXRα, and explore allosteric communication within the CAR-RXRα complex. These results provide a molecular-level insight into PFAS-mediated regulation of NR signaling and contribute to understanding mechanisms underlying PFAS-associated hepatotoxicity.

INVESTIGATING THE ROLE OF APHID SALIVARY GAMMA-GLUTAMYLTYROSINE ON ACONITASE ENZYMATIC ACTIVITY IN ARABIDOPSIS
Presenter(s): Sophia Bonnema
Category: Biochemistry and Molecular Biology
Mentor(s): Hillary Fischer (College of Natural Science)

Aphids are phloem-feeding insects that obtain nutrients from their host plants. After settling on a suitable plant, they penetrate the phloem using specialized mouthparts and consume sugars such as sucrose. While feeding, aphids inject saliva into plant tissues. However, the effects of this saliva on plant physiological processes and metabolic function remain poorly understood. Determining whether aphid saliva has beneficial or detrimental impacts on the plant is therefore an important area of investigation. In the Skirycz lab, recent isothermal shift assays in Arabidopsis showed an interaction between cytosolic enzymes Aconitase1 and Aconitase3 and the dipeptide gamma-glutamyltyrosine found in aphid saliva that is injected into the plant during infestation. Dipeptides are known to have regulatory roles in enzyme activity, either by activation or inhibition. Therefore, ACO1/3 proteins were expressed in bacteria, purified, and paired with cytosolic isocitrate dehydrogenase (cICDH) with enzyme efficiency indirectly quantified as resultant NADPH production. The response of ACO1/3 to gamma-glutamyltyrosine was then measured as such.

ENGINEERING SYNECHOCOCCUS ELONGATUS PCC 7942 FOR ENHANCED AMMONIUM SECRETION
Presenter(s): Megan Lancaster
Category: Biochemistry and Molecular Biology
Mentor(s): Daniel Ducat (College of Natural Science), Jorge Guio-Martinez (College of Natural Science)

Nitrogen is a fundamental biological element that plays a key role in microbial metabolism, particularly through nitrogen cycling processes that facilitate the transfer of reducing equivalents within microbial communities. In unicellular cyanobacteria such as Synechococcus elongatus, nitrate (NO3-) and nitrite (NO2-) can be reduced to ammonium (NH4+) through the sequential action of nitrate reductase (NR) and nitrite reductase (NiR). Previous works revealed that glutamine synthetase/glutamate synthase (GS/GOGAT) cycle, the primary ammonium assimilation pathway, can be inhibited in cyanobacteria using methionine sulfoximine (MSX). This leads to the accumulation of intracellular NH4+ which is subsequently released from the cell, suggesting that limiting GS/GOGAT activity in S. elongatus could enable ammonium secretion. This project aims to engineer S. elongatus to enhance ammonium secretion by upregulating pathways involved in nitrogen uptake and assimilation and downregulating ammonium utilization through the GS/GOGAT system.

INTERROGATING RPAA INTERACTIONS WITH CARBOXYSOME COMPONENTS
Presenter(s): Makayla Guenther
Category: Biochemistry and Molecular Biology
Mentor(s): Daniel Ducat (College of Natural Science), Maria Del Carmen Santos Merino (College of Natural Science)

Carboxysomes are bacterial microcompartments that encapsulate the primary CO2 fixation enzyme, Rubisco. These microcompartments are dynamic structures that respond to environmental conditions (CO2, light availability, redox state, temperature, and light quality). However, the molecular mechanisms involved in this adaptive process remain elusive. In a recent publication from our group, RpaA, a known protein important for circadian regulation and central carbon metabolism regulation, has been implicated as a regulator of carboxysome dynamics. However, the full extent and the mechanism on how RpaA regulates carboxysome dynamics is not fully understood. To disentangle these regulatory mechanisms, we interrogated the interaction of RpaA with the full list of carboxysome components (cargo, shell, and accessory protein components) using Bacterial Two-Hybrid (B2H) assays. The strength of the interactions was quantified by measuring the β-galactosidase enzymatic activities. Several components of the shell (CcmK2, CcmL and CcmK4) showed the strongest interaction together with RbcL (the large subunit of Rubisco) and the positioning protein McdB. Medium Interactions were observed with other components of the shell (CcmP and CcmO), whereas the weakest interactions were limited to cargo components (RbcS, CcmM and CcmN) and the accessory protein shell CcmK3. All together indicates that RpaA might interact with carboxysomes when they are fully formed, since most of the interactions are with shell components. Future steps will be focused on studying these interactions in vivo using fluorescent reporters.

PHAGE INDUCTION IN PSEUDOMONAS SYRINGAE PV. MORSPRUNORUM RACE 1
Presenter(s): Paige Franklin
Category: Biochemistry and Molecular Biology
Mentor(s): Michelle Hulin (College of Agriculture & Natural Resources)

Bacterial canker is a devastating disease affecting stone fruit trees. This disease is caused by strains of the Pseudomonas syringae species complex, including Pseudomonas syringae pv. morsprunorum race 1 (PsmR1). PsmR1 evolves through horizontal gene transfer (HGT) mediated by bacteriophages. Phages are viruses that infect bacteria that can transfer genes. Previous work shows that prophage 1 (pp1) alters bacterial virulence on cherry. Understanding the role of these phages in virulence evolution will provide a better understanding of disease emergence in the field. This project investigates the activation of pp1 in PsmR1. As pp1 is temperate, it's DNA remains integrated in the bacterial genome. When the phage is dormant and passively replicating, it is referred to as the lysogenic cycle. Excision and circularization of the phage occurs with induction into the lytic cycle. In this case, phage DNA is replicated separately to produce phage particles and lyse the host cell. Polymerase chain reaction (PCR) was performed using primers to detect integrated, excised, and circularized phage DNA. Induction of pp1 was achieved by treating PsmR1 with varying concentrations of the antibiotic mitomycin C and with UV treatment. Quantitative PCR (qPCR) was used to assess the amount of circularized phage DNA present. The cI-cro

promoter, which regulates the switch between lytic and lysogenic cycle, was cloned with fluorescent reporters and transformed into PsmR1 to visualize and quantify phage activation. This work ultimately aims to develop tools to study phage activation in PsmR1 to understand how this phage mediates HGT and evolution of virulence.

DETERMINING THE REGULATORY ROLE OF PUTATIVE MIRNA-DERIVED PEPTIDES (MIPEPS) IN ARABIDOPSIS THALIANA
Presenter(s): Zoe Kerr
Category: Biochemistry and Molecular Biology
Mentor(s): Isaiah Kaufman (College of Natural Science), Polly Hsu (College of Natural Science)

MicroRNAs (miRNAs) are small RNAs with important roles in regulating gene expression. miRNAs are processed from longer primary transcripts (pri-mRNA). Recent studies revealed that some pri-miRNAs contain small open reading frames that encode miRNA-encoded peptides (miPEPs). In the model plant Arabidopsis thaliana, some miPEPs have been shown to increase transcription of their originating miRNA gene, triggering a positive feedback loop that increases miRNA levels. My study aims to validate the effects of a previously studied miPEP, miPEP858a, and determine if two additional miPEPs, miP169l and miP163, exhibit similar regulatory behavior. To test this, I will be treating Arabidopsis seedlings with the peptides and then quantifying expression of the pri-miRNA and targets of the miRNA using RT-qPCR. Depending on the function of these putative miPEPs, they may have potential agricultural applications for regulating gene expression in crops.

INVESTIGATING THE INTERACTIONS OF ELP1 AND ELP3 IN EPIGENETIC REGULATION
Presenter(s): Erik Howe
Category: Biochemistry and Molecular Biology
Mentor(s): Tommy Vo (College of Human Medicine)

Human ELP1 and ELP3 are conserved proteins that come together to form a protein complex called Elongator. Mutations of Elongator can lead to destructive neurological disorders or cancers. However, the functions of ELP1 and ELP3 are not yet fully understood. Our lab recently found that the yeast version of ELP1, called Elp1, is involved in epigenetic remodeling. Epigenetics refers to changes in DNA expression that don't arise from changes in the base pairs of the DNA but from changes in the chromatin structure from things such as methylation of histones. My project is to study how Elp1 and Elp3 coordinate epigenetic changes. Because yeast and human Elongator are highly conserved, understanding how it works in a genetically tractable yeast model will help us derive hypotheses of how it could work in humans. We hypothesize that Elp3 can epigenetically activate gene expression, but Elp1 normally prevents this. To test this, we will use the yeast Schizosaccharomyces pombe to determine what happens to Elp3 protein in the absence of Elp1 and to investigate the epigenetic outcomes of yeast cells that lack Elp1, Elp3, or Elp1 and Elp3. To accomplish this, I will perform immunobloting, chromatin immunoprecipitation, and mass spectrometry experiments. Long-term, results from my project will help us better understand the role Elongator in various human diseases and disorders.

IMPACT OF CYTOKINES ON MACROPHAGE SUBTYPE DIFFERENTIATION IN VITRO
Presenter(s): Jade O'Brien
Category: Biochemistry and Molecular Biology
Mentor(s): Jennifer Jacob (College of Natural Science), Ryann Ray (College of Natural Science)

Macrophages are white blood cells that help the immune system eliminate foreign bodies as well as dead or defective host cells. Macrophages also play a role in activating tumor-killing cytotoxic T lymphocytes. The subsets and quantities of macrophages in humans can have profound impacts on health and disease prognosis, particularly for cancer patients. All cells have basal background fluorescence due to differences in size and complexity of internal structures. We hypothesize that cell autofluorescence can be used to determine the type of macrophages (subtypes) present in a given tissue. In the laboratory, immune cells are difficult to analyze due to changes in the tissue microenvironment and the specific conditions it takes to culture them. This project aims to develop our understanding of how different environments contribute to the expression of proteins that identify specific macrophage subtypes and their ability to further activate immunity against cancer. Using these results, we plan to better characterize the autofluorescent profile (using flow cytometry without staining) of macrophage subtypes. In this experiment, murine bone marrow stem cells were collected and cultured into macrophages in environments containing macrophage colony stimulating factor (M-CSF) or granulocyte macrophage colony stimulating factor (GM-CSF). These cells were collected, stained, and analyzed for cell phenotype, expression of antigen presentation proteins, and costimulatory molecules using flow cytometry. We will then use the resulting macrophage subtype profiles to assess their autofluorescence and association with disease progression and prognosis.

BIOENERGETIC CHARACTERIZATION OF RAT HEART HOMOGENATES
Presenter(s): Collin Vora
Category: Biochemistry and Molecular Biology
Mentor(s): Alyssa Vadovsky (College of Natural Science), Jason Bazil (College of Osteopathic Medicine)

Mitochondrial bioenergetics are essential for cellular energy production, particularly in high-energy tissues such as the heart. Our lab studies mitochondrial metabolism and how it may be altered under pathological conditions such as calcium overload. In this study, I characterized the bioenergetic activity of rat heart tissue homogenates by measuring key enzymes involved in the electron transport chain and tricarboxylic acid cycle. Using a spectrophotometer and plate reader, Complex I and Complex II activities were measured through absorbance changes associated with NADH oxidation and DCPIP reduction, with specific inhibitors used to confirm enzyme activity. Additional assays measured isocitrate dehydrogenase and malate dehydrogenase activity, while citrate synthase activity was used as a marker of mitochondrial content. Together, these assays provide a foundation for evaluating mitochondrial bioenergetic capacity and support future studies investigating metabolic changes in mitochondrial dysfunction.

VERNAL POOLS AS ENVIRONMENTAL PROXIES: INVESTIGATING THE CORRELATION BETWEEN POOL CHEMISTRY AND FARMLAND SOIL HEALTH
Presenter(s): Sarah Wood
Category: Biochemistry and Molecular Biology
Mentor(s): Cheyenne Kleiner (College of Education), Julie Libarkin (College of Natural Science)

Vernal pools are seasonal wetlands that are highly sensitive to human-driven disturbances, yet their potential as indicators of terrestrial soil health remains under-researched. This study investigates whether the chemical composition of vernal pool water and benthic soil can serve as a proxy for the nutrient profiles of the surrounding landscape. We hypothesize that pools adjacent to agricultural runoff and salted roadways will exhibit higher concentrations of nitrates, phosphates, and chloride compared to an isolated forest-preserve baseline. To test this, water and soil samples will be collected over a six-week spring period from three site types: roadside edges, active farmlands, and a protected baseline. Using spectrophotometry and Ion Chromatography, we will compare the chemical makeup of these pools to determine if they act as localized "sinks" or active filters that mitigate runoff. By assessing how much nutrient loading is retained versus filtered by the pool, we can determine the accuracy of using wetland sampling as a low-cost alternative to expensive, large-scale soil grid testing. Establishing a strong correlation between pool chemistry and soil health will not only provide a tool for precision agriculture but also strengthen the advocacy for vernal pool protection as vital components of both ecological and human infrastructure.

COMPARING MPI, MICROCT, AND ULTRASOUND FOR NON-INVASIVE TRACKING OF 3D-PRINTED BIOMATERIAL DEVICES
Presenter(s): Ava Buchanan
Category: Biochemistry and Molecular Biology
Mentor(s): Kendell Pawelec (College of Osteopathic Medicine)

Non-invasive imaging has proved to be important in regenerative medicine through tracking the location of biomaterial devices and understanding their condition over time. However, each imaging technique relies on different contrast mechanisms and can't always guarantee visibility. Incorporating different contrast agents, such as nanoparticles, can also influence tissue degradation, cellular response, and material properties. In this project, we compared the detectability and localization of 3D-printed scaffolds imbued with contrast agents, using micro-Computed Tomography (μCT), magnetic particle imaging (MPI), and ultrasound (US). These imaging techniques were chosen for their complementary strengths: MPI's sensitivity, μCT's resolution, and ultrasound's convenience and portability. For the MPI, iron oxide tracers (VivoTrax and Synomag) were used at concentrations up to 5.5 mg/mL. Data was acquired by utilizing the MPI 2D imaging mode and 3D ROI tool to quantify signals. Tantalum oxide (TaOx) nanoparticles were used for the μCT, based on its efficacy and biocompatibility. Ultrasound was acquired using moderate brightness (moderate gain), high frequency (CHI mode), shallow image depth, and high contrast. A dual-contrast scaffold was detectable in MPI and μCT pre-implantation and remained visible in all modalities after implantation in a model tissue. These results show that a 3D-

printed scaffold can be engineered for multimodal visibility, supporting real-time, non-invasive monitoring of implanted devices and advancing assessments of biomaterials in regenerative medicine.

ELUCIDATING TETRAMERIC COMPLEX FORMATION IN THE RARE DISEASE FIBRODYSPLASIA OSSIFICANS PROGRESSIVA
Presenter(s): Addison Johnson
Category: Biochemistry and Molecular Biology
Mentor(s): Amberly Crawford (College of Natural Science)

Fibrodysplasia Ossificans Progressiva (FOP) is a rare genetic disorder in which connective and muscle tissue gradually turns to bone, severely impacting joint mobility and overall quality of life. Activin receptor-like kinase 2 (ALK2), a type I receptor, when mutated, is known to cause FOP, but the molecular drivers of complex formation remain unknown. To better understand complex formation and composition, we designed DNA constructs of type I receptors, both wild-type and containing the R206H mutation commonly seen in FOP. These constructs also encoded for Nano-BiT fluorescent proteins, allowing us to determine complex assemblage upon transfection. We then transfected Human Embryonic Kidney 293 (HEK293) cells with the constructs, along with the type II receptor Activin receptor type-2B (A2B), and used fluorescence assays to assess tetrameric complex formation in the presence of known agonists. We determined that ALK2 and A2B composes the tetrameric complex in both the wild-type and mutant. Co-immunoprecipitation assays and Western immunoblotting confirmed these ALK2-A2B tetrameric complex interactions. By better understanding how this complex formation leads to FOP progression and pathogenesis, we can discover novel and targeted treatments for this rare disease.

QUANTIFYING MATRIX METALLOPROTEINASE-2 WITH MAGNETIC PARTICLE IMAGING TO MONITOR BREAST CANCER TUMORS
Presenter(s): Dorothy Bodapati
Category: Biochemistry and Molecular Biology
Mentor(s): Roshni Thangampillai Senthilkumar (College of Engineering)

Matrix metalloproteinase-2 (MMP-2) is a zinc-dependent endopeptidase present in breast cancer tumor environments and has been implicated in tumor metastasis. Research shows that MMP-2 is involved in cancer cell survival, proliferation, and angiogenesis; thus, the more MMP-2 that is present, the more the tumor progresses. It is more effective to quantify MMP-2 with an imaging modality rather than using western blot or ELISA. Western blot and ELISA require a tissue biopsy and they are time-specific, whereas with imaging we can check the cells repeatedly to see the amount of MMP-2. We propose using iron oxide loaded poly (lactic-co-glycolic acid) (PLGA) nanoparticles (NPs) conjugated with the MMP-2 sensitive GLPGIAGQ peptide to visualize and quantify MMP-2 expression in a solid tumor. MMP-2 cleaves the peptide which degrades the NPs, resulting in the release of the iron oxides which produces a strong signal when imaged with Magnetic Particle Imaging (MPI). A stronger signal is produced when the NPs are cleaved because the Brownian relaxation is no longer quenched since the iron oxides are no longer bound in the polymer's core. Using MPI and iron oxide PLGA NPs we can longitudinally monitor tumor

progression. Our research findings could potentially show whether the tumor is responding properly to therapy based on tumor progression measured by MPI signal.

UNDERSTANDING PROTEIN-LIPID MOVEMENT IN PLANTS THROUGH AN OPTOGENETIC APPROACH
Presenter(s): Grace Minton
Category: Biochemistry and Molecular Biology
Mentor(s): Susanne Hoffmann-Benning (College of Natural Science)

As plants cannot move to get away from a threat, they must be able to perceive signals from the environment and have an appropriate developmental response to survive. Our lab proposed that long distance signaling throughout the plant can occur by lipid movement in the phloem. This movement will likely be mediated by proteins. The protein PLAFP, which binds to phosphatidic acid and is found in the phloem, is generated in response to ABA when under drought stress. The gene encoding PLAFP has been cloned behind an optogenetic promoter, PULSE. It can be turned on or off under different light conditions. Specifically, it is activated under red light. To test the light induction, or lack thereof, observations with confocal light microscopy and RT-PCR expression studies will be performed. This allows for movement studies, where only one section of the plant is induced, then the entire plant is tested for mRNA and protein presence. The positive control of this experiment is the protein Flowering Locus T (FT), which travels throughout the phloem, and the negative control is the GRIP protein, which does not move through the phloem. I have confirmed the functionality of the optogenetic promoter system in FT transgenic lines, with consistent expression under 19-hour red light, selective expression under 3-hour red light, and no expression under white light and dark conditions. Confocal microscopy confirmed the presence and mobility of the protein. This methodology can be replicated for verifying expression in GRIP and PLAFP-PULSE lines and further movement studies.

CHARACTERIZATION OF THE PLASTOGLOBULE-ASSOCIATED ABC1K5 PROTEIN KINASE
Presenter(s): Sarah Weber
Category: Biochemistry and Molecular Biology
Mentor(s): April Kaneshiro (College of Natural Science), Peter Lundquist (College of Natural Science)

The atypical protein kinase (aPK) family is an ancient family found in the mitochondria and plastids of eukaryotes. In Arabidopsis thaliana, members of this family are referred to as Activity of bc1 complex protein kinases (ABC1Ks). There are 6 ABC1Ks that associate to plastoglobules, lipoprotein bodies that bud from the outer thylakoid membrane and appear to play a role in plant development and resilience to stressors. These 6 members are hypothesized to perform regulatory roles that aid in optimizing and maintaining photosynthetic activity, facilitating plant development, and responding to environmental stressors. Interestingly, ABC1Ks appear to utilize manganese as a cofactor and require low salt concentrations. However, ABC1K5 has yet to be studied. To gain a better understanding of ABC1K5, we heterologously expressed and purified an ABC1K5 construct. The ABC1K5 gene was inserted into a pMAL-c5x vector using restriction enzyme cloning. Expression of recombinant ABC1K5 in E. coli BL21 (DE3) cells was assessed using SDS-PAGE and western blot. While purification using nickel-affinity

chromatography was successful, further optimization is required. Purified ABC1K5 will be assayed for autophosphorylation activity.

EXPLORING THE ROLE THE LYSINE ACETYLTRANSFERASE DOMAIN OF ELONGATOR PROTEIN 3 IN HETEROCHROMATIN FORMATION
Presenter(s): Kate Darrow
Category: Biochemistry and Molecular Biology
Mentor(s): Tommy Vo (College of Human Medicine)

Elongator is a highly conserved protein complex, from yeast to human, that is well-associated with human diseases and disorders, including Riley-Day syndrome and medulloblastomas. However, we do not fully understand its molecular functions. It is known that Elongator comprises protein subunits Elongator Protein 1 (Elp1) and Elongator Protein 3 (Elp3) that work together to mediate tRNA modifications. It is commonly believed that Elp1 acts as a scaffold that binds to tRNAs, while Elp3 uses its lysine acetyltransferase (KAT) domain to catalyze the mcm5s2 modification of Elp1-bound tRNAs. This might not be the only function of Elp1 and Elp3 because our lab recently showed in a fission yeast model Schizosaccharomyces pombe (S. pombe) that Elp1 could also repress gene expression through heterochromatin formation. Interestingly, this non-tRNA-related function requires Elp1 to suppress an unknown function of Elp3. My project is to investigate whether the KAT domain of Elp3 is involved in regulating Elp1-dependent heterochromatin formation. By mutating the Elp3 KAT domain in yeast cells that lack Elp1, I will test the hypothesis that Elp1 promotes heterochromatin by suppressing the activity of the KAT domain of Elp3. This work will advance our molecular understanding of what Elongator subunits do in eukaryotic cells. This is important because these functions likely contribute to their importance in human diseases and disorders.

EXPRESSION, PURIFICATION, AND STRUCTURAL ANALYSIS OF APP, A NEISSERIA MENINGITIDIS VIRULENCE FACTOR INVOLVED IN PATHOGENESIS
Presenter(s): Arnav Sharma
Category: Biochemistry and Molecular Biology
Mentor(s): Hyojin (Kelly) Kim (College of Natural Science), Md Shafiqur Rahman (College of Natural Science)

The adhesion and penetration protein (App) of Neisseria meningitidis is a multifunctional virulence factor that promotes host cell attachment, cellular entry, nuclear targeting, histone cleavage, and induction of apoptosis. Although App plays a significant role in meningococcal pathogenesis, little is known about its underlying molecular and structural mechanisms. To enable structural and mechanistic studies, we cloned, expressed, and purified full-length recombinant App, as well as a mutated version, AppS267A, in which the serine at position 267 is replaced by alanine. This mutation abolishes serine protease activity and prevents autoproteolytic cleavage, yielding a stable full-length protein. Both wild-type and mutant proteins were successfully purified to high homogeneity. Notably, the AppS267A variant yielded a stable full-length protein, providing a valuable tool for investigating the intact molecular

architecture. These purified proteins serve as the foundation for high-resolution structural analysis using cryo-electron microscopy (cryo-EM) to reveal App's molecular architecture and functional domains. Understanding the structural basis of App activity will provide vital insights into its involvement in meningococcal virulence, potentially guiding the development of innovative therapeutic options against meningococcal disease.

QUANTIFYING ENZYME LOADING IN BACTERIAL MICROCOMPARTMENTS USING A TETRACYSTEINE-FLASH TAGGING STRATEGY
Presenter(s): Cassidy Verburg
Category: Biochemistry and Molecular Biology
Mentor(s): Eric Hegg (College of Natural Science), Sreeahila Retnadhas (College of Natural Science)

Bacterial microcompartments (BMCs) are proteinaceous organelles that spatially organize metabolic reactions in bacteria and represent attractive scaffolds for pathway engineering. These self-assembling shells form selectively permeable compartments that allow substrate and product diffusion while confining enzymes and reactive intermediates, improving metabolic efficiency and protecting cells from toxic intermediates. Because of these properties, BMCs are increasingly used as modular platforms for synthetic biology and metabolic engineering. The Center for Catalysis in Biomimetic Confinement (CCBC) has developed a standardized strategy to target and encapsulate cargo enzymes inside engineered BMC shells, enabling construction of compartmentalized enzymatic systems. However, a key challenge is accurately determining how much cargo enzyme is encapsulated within each shell particle, which is essential for understanding enzyme loading efficiency, stoichiometry, and how confinement affects catalytic activity. To address this limitation, we employ a tetracysteine tag-FlAsH labeling system as a quantitative fluorescence-based method to measure cargo encapsulation. The tetracysteine motif (CCPGCC) is a small genetically encoded peptide that binds the biarsenical fluorescein dye FlAsH (Fluorescein Arsenical Hairpin Binder), becoming highly fluorescent upon binding and enabling selective detection of tagged proteins with minimal background. Because the tag is much smaller than fluorescent proteins, it minimally perturbs protein structure and is well suited for confined environments such as BMC lumens. Using a thermostable malate dehydrogenase from Thermus thermophilus as a model cargo, we establish a fluorescence-based approach to quantify enzyme loading in engineered BMC shells.

FUNCTIONAL ENGINEERING AND ANALYSIS OF CIRCULAR RNAS FOR POST-TRANSCRIPTIONAL REGULATION AND THERAPEUTIC DELIVERY
Presenter(s): Jayadeep Yedla
Category: Biochemistry and Molecular Biology
Mentor(s): Masako Harada (College of Engineering)

Circular RNAs (circRNAs) are an emerging class of endogenous RNA molecules that can be distinguished by their covalently closed-loop structure. Unlike linear mRNAs, circRNAs lack both a 5' cap and a 3' poly(A)tail, structural features that regulate RNA stability and translation. This circular structure confers resistance to exonuclease-mediated degradation, thus resulting in enhanced molecular stability and

prolonged half-lives compared to the linear counterpart. This intrinsic stability of circRNA renders them attractive therapeutic candidates. Despite the growing attraction, the functional parameters that govern engineering circRNA activity. Addressing this gap will be essential for rational designs of circRNA based regulatory and functional therapeutic applications. This project aims to develop and functionally characterize synthetically engineered circRNA to evaluate their potential as post transcriptional regulators. Molecular biology techniques such as molecular cloning to design constructs and cellular assays will be performed to evaluate the potential of circRNAs to (1) Sequester miRNA as functional "sponges" and (2) Translational capacity via cap-independent pathways such as the incorporation of internal ribosomal entry sites. These experiments will serve as a basis for further study of circRNA applications in translational research. This systematic study and analysis of engineered circRNAs will provide a fundamental basis for RNA-based therapeutics. Indeed, circRNA regulatory potential can be harnessed by extracellular vesicle delivery systems to develop advanced treatments of dysregulated gene pathways.

PROTEIN KINASE A AND ITS RELEVANCE IN SPERM METABOLISM
Presenter(s): Lana Kouatli
Category: Biochemistry and Molecular Biology
Mentor(s): Melanie Balbach (College of Natural Science)

Upon ejaculation, sperm must immediately start producing sufficient energy to support motility and maturation in the female genital tract to gain fertilization capacity (capacitation). It is suggested that even small disruptions in sperm metabolism can have profound effects on fertilization capacity. We showed that capacitation leads to an increase in glycolytic flux and oxidative phosphorylation in mouse and human sperm. Capacitation is regulated by changes in intracellular calcium (Ca2+), sAC-mediated cAMP increase, and protein phosphorylation via Protein Kinase A (PKA). However, the interplay between these signaling pathways regulating sperm capacitation and sperm metabolism remains mostly unexplored. A combination of sperm motility assays, Western Blot, enzymatic and metabolite assay kits, as well as stable isotope labeling for metabolic tracing was used to identify changes in sperm motility, capacitation, and metabolism in non-capacitating and capacitating conditions in the presence and absence of PKA inhibitor. We observed an increase in motility, ATP usage, and metabolite activity when sperm were exposed to capacitating conditions. Blocking PKA activity changes the ATP equilibrium and diminishes the sperm's ability to move efficiently and increase intracellular Ca2+ levels. Stable isotope labeling with PKA inhibitor diminished the capacitation-induced increase in central carbon metabolic activity, suggesting that PKA might be involved in regulating the switch to increased metabolic activity during capacitation. Our research will further push the understanding of our knowledge of sperm physiology, with implications not only for infertility treatment but also novel contraceptives and other pharmaceutical developments.

QUANTIFYING AIRBORNE ANTIBIOTIC RESISTANCE GENES ON MSU FARMS AFTER MANURE APPLICATIONS
Presenter(s): Mackenzie Csapo
Category: Biochemistry and Molecular Biology
Mentor(s): Kaisen Lin (College of Engineering)

The widespread overuse of antibiotics in agriculture and livestock has contributed to the emergence and environmental distribution of antibiotic resistance genes (ARGs) in manure. Antibiotic resistance genes can promote antimicrobial resistance (AMR), which reduce effectiveness of antibiotics in fighting infections and can be directly associated with over 1 million deaths worldwide. Not only are the animals themselves exposed to ARGs in their manure, but also the farm employees who come into contact with it. Studies have previously shown ARG concentrations are higher in downwind air samples of manure than those upwind. The primary source and method of the emission of such genes is not fully understood. This specific study investigates the presence of airborne ARGs associated with manure spreading and hauling at Michigan State University farms by quantifying the tetracycline resistance gene (tetA) using quantitative polymerase chain reaction (qPCR) from air samples. Air samples were collected on MSU research farm during manure spreading events. DNA was extracted from matter captured on filters from multiple locations and then quantified by qPCR. From that, the limit of detection (LOD) of the assay was found to be around 16 copies/reaction. One sample exceeded this detection threshold, indicating a positive detection of the tetA gene. The findings of this study contribute to ongoing efforts to characterize environmental ARG transmission, specifically if transmission is associated with manure, and may help inform mitigation strategies to reduce airborne ARG exposure in agricultural settings.

INSIGHTS INTO METAL COORDINATION BY CBRXA IN PSEUDOMONAS AERUGINOSA
Presenter(s): Godfred Osei-Agyei
Category: Biochemistry and Molecular Biology
Mentor(s): Benjamin Orlando (College of Natural Science)

Pseudomonas aeruginosa exhibits high intrinsic antibiotic resistance, in part through membrane-associated proteins that remain poorly characterized. Here, we investigate a putative resistance-associated protein composed of transmembrane domains and a large soluble region, focusing on the role of a predicted zinc-binding site within the soluble domain. AlphaFold predictions identified conserved residues capable of coordinating zinc, suggesting that metal binding contributes to protein oligomerization and function. The soluble domain was expressed and purified, and inductively coupled plasma-mass spectrometry (ICP-MS) analysis revealed zinc as the predominant metal co-purified with the protein. To assess the functional relevance of zinc binding, site-directed mutations were introduced at predicted coordinating residues. Ongoing analysis examines whether these mutations reduce zinc association and alter protein dimerization. These findings provide evidence that zinc specifically associates with the soluble domain and support a potential structural role for metal binding in protein assembly. Elucidating this mechanism may advance understanding of metal-dependent regulation in antibiotic resistance pathways in P. aeruginosa.

CHARACTERIZATION OF NOVEL SUGAR PHOSPHATE UTILIZING BACTERIAL MICROCOMPARTMENT SHELL PROTEINS
Presenter(s): Cheyanne Schlinke
Category: Biochemistry and Molecular Biology
Mentor(s): Matthew Dwyer (College of Natural Science)

Bacterial Microcompartments (BMCs) are protein-based geometrical structures that exist in many bacteria. Their functions range from an anabolic carbon-concentrating mechanism to byproduct sequestration of toxic intermediates generated from scaffolded enzyme-driven catalysis, producing sources of energy for organismal growth. Recent characterization of novel BMC-localized enzymes from the Sugar Phosphate Utilizing (SPU) BMC, signifies the presence of a widespread sugar phosphate-processing nanoreactor. We believe that this bacterial-induced nanoreactor is pulling from an abundance of nucleic acid degradation products to fuel bacterial growth. Here, we have developed a synthetic SPU BMC shell system to study the biochemical and biophysical properties of SPU BMCs to better understand its role in natural habitats. Expression and purification of SPU shell proteins revealed the assembly of what we believe to be a 16 nanometer shell-like structure. With this novel BMC shell structure, we seek to understand the fundamentals of SPU shell protein self-assembling properties and their likeness with other BMC subtypes.

OPTIMIZATION OF A HIGH-THROUGHPUT SCREENING FOR FUSARIUM VIRGULIFORME DISEASE RESPONSE IN PENNYCRESS
Presenter(s): Elena Elias
Category: Biochemistry and Molecular Biology
Mentor(s): Seung Rhee (College of Natural Science)

Pennycress (Thlaspi arvense) is an emerging winter oilseed cover crop within corn-soybean rotations, providing soil cover during the winter after corn-soybean harvest while producing renewable biofuel. However, soybean is highly susceptible to Sudden Death Syndrome (SDS), a disease caused by Fusarium virguliforme. If pennycress supports the proliferation of F. virguliforme in soil during winter, it could increase disease pressure on subsequent soybean crops and negatively impact yield. In addition to pathogen risk, it is important to establish whether pennycress ecotypes differ in susceptibility and symptom development. This research aims to optimize a high-throughput screening platform for assessing disease response to F. virguliforme in pennycress seedlings, enabling comparison of susceptibility and symptom development among ecotypes. To optimize, we included experiments assessing germination and growth conditions under a variety of conditions, such as agar-based versus liquid growth media and germination in the presence or absence of custom 3D-printed inserts. We also compared seed pretreatment methods to improve germination consistency, with gibberellic acid (GA) treatments evaluated alongside traditional cold stratification. We found that germination rates were similar between agar-based and liquid-media systems. However, we selected agar-based systems because they directed root growth downward, resulting in more uniform seedling orientation compared to liquid media. GA-treated seeds germinated faster and more reliably than cold-stratified seeds. Optimizing F. virguliforme inoculum concentration led to consistent disease development while

maintaining seedling viability. We quantified disease symptoms by measuring leaf area and chlorosis using scripts written in Python. These optimized methods support scalable, high-throughput phenotyping of pennycress responses to F. virguliforme.

HETEROLOGOUS EXPRESSION OF ARABIDOPSIS THALIANA ELT4 LIPASE IN NICOTIANA TABACUM: A STEP TOWARD ENHANCING STRESS RESILIENCE IN CROPS
Presenter(s): Abby Holland
Category: Biochemistry and Molecular Biology
Mentor(s): Febri SUSANTO (College of Natural Science)

Plastoglobules (PGs) are lipid droplets inside of the chloroplasts of photosynthetic organisms that play a large role in stress responses and metabolism. When these structures respond to stress, they significantly influence physiology and adaptation of the plant. Previous studies from our lab show that under stress Jasmonic Acid (JA) biosynthetic enzymes are localized to the plastoglobules, pointing to them playing an important role in JA synthesis and regulation. In this study, the focus is esterase/Lipase/Thioesterase 4 (ELT4). ELT4 is a lipase that is upregulated under high-light stress and is linked to JA metabolism and fertility. Previous research demonstrated that ELT4 overexpression in Arabidopsis thaliana enhances fertility and helps maintain yield under drought and heat stress. Given its potential role in stress resilience, this study aims to evaluate ELT4's function in a heterologous system by introducing it into Nicotiana tabacum. To achieve this, Agrobacterium-mediated transformation and plant tissue culture techniques were used to generate transgenic Nicotiana tabacum lines overexpressing ELT4. Transgenic plants are currently screened up to the T2 generation to obtain homozygous lines, which will subsequently be characterized through phenotypic analysis. At this stage, data collection is still ongoing, and results will be presented and discussed. The findings from this study will provide insights into the potential of ELT4 to confer stress resilience in crops, serving as a foundation for future agricultural applications, particularly in the context of climate change. Key words: Plastoglobules, Jasmonic Acid, Lipase, Heterologous expression, Crop Resilience

GENETIC BACKGROUND IMPACTS BREAST CANCER METASTASIS IN MICE
Presenter(s): Aaron Chou
Category: Biochemistry and Molecular Biology
Mentor(s): Jennifer Jacob (College of Natural Science)

Overexpression of the proto-oncogene HER2/neu drives aggressive tumor formation. Neu, the rat homolog of HER2, is constitutively active and induces spontaneous mammary tumor formation in BALB NeuT mice. Previous QTL analysis of HER2/neu antibody responses identified H2-T23 as a candidate gene that may influence immune regulation. H2-T23 interacts with NKG2A, an inhibitory checkpoint receptor on NK cells that suppresses NK cell activity. Sequence differences in H2-T23 may therefore alter NK cell inhibition and lead to increased NK cell activity. PWK background NeuT mice exhibit stronger antibody responses than parental BALB NeuT mice. This suggests that NK cells in PWK mice may be generally more active than those in BALB mice. Increased NK cell activity may affect the ability of these mice to control

tumor progression and metastasis. In this study, we investigate whether increased NK cell activity influences tumor metastasis. PWK (n=13) and BALB mice (n=10) were implanted with 4T1 tumor cells to evaluate tumor progression and immune responses. Following implantation, tumor growth was monitored by palpation twice per week. Tumor size was measured, and tumor volume was calculated until it reached approximately 50 mm3, at which point mice were injected with anti-NKG2A antibody. Two to three weeks after antibody treatment, tumors were harvested and dissociated into single-cell suspensions using a mammary gland tumor dissociation protocol. Immune cell populations were then analyzed by flow cytometry to characterize tumor-infiltrating cells. The anti-NKG2A antibody provided minimal benefit in enhancing NK cell activation or preventing tumor metastasis. There was no major difference in T-cell responses between BALB/c and PWK. However, smaller tumors tended to contain more NK cells, whereas tumors larger than 1000 mm3 showed increased infiltration of myeloid cells. Future directions include investigating whether combining anti-NKG2A antibody treatment with other complexes could enhance immunotherapy.

IDENTIFICATION OF GENES INVOLVED IN THE JASMONIC ACID PATHWAY IN ARABIDOPSIS THROUGH SUPPRESSOR MUTANT SCREEN

Presenter(s): Conner Hall
Category: Biochemistry and Molecular Biology
Mentor(s): Christoph Benning (College of Natural Science), Jinjie Liu (College of Natural Science)

Plastid Lipase 3 (PLIP3) is an enzyme that releases 18:3 fatty acid from the lipid chloroplast membrane which is used as a substrate for JA biosynthesis. Overexpression of PLIP3 (PLIP3-OX) in Arabidopsis leads to the accumulation of JA, inducing plant defense and causing stunted growth and changed plant morphology (Wang et al., 2018). To identify novel transporters or other enzymes required for jasmonic acid (JA) biosynthesis and signaling pathways in the model plant Arabidopsis, we have enabled a forward genetics approach to generate suppressor mutants by treating PLIP3-OX seeds with ethyl methanesulfonate (EMS). Next-generation sequencing of a suppressor mutant (Sup105) revealed that AOS, a gene that encodes allene oxide synthase, is involved in the JA pathway and is a potential causal gene responsible for the Sup105 phenotype. T-DNA lines were backcrossed with PLIP3-OX followed by phenotyping and genotyping experiments. We have obtained a double mutant carrying mutations with both the AOS T-DNA and the PLIP3 overexpression. Currently, we are characterizing the phenotypic traits and the lipid profile of the double mutant. Future studies on the double mutant are expected to provide further insight into the relationship between lipid metabolism and the JA signaling pathway.

EFFECT OF POTENTIAL ALZHEIMER'S DISEASE DRUGS ON AGGREGATION AND CYTOTOXICITY OF HYPERPHOSPHORYLATED TAU

Presenter(s): Nikhil Kunjur
Category: Biochemistry and Molecular Biology
Mentor(s): Hsiao Tien Chien (College of Natural Science), Min Kuo (College of Osteopathic Medicine)

Pathological tau is one of the key contributors to Alzheimer's disease (AD) as well as other neurodegenerative diseases. It is believed abnormal hyperphosphorylated tau is responsible for its loss of normal physiological function, gain of neuronal toxicity and its aggregation to form neurofilament tangles (NFTs). In the human brain, alternative splicing of the MAPT gene generates six distinct tau isoforms with variation in their microtubule-binding repeats and N-terminal inserts, which exhibit unique structural properties, aggregation kinetics, and distinct profiles of neurotoxicity. Because these different isoforms drive disease progression in complex ways, targeting tau pathology remains highly challenging, and there is no effective drug that can prevent or cure AD to date. This project aims to investigate small-molecule compounds on aggregation ability and cytotoxicity of different pathological hyperphosphorylated tau isoforms (p-tau) synthesized by the PIMAX system, which possesses disease-relevant characteristics. The aggregation ability was evaluated with Thioflavin S (ThS) for amyloid formation. Cytotoxicity of tau isoforms and compound cytoprotection activity were assessed using metabolic viability assays. CDK-5 phosphorylated 1N3R tau was identified as the most toxic and aggregation-prone isoform .

In the preliminary data, several compounds were selected in 100,000-compound high-throughput screening with inhibiting features on p-tau aggregation and cytotoxicity. MSU-45028 (C9), as one of the top-tier candidates was selected and subjected to medicinal chemistry modifications for better EC50 against p-tau cytotoxicity. Our results demonstrate that Indirubin-3-monoxime (I3M) and C9F, a derivative of C9, both confer significant cytoprotection against p-tau-induced toxicity. However, C9F, unlike I3M, does not disrupt p-tau aggregation, suggesting a disconnect between aggregation of p-tau and cytotoxicity. It is worth noting that indirubin is the active ingredient of several Chinese traditional medicines. Our findings have the potential to help AD therapy with existing, alternative medications.

ZEBRAFISH MODEL OF TAUOPATHY UTILIZING CEREBROVENTRICULAR MICROINJECTION OF HYPERPHOSPHORYLATED TAU (P-TAU)

Presenter(s): Michael Facchinello
Category: Biochemistry and Molecular Biology
Mentor(s): Min Kuo (College of Osteopathic Medicine), Yu-Wen Chung-Davidson (College of Agriculture & Natural Resources)

Tau is a microtubule-associated protein that is integral for healthy neurological functions. It pathologically aggregates in patients with tauopathies, characterized by accumulation of aberrantly phosphorylated tau (p-tau). Zebrafish models have been demonstrated to provide valuable insights into human diseases. Here we investigated p-tau mediated toxicity in zebrafish brain by introducing p-tau via cerebroventricular microinjection (CVMI). Vehicle-treated controls and fish receiving p-tau (30, 60, 90 ng/µL in vehicle) were tested for behavioral performances. Proteomics analysis was conducted on the

same group of fish (6 months post-CVMI). Light/dark preference tests revealed p-tau-induced behavioral alterations: Notably, 90 ng/µL p-tau significantly increased total distance moved compared to both control and p-tau 30 ng/µL groups (one-way ANOVA test, DF =3, $p < 0.01$). These behavioral effects were largely transient, diminishing after three weeks. Proteomic analysis revealed differential protein expressions related to dysfunctions in calcium homeostasis, mitochondria, myelin, protein folding, proteosome, ribosome, and synapse. Future work includes developing a p-tau CVMI transgenic zebrafish model that expresses human tau and further elucidating p-tau's transient and long-term effects post CVMI. Hyperphosphorylation of recombinant zebrafish tau with the PIMAX system (ztau) will be performed to assess ztau's propensity for aggregation.

MOLECULAR ARCHITECTURE AND DYNAMIC REMODELING OF FUNGAL CELL WALLS REVEALED BY ADVANCED SOLID-STATE NMR SPECTROSCOPY
Presenter(s): Aswath Karai
Category: Biochemistry and Molecular Biology
Mentor(s): Tuo Wang (College of Natural Science)

In our current healthcare system, fungal infections are rising problem. Specifically, Aspergillosis, Candidiasis, and Cryptococcosis result in the death of millions of individuals annually. Many current antifungal medications are ineffective, as current cell wall models are incomplete. Here, we are using solid-state NMR to view cell wall structures and remodeling in natural environments.

Business

EXPLORING K-FOOD INTO U.S HOTELS BREAKFAST
Presenter(s): Kayla Yim, Marly Garrett, Min Jae Kwon, Song Nhi Doan
Category: Business and Entrepreneurship
Mentor(s): Mi Ran Kim (Eli Broad College of Business)

This study examines how Korean fusion breakfast offerings can elevate standard American hotel breakfasts into culturally distinctive dining experiences, leveraging strong B2B capabilities and existing select-service hotel infrastructure. Market research, including an online survey of 200 U.S. consumers, indicates substantial readiness and growing demand for K-Food integration within hotel breakfast settings. This study can provide important insights into U.S. hotel guests' perceptions and needs regarding global cuisine-particularly in the breakfast context and offers meaningful implications for how international food companies can more effectively enter and position themselves within the U.S. hospitality market.

EFFICACY OF TAPE/ HOW THE STRUCTURE OF TAPE IMPACTS UTILITY
Presenter(s): Al Raymond
Category: Business and Entrepreneurship
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Many materials are referred to as "tape" with varying properties. The most basic unifying factors being that they are long strips of material stored in a roll that is coated in an adhesive, typically only on one side. This broad definition and myriad of uses begs the question as to what separates one type of tape from the other in a concretely quantifiable way. Commercially, tape brands uses a number of different methods: Peel adhesion (how well tape sticks when pulled back), tack (how quickly tape grips to surface/weight it can withstand), tensile (how much stretch before breaks), temperature resistance (extreme hot/cold), and shear (ability to resist slipping from a surface). Alongside studying the macrostructure of the tape, using Scanning Electron Microscopy (SEM) the different microstructures of the tape can be examined. Findings can be compared to previously conducted quality control tests done by the manufacturers of the tape samples.

AUTHENTICITY IN SUSTAINABLE STOCK INVESTING: A COMPARATIVE ANALYSIS OF U.S. AND INTERNATIONAL IMPACT FUNDS
Presenter(s): Ava Soltysiak
Category: Business and Entrepreneurship
Mentor(s): Antoinette Tessmer (Eli Broad College of Business)

Given growing awareness of environmental and equality concerns, financial services companies have increased their product line to include a variety of Impact Fund offerings. These funds are said to include companies that support specific Environmental, Social, and Governance (ESG) regulations. We aim to investigate the authenticity of these sustainable financial offerings, specifically referring to the practice of "greenwashing". This study explores whether significant differences exist between American and international Impact Funds, both with regard to their commitment to sustainability and capital allocation. Specifically, this research compares the total assets under management (AUM) with the capital allocated to sustainable investments across firms in the U.S. and international markets. The prevalence of "greenwashing" is measured through the frequency with which the "Magnificent Seven" - Amazon, Apple, Alphabet, Tesla, Meta, NVIDIA, Microsoft - are included within a fund's portfolio. These seven companies control about one-third of the total U.S. stock market and fall well below United Nations Sustainable Development Goal (SDG) standards due to environmental pollution and social inequality. We aim to challenge that their widespread inclusion in Impact Funds is mostly used to drive fund performance, rather than to support ESG standards. By incorporating performance metrics and portfolio analysis, this research seeks to evaluate whether meaningful differences exist between U.S. and international Impact Funds in terms of sustainability commitment and alignment with stated investment objectives. These findings aim to contribute to the discussion of both policy standardization and sustainable capital allocation in the financial industry.

WORK DESIGN FOR AI AGENTS
Presenter(s): Dhruv Kekin Toprani
Category: Business and Entrepreneurship
Mentor(s): Cory Eisenhard (Eli Broad College of Business)

Recent advances in large language models (LLMs) have significantly expanded the range of tasks that artificial intelligence agents can perform. However, even highly capable models often struggle to execute complex tasks reliably when operating in dynamic environments. One emerging explanation is that many work contexts are implicitly designed for human workers rather than for AI agents. As a result, AI performance may depend not only on model capability but also on whether agents are equipped with tools and system structures specifically designed to support their decision making and action processes. This study examines how different classes of language models perform across varying task conditions and levels of tool support. We embed both reasoning oriented models and standard LLMs as autonomous agents in an interactive maze environment that requires sequential decision making under partial information. The environment systematically varies key task parameters including problem complexity, information availability, and environmental constraints. In certain conditions, agents are provided with tools designed specifically for AI agents, such as structured path planning utilities that help the model track explored space and avoid inefficient search behavior. Agent performance is evaluated using objective metrics including number of actions taken, API calls, token consumption, and task completion time. By comparing reasoning enabled models and standard LLMs across these experimental conditions, we assess how reasoning capabilities interact with tool availability to influence efficiency and task success. Our results highlight the importance of designing tools and socio technical systems that allow AI agents to leverage capabilities effectively.

SUSTAINABLE STOCK INVESTMENT IN GLOBAL HEALTHCARE: RISK, RETURN, AND SUSTAINABILITY INTEGRATION ACROSS INTERNATIONAL MARKETS
Presenter(s): Minh Nguyen, Nighinn Malherbe, Sean Paul Ssemakula
Category: Business and Entrepreneurship
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Bianca Frost (University of Pretoria)

This research examines sustainable stock investment within the healthcare sector, focusing on companies aligned with United Nations Sustainable Development Goal 3 (Good Health and Well-being). Rather than sustainable finance broadly, the study centers on stock investment based on both financial performance and sustainability criteria. The research is relevant because investors must balance risk and return when integrating sustainability factors into investment decisions. As global healthcare demand continues to grow, understanding how sustainability-aligned healthcare companies perform financially is critical for long-term value creation. The study is conducted by constructing and analyzing an actively managed stock portfolio comprising 10 healthcare companies across the United States, Europe, and Japan. Financial analysis includes cumulative returns and reward-to-risk ratios, while sustainability analysis evaluates corporate governance, product safety, healthcare access, and reputational factors. A

COIL (Collaborative Online International Learning) collaboration with Japanese and European researchers adds international perspectives, improving company selection and strengthening the portfolio's risk diversification. We use Stocktrak to track each company's market performance, place trades, and measure the risk-adjusted performance over time. We also use the S&P-500 Health Care Index, which is made up of 60 largest healthcare companies in the USA, as a benchmark. The research anticipates that international diversification enhances portfolio resilience and that companies with strong sustainability performance and reputations can deliver competitive, risk-adjusted returns. Overall, the findings are expected to indicate that incorporating sustainability factors into financial analysis supports a more balanced healthcare investment strategy with improved long-term stability.

DOES THE STOCK MARKET VALUE GENDER EQUALITY
Presenter(s): Abhijna Akkineni, Anda Brie, Josh Zietsman, Sophie Conway
Category: Business and Entrepreneurship
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Bianca Frost (University of Pretoria)

Our research focuses on how the stock market interacts with companies to show external and internal action on SDG 5 - Gender Equality, SDG 9 - Industry, Innovation, and Infrastructure, and SDG 13 - Climate Action. It is important to recognize companies that strive to improve the world by supporting gender equality, improving infrastructure, and taking action to protect the climate. Tracking these companies' data allows investors to see how a company's support of sustainable development goals affects profit numbers in the stock market. It is important to highlight the positive trends between companies that work to promote SDGs and their monetary profits because this will draw more investors to these companies that show success. This is beneficial to society because rewarding companies that have more ethical practices will be more likely to make future companies also support SDGs and will therefore have a positive effect on the community as a whole. We collected stock data to calculate and analyze reward to risk ratios and cumulative returns. For many investors, investments are made based on current events and companies' prospective growth on the market. Our diverse portfolio will show investors that stock market investments can align with current market trends while keeping strong sustainable intentions.

IS IT FEASIBLE TO GET RICH AND BE ENVIRONMENTALLY SMART?
Presenter(s): Felix Atkins, Iyapha Somfongo, Jeffrey Chan, Osmond Chou
Category: Business and Entrepreneurship
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Bianca Frost (University of Pretoria)

We built a portfolio that balances a fair risk to reward ratio by investing in companies with strong SDG 15 qualities. SDG 15- Life on Land, is a United Nations Sustainable Development Goal focused on protecting, restoring, and promoting sustainable use of land. Growing wealth passively, especially through company stocks, is very important. What many stock investors do not realize is that by investing in stocks, they are gaining some ownership in the company, thereby giving them some power/right in the company's internal and external decisions to support SDG 15. We used key analytical tools to financially assess different companies' performance on the stock market using historical data. These include tools like

Yahoo Finance to grab historical prices of companies, AI research tools to find companies that have strong environmentally sustainable practices and StockTrak to create a simulated portfolio to monitor our proposed portfolio. As a comparison benchmark, we chose a professionally managed fund that operates internationally. We expect most of these companies to outperform or do similarly to the chosen benchmark . We have developed a portfolio of 15 companies with global reach that has shown continued performance while exemplifying our environmental values.

ETHICS VS. EARNINGS: STOCK MARKET PERFORMANCE OF SDG-ALIGNED PORTFOLIOS AGAINST GLOBAL INDEX
Presenter(s): Allison Tran, Ivanka Tasevski, Mbalenhle Makena, Toby Waterman
Category: Business and Entrepreneurship
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Bianca Frost (University of Pretoria)

We investigate sustainable stock investment by using UN Sustainable Development Goal #8, Decent Work and Economic Growth, to create a stock portfolio, and then compare the earnings to another SDG-oriented, professional portfolio, as well as the S&P Global 1200, a large, traditional, international portfolio. To conduct our research, we are measuring our portfolio's growth on Stock Trak, pulling close values for our comparison indices from Yahoo Finance, and modeling the compiled data using Excel. We are also collaborating with researchers from universities in Japan and South Africa to bring global perspectives to our work. This research is important because it helps American investors evaluate whether global sustainable portfolios can deliver competitive returns while maintaining a reasonable reward-to-risk balance. By comparing our portfolio, which is specifically centered on SDG 8, against a sustainability-focused ETF and a global index, this study evaluates differences in return, volatility, and overall portfolio stability. Rather than prioritizing high short-term gains, our research emphasizes long-term, stable growth. We project sustainability to continue to be favored by public sentiment, delivering risk-adjusted returns. Due to our diversification and international exposure, we project our portfolio to exhibit lower volatility and smaller drawdowns relative to our benchmark indexes, resulting in higher risk-adjusted performance in the long term. Although sustainable investments are vulnerable to shifts in regulation and changing investor sentiment, our focus on SDG 8's safe work environment and economic stability will hopefully mitigate downside risk in times of market uncertainty.

SUSTAINABLE STOCK INVESTMENT FOR SUSTAINABLE CITIES AND COMMUNITIES
Presenter(s): Gunnar Stephan, Owen Sylvester, Simbavashe Jaja
Category: Business and Entrepreneurship
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Bianca Frost (University of Pretoria)

Our research is about creating a stock portfolio exclusively featuring companies that align with Sustainable Development Goal 11, Sustainable Cities and Communities. We have collaborated with a Japanese student to diversify our research, along with the companies featured in our portfolio. In the end, we created an investment portfolio, dividing up $1,000,000 unequally among the companies. By 2050, an estimated 7 out of 10 people will live in an urban setting. Additionally, they will contribute over

80% of the global GDP. Currently, 92% of Japanese citizens live in an urban area. SDG 11 helps sustain modern-day living without global climate harm. Marriott is reducing environmental impact in urban areas through sustainable building design. Furthermore, Republic Services is reducing emissions through innovative waste management. We have conducted our research using StockTrak, Yahoo Finance, ChatGPT, and Excel. ChatGPT helped find companies that aligned with our goal. Furthermore, we analyzed all of our companies to ensure that they are not only a sustainable investment but are also devoted to promoting sustainable development. Using Excel, we calculated the reward-to-risk ratio and the cumulative return since the portfolio's inception date by comparing it to our benchmark, a professionally managed portfolio that specializes in smart city infrastructure. We expect to prove that investment via sustainable cities and communities is a relevant and profitable investment strategy. Additionally, to make our research as understandable as possible with the help of South African Students. Furthermore, we expect our portfolio's return on the day of UURAF to exceed our benchmark.

SUSTAINABLE GLOBAL INVESTMENT: HOW SDGS MAKE PROFIT AND MITIGATE RISK
Presenter(s): Catarina McGuire, Fischer Datesman, Molly Ginther, PK Shozi
Category: Business and Entrepreneurship
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Bianca Frost (University of Pretoria)

Our research examines international sustainable investments and how an effective portfolio can be constructed. In collaboration with European and Asian researchers, we developed a diversified portfolio and applied both qualitative and quantitative measures to create informed investment and portfolio development recommendations. Our research is significant because it could support investment in companies that advance affordable and clean energy, sustainable cities and communities, and responsible consumption and production, corresponding to the United Nations' Sustainable Development Goals (SDGs) 7, 11, and 12. We used ESG (Environmental, Social, and Governance) analysis to select seven companies based on sustainability performance and long-term value creation, resulting in a profitable, sustainable portfolio aligned with our selected SDGs. Then, we used Excel to compile and analyze historical stock market data for a total of seven selected companies, sourced from Yahoo Finance. We collaborated with international researchers through a Collaborative Online International Learning (COIL) project to develop a portfolio that values our selected three SDGs, thus creating a sustainable and global investment strategy. We then used StockTrak to simulate investments within our portfolio and Excel to monitor company performance in comparison to an established U.S. based environmentally conscious portfolio. Through our research, we aim to create a diverse investment portfolio, with an emphasis on sustainability. We expect our portfolio to deliver reasonable risk-adjusted returns, as the companies were purposely selected for their commitment to achieving sustainability goals alongside their long-term financial performance.

CLEAN ENERGY ECONOMICS: CLEAN ENERGY PORTFOLIO VERSUS TRADITIONAL ENERGY MARKET
Presenter(s): Elliana Ramer, Jaelynn Prior, Kennedy Davis, Valenteen Polus
Category: Business and Entrepreneurship
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Bianca Frost (University of Pretoria)

Our research involves international collaboration, sustainable finance, and clean energy. We collaborated with researchers in Norway and Japan to create an investment portfolio of companies whose work aligns with Sustainable Development Goals (SDGs) number 7: Affordable and Clean Energy, and 13: Climate Action. Our research is important because it explores the opportunity for investing to be a tool, not just for economic growth, but for social and environmental change. Our international collaboration showed us that generally American stock investors prioritize the monetary value of companies, whereas European's also consider their qualitative values, such as their commitment to SDGs. Our portfolio focuses on SDGs 7 & 13, because transitioning to clean energy and acting against climate change is necessary to maintain the energy-rich lifestyle we are accustomed to in America. We conducted research by finding energy companies, tracking their stock performance, and considering their commitment to SDGs 7 & 13. We monitored the company's performance by pulling data from Yahoo Finance and compiling it into Excel. Using this, we calculated their cumulative returns and reward-to-risk ratios. Our European collaborators provided us with qualitative data, which, combined with our reward-to-risk ratios, helped finalize which companies would align with our portfolio goals. Our portfolio's performance will be compared to a large, professionally managed portfolio invested exclusively in the energy sector. We expect that by considering a company's monetary value and commitment to sustainability, American investors will choose to invest in a portfolio that provides positive performance for the investor and the planet.

Cell Biology, Genetics, & Genomics

IDENTIFYING GENETIC MARKERS FOR SEX DETERMINATION IN THE SPOTTED GAR
Presenter(s): Mars Baas
Category: Cell Biology, Genetics and Genomics
Mentor(s): Ingo Braasch (College of Natural Science)

There are multiple modes of sex determination that differ among species, including genetic sex determination (GSD). Within GSD, sex is determined by genetic factors that may involve one or more chromosomes, which can vary in number or size between the sexes. The spotted gar (Lepisosteus oculatus), an emerging model for vertebrate comparative biology, exhibits no observable traits distinguishing sexes, and a genetic mechanism of sex determination has yet to be determined. Recent work by Pinto et al. introduced the Sex Chromosome Identification by Negating Kmer Densities (SCINKD) method to identify putative sex chromosomes in vertebrate genomes. SCINKD has been applied to our new spotted gar genome assembly from a male individual by analyzing haplotype differences (sets of allele variations). Using this approach, chromosomes 14 and 18 were identified as potential sex chromosomes due to differences in haplotype length and higher levels of repeat content compared to other chromosomes. Our analyses thus reveal a putative dual X1/Y1 (chr14) X2/Y2 (chr18) male sex

determination mechanism in spotted gar. To validate these findings, Polymerase Chain Reaction (PCR) assays have been developed to amplify and compare regions of the identified chromosomes between sexes. Because exploration of these specific genomic regions is novel, effective primers have not yet been established. Our ongoing research focuses on testing a set of 24 candidate primer sets to determine their amplification success, optimal annealing temperatures, and sex specificity. Validation of these primer sets will enable the first experimental confirmation of the genetic basis of sex determination in spotted gar.

SEXUAL DIMORPHISM IN COLON AND RECTAL CANCER CELLS RESPONSE TO NANOPARTICLES AND CHEMOTHERAPY
Presenter(s): Sarah Krikor
Category: Cell Biology, Genetics and Genomics
Mentor(s): Morteza Mahmoudi (College of Human Medicine)

Despite nanomedicines' promise in cancer therapy, their clinical translation remains hindered by a lack of understanding of their mechanisms, particularly how biological sex influences drug efficacy and toxicity. Here, we systematically investigate sex-specific differences in colorectal cancer (CRC) cell biophysics, metabolism, and response to nanoparticles (NPs) and oxaliplatin. Utilizing 2D and 3D models of male and female CRC cells, we uncovered profound sexual dimorphism. Female cells exhibited distinctive lipid droplet morphologies, often non-spherical and located near the plasma membrane, as well as fragmented mitochondrial networks, suggesting a unique metabolic adaptation. Conversely, male cells displayed larger, more spherical lipid droplets and fused mitochondria. Atomic force microscopy revealed female CRC cells to be significantly stiffer than male cells. As a consequence, male rectal cells showed significantly higher uptake of NP in 3D bioprinted constructs, and notably, female cells were intrinsically more resistant to oxaliplatin. Molecular analysis of PRUNE2 and PLIN2 mRNA expression further demonstrated sex-dependent baseline levels and divergent dynamic transcriptional responses to oxaliplatin treatment. Based on our findings, we can design sex-informed nanomedicine strategies and optimise personalised cancer treatments by taking advantage of biological sex's fundamental modulation of cancer cell biophysics, metabolic programming, and chemosensitivity.

SPATIAL EXPRESSION OF TBX18, TBX3A, AND TBX3B IN ZEBRAFISH USING HYBRIDIZATION CHAIN REACTION.
Presenter(s): Treyton Grigg
Category: Cell Biology, Genetics and Genomics
Mentor(s): Tony Zhou (College of Natural Science)

The T-Box transcription factor family plays a crucial role in embryonic development of the limbs, heart, and other tissues. A common biomedical model species, zebrafish (Danio Rerio), shares about 70% of its genes with humans, including the T-Box transcription factor family. The zebrafish genome has undergone a whole-genome duplication event, leading to two copies of tbx3 (a,b), but only one copy of tbx18. Tbx18 is involved in fin expression, especially in the median fin, and previous unpublished studies from

the Braasch Lab indicate that tbx3 and tbx18 have complementary expression patterns. In this study, we analyzed three T-Box genes, tbx18, tbx3a, and tbx3b in zebrafish embryos using Hybridized Chain Reaction, or HCR, to compare spatial expression between the three genes, mostly in regions of developing fins. HCR amplifies weak signals better than traditional in-situ hybridization, allowing more definitive results of gene expression location. Comparing the expression of closely related T-Box genes allows for the identification of shared and divergent roles in tissue expression during development. Zebrafish samples were analyzed at 2, 3, and 6 dpf, allowing us to confirm previous results at 3 dpf and to analyze a new timepoint after 6 days of development. This allowed us to track the expression of the T-Box genes through the progressing stages of development. Gene expression overlapped in some areas, while others showed distinct regions of gene-specific localization. Understanding these expression patterns leads to a broader knowledge of complex conserved genetic pathways that can show conserved expression and function between genes.

STUDYING THE EFFECTS OF GRANISETRON ON HUMAN HEART DEVELOPMENT
Presenter(s): Camryn Sparschu
Category: Cell Biology, Genetics and Genomics
Mentor(s): Colin Ohern (College of Osteopathic Medicine)

Gestational nausea is the most common complication of pregnancy in the first trimester, affecting approximately 90% of all pregnancies. Typically, severe gestational nausea is treated with antiemetics, most notably ondansetron. However, epidemiological studies have found a higher prevalence of congenital heart defects (CHDs) in newborns whose mothers took ondansetron during pregnancy. Granisetron is an antiemetic of the same drug class as ondansetron, but rigorous epidemiological studies have yet to show an association with CHDs in newborns. Five years ago, the Aguirre lab pioneered one of the first human pluripotent stem cell-derived heart organoids (hHOs) that feature relevant heart cell populations (e.g., atrial and ventricular cardiomyocytes), chambers, and rhythmic beating with measurable electrophysiology, modeling the developing heart. In a follow-up study, these hHOs were subjected to metabolic maturation with simultaneous, increasing doses of ondansetron, finding elongated action potential durations in cardiomyocytes and suppressed expression of myosin light chain 2 (MYL2), a marker for ventricular cardiomyocyte maturation. In this current study, using a parallel experimental set-up, we hypothesized that increasing doses of granisetron in hHO culture medium would lead to electrophysiologic and gene expression changes. We used electrophysiological optical mapping, real-time quantitative polymerase chain reaction, immunofluorescence confocal microscopy, and brightfield live-imaging. Overall, no significant electrophysiologic changes, reductions of MYL2 expression, or altered function were found between control hHOs (no granisetron exposure) compared to granisetron-exposed hHOs. This data suggests granisetron is a safer alternative to treating gestational nausea compared to ondansetron. Future epidemiological studies should investigate the validity of these findings in patients.

OPTIMIZATION AND VISUALIZATION OF THE INDUCTION OF PROPHAGES IN PSEUDOMONAS SYRINGAE USING TRANSMISSION ELECTRON MICROSCOPY
Presenter(s): Laely Bishop
Category: Cell Biology, Genetics and Genomics
Mentor(s): Daniel Maddock (College of Agriculture & Natural Resources), Michelle Hulin (College of Agriculture & Natural Resources)

Pseudomonas amygdali pv. morsprunorum (Pam) is a plant pathogenic bacteria that causes bacterial canker on cherry trees and is a part of the P. syringae species complex. Within the P. syringae genome, are integrated bacteriophage viruses called prophages can increase the pathogenicity of the bacteria. Pam strain S11 has three putative prophages, including one shown to increase pathogenicity. We hypothesize that these prophages can be induced to form virus particles which can be visualized using transmission electron microscopy (TEM).Once induced then visualized, it can be determined which phage is present. The induction and imaging of phages involves inducing with an antibiotic mitomycin C, cell lysis, and precipitating particles all under various conditions to preserve the phages once induced, then using TEM to image the phages. By optimizing this process, the ideal conditions for each step have been identified and shown to be efficient. Having a repeatable and refined protocol can also help visualize other phages in the P. syringae complex in the future. Research on phages is important to understand the pathogenicity and evolution of bacteria, and may inform future research and strategies to help the management and prevention of bacterial canker on Prunus spp.

SHIGELLA FLEXNERI TRANSPOSON MUTAGENESIS LIBRARY
Presenter(s): Madelynn Frendo
Category: Cell Biology, Genetics and Genomics
Mentor(s): Kristin Parent (College of Natural Science), Megan Cross (Research & Innovation)

As multidrug-resistant bacterial strains are on the rise, the risk of contracting untreatable diseases increases. One of the strains this is present in is Shigella flexneri, a facultative anaerobic Gram-negative bacilli bacterium. Shigella is a human pathogen that is the leading cause of shigellosis, a waterborne and foodborne illness that inhabits the human intestinal tract (1). This is transmitted through humans and food via the fecal-oral route. Foodborne outbreaks often occur when consuming foods that have little exposure to thermal treatment, are processed by hand, or raw foods. Shigellosis is the bacterial invasion of the human gut epithelium, resulting in fever, abdominal pain, and bloody diarrhea, which primarily infects children (2). Increased rates of antibiotic resistance have led to the lack of an effective treatment and have pushed research to find alternative treatment methods, specifically in phage therapy (3). To identify ways to increase the effectiveness of phage treatment, the generation of a transposon library was generated in Shigella flexneri to identify genes associated with phage infection. Using an inducible transposon that selects for kanamycin resistance, insertions will occur in random genes, creating mutant colonies. The colonies will be sequenced to determine where the transposon is inserted and treated with bacteriophage. Mutant colonies can have no effect on phage infection, increase phage infection, or decrease phage infection. Based on these results, genes can be determined and selected to increase the effectiveness of phage therapies and provide advancements in treatment for shigellosis.

SALINITY AND ACIDITY TOLERANCE OF GEOBACILLUS STEAROTHERMOPHILUS
Presenter(s): Laurence Newmeyer
Category: Cell Biology, Genetics and Genomics
Mentor(s): Heather Miller (College of Natural Science)

Geobacillus stearothermophilus is a Gram-positive, spore-forming, thermophilic bacterium, recognized for its use in testing autoclaves and related cycle parameters to ensure proper sterilization of biological contaminants. However, this bacterium's resistance to or tolerance of extreme salinity and acidity, which are often found in various food products, is poorly understood. Understanding G. stearothermophilus's tolerance of high salt and low pH environments should be investigated to ensure effective food safety protocols are implemented. We will test this bacterium's tolerance of salinity and pH together and separately using a checkerboard assay to determine the copy number of key genes under different conditions. One of the genes we will be testing is sigB, a master stress response gene. We will also evaluate an analogue of an osmoprotectant gene, opuC, and an analogue of a sodium-proton antiporter gene, mnhA. We hypothesize that there will be low copy numbers of the mnhA and opuC analogues, as well as sigB, making the bacteria sensitive to these conditions in tandem. The outcomes of this research will help characterize the boundaries of G. stearothermophilus's salinity and acidity resistance, which will better inform food safety decisions involving acidic and salty foods.

MOLECULAR CONTROL OF CYTOSKELETAL FLOW AND NEURITE OUTGROWTH.
Presenter(s): Chloe Murray, Lorenzo Thrasher, Maya Viers
Category: Cell Biology, Genetics and Genomics
Mentor(s): Kyle Miller (College of Natural Science)

The elongation of neuronal extensions requires the transport of materials, mainly made in the cell body, to growth cones. In various types of neurons, including chick sensory, Aplysia Bag Cell, and Drosophila motor neurons, materials in the axon shaft, including MTs and docked organelles, flow forward in bulk during outgrowth. Paradoxically, a recent report suggests that during the initial outgrowth of cortical neurons, MTs in the neurite shaft flow toward the cell body. To determine if this retrograde motion involves the sliding of MTs down a stationary cortical actin/spectrin meshwork or bulk flow of all components, we examined the motion of docked mitochondria, ER, actin filaments, and beads bound to the outside of the neurite. In all cases, these moved backward to the neuronal cell body at roughly the same velocity suggesting bulk retrograde flow occurs along the neurites during their initial outgrowth. To investigate the mechanism, we tested and confirmed that the predictions of the clutch hypothesis apply to cortical neurons. Further, we investigated the mechanism behind how CNS neurons elongate by measuring patterns of actin flow by inhibiting the Rac and Rocks signaling pathways, actin assembly, and vesicular transport of Golgi-derived vesicles. These experiments suggest that bulk retrograde flow and axonal elongation are coupled through signaling pathways that modulate actin dynamics.

EFFECTS OF ELEVATED TEMPERATURE ON FRUIT RIPENING IN SOLANUM LYCOPERSICUM L.
Presenter(s): Lisett Becerra
Category: Cell Biology, Genetics and Genomics
Mentor(s): Melissa Lehti-Shiu (College of Natural Science)

Rising average temperatures caused by climate change have decreased agricultural productivity. In Michigan, many growers have observed tomato cultivars delayed in ripening until early fall, potentially due to increasing summer temperatures. Studies have implicated changes in gene expression as mechanisms behind tomato ripening inhibition, but a definitive cause has yet to be determined. The purpose of this study is to test the hypothesis that tomato ripening is inhibited because ripening hormone genes are not expressed under heat stress. To investigate this hypothesis, I will grow Roma tomatoes and Phoenix tomatoes, the latter being thermotolerant, under different temperature conditions. The experiment will be conducted by acclimating the cultivars in a 25C growth chamber until fruit set, then half of each species will be transferred to a 32C growth chamber. Tissue samples from both cultivars will be collected before and after the transfer, and Reverse Transcriptase Polymerase Chain Reaction will be performed to measure gene expression in these tissues. I expect that the Roma tomatoes, in both conditions, will show reduced expression of hormone-related genes compared to the more heat tolerant Phoenix tomatoes. Finding a correlation between hormone-related gene expression and heat stress in tomatoes is the starting point to determine if silencing of hormone-related genes contributes to the delay in ripening. The next step would be to compare ripening in hormone gene knockout lines (generated using CRISPR-Cas9) and overexpression lines. Researching tomato ripening inhibition could result in a genetically modified line that can ripen under high temperatures and increase crop yield.

UNCOVERING THE ACID-SENSING MECHANISM: GPR68 REGULATION OF BREAST CANCER PH DYNAMICS
Presenter(s): Joey Norton
Category: Cell Biology, Genetics and Genomics
Mentor(s): Charles Williams (College of Human Medicine)

Extracellular acidification is a hallmark of cancer that modifies the tumor microenvironment, enabling malignancy and immune evasion. In the 1920s, Warburg characterized extracellular acidity in tumors as a consequence of high-rate aerobic glycolysis, where cancer cells ferment glucose into lactic acid even in the presence of oxygen. This phenomenon is evident in aggressive breast cancer subtypes, such as MDAMB231, which show greater Warburg-like behavior. However, the molecular pathways linking acidity to malignant behavior in breast cancer remain poorly understood. The proton-sensing GPCR GPR68 may mediate acid signaling that promotes breast cancer invasiveness. GPR68 is upregulated in aggressive breast cancer as breast cancer progresses toward malignancy, suggesting a mechanistic link worth investigating. To determine whether GPR68 responds to extracellular acidification in breast cancer to promote malignancy, we investigated whether modulating GPR68 activity affects pH dynamics.

Breast cancer cell lines and immortalized non-cancer controls were transfected with pHLourin2, a modified GFP variant that enables detection of pH changes, and then sorted by flow cytometry. GPR68 was inhibited by ogremorphin and activated by ogerin, and changes in extracellular pH were detected through fluorescence imaging of pHLourin2. By comparing pH dynamics under GPR68 activation and inhibition, we expect that inhibiting GPR68 will either acidify or basify the tumor microenvironment. Ultimately, establishing that GPR68 activity is involved in extracellular acidosis signaling provides a novel therapeutic opportunity to prevent breast cancer metastasis.

CONSTRUCTION OF A CRISPR DONOR PLASMID FOR GENOMIC INTEGRATION OF A THERMOSTABLE LUCIFERASE-TAGGED EXTRACELLULAR VESICLE REPORTER CASSETTE

Presenter(s): Nela Travnickova
Category: Cell Biology, Genetics and Genomics
Mentor(s): Masako Harada (College of Engineering)

Extracellular vesicles (EVs) are tiny, membrane-enclosed particles produced by cells, which aid in cell communication by carrying proteins, lipids, and nucleic acids between cells. The protein marker CD63, part of the tetraspanin family, is commonly found on EV membranes and is often used to identify them. ThermoLuc is a heat-resistant luciferase that produces a luminescent signal for highly sensitive detection of biological events. When fused with CD63, ThermoLuc enables real-time, quantitative observation of EV creation, release, and absorption in living cells. The objective of this project aimed to create the recombinant plasmid pDNR-EF1α-ThermoLuc-CD63 by replacing the ML39-C1C2 sequence in the pDNR_AAVS1-EF1α-ML39-C1C2 backbone with the ThermoLuc-CD63 insert. The backbone plasmid was cut with SalI and MluI restriction enzymes, while the ThermoLuc-CD63 fragment was PCR-amplified from the pcS-ThermoLuc-CD63 plasmid. The purified backbone and insert were assembled through SLiCE recombination and then transformed into competent Escherichia coli cells. Recombinant plasmids were identified via colony PCR and agarose gel electrophoresis, followed by plasmid purification and sequencing. First, the backbone plasmid was cut with the SalI and MluI enzymes, which linearize it and produce compatible ends for inserting the gene of interest and removing the unnecessary ML39-C1C2 sequence. Secondly, the plasmid pcS-ThermoLuc-CD63, carrying the gene of interest, was amplified from the EF1a promoter to ThermoLuc CD63 by PCR using forward and reverse primers, then purified to obtain a clean insert. The backbone and insert were joined using SLiCE, a ligase-free recombination technique that facilitates homologous recombination between DNA fragments with overlapping sequences. The assembled plasmid was introduced into competent Escherichia coli cells and plated on selective media. Three colonies were selected and analyzed by colony PCR and agarose gel electrophoresis to verify that the competent cells had taken up the DNA construct. Colonies containing the recombinant plasmid were cultured, and the plasmid DNA was purified via miniprep for further analysis using a nanodrop. Sequencing confirmed the successful assembly of the 11.2 kb pDNR-EF1α-ThermoLuc-CD63 plasmid without any nucleotide mismatches. This validated construct offers a luminescent reporter system to label extracellular vesicles, allowing real-time tracking of EV formation and movement in living cells. It also supports future research on EV biology and the engineering of therapeutic extracellular vesicles.

TRANSCRIPTOMIC ANALYSIS OF SICKLE CELL DISEASE REVEALS GENE EXPRESSION SIGNATURES AND DISEASE MECHANISMS
Presenter(s): Sunidhi Shintre
Category: Cell Biology, Genetics and Genomics
Mentor(s): George Mias (College of Natural Science)

Advancements in genomics and bioinformatics are transforming our understanding of complex diseases through large-scale omics data analysis. By integrating transcriptomic and proteomic profiling, researchers can assess gene expression changes linked to disease onset and progression. Machine learning (ML) identifies patterns in high-dimensional datasets, enabling discovery of gene sets associated with disease and potential regulatory processes. We apply statistical and ML-based analyses to large gene expression datasets from public repositories to identify differentially expressed genes and categorize disease-related phenotypes. We are investigating gene expression changes in sickle cell disease (SCD). SCD is caused by a missense mutation (Glu6Val) in the HBB gene, which encodes the β-chain of hemoglobin. This mutation promotes hemoglobin S polymerization, leading to red blood cell sickling, impaired microvascular flow, pain, and other complications. We are curating datasets from Gene Expression Omnibus (GEO), consisting of RNA-seq data from patient samples with SCD and controls, selected for availability of key metadata. RNA-seq data will be processed to obtain normalized gene expression levels, and differentially expressed genes will be identified while accounting for age, sex, and other confounders supported by the curated metadata. Pathway and gene enrichment analyses will associate dysregulated genes with biological functions and disease-related pathways. We expect to identify gene signatures in SCD that may serve as biomarkers and potential therapeutic targets. Additionally, we aim to develop an ML-based classifier to predict disease severity and clinical phenotypes, offering insights for precision medicine applications in SCD. Findings will be validated across cohorts and shared openly with the community.

EVALUATING OGREMORPHIN AS A FERROPTOSIS-INDUCING AGENT IN AMELANOTIC MELANOMA C32 CELLS
Presenter(s): Deniz Oeztuerk
Category: Cell Biology, Genetics and Genomics
Mentor(s): Leif Neitzel (College of Human Medicine)

Cutaneous melanoma is the most lethal form of skin cancer, with over 104,000 new invasive cases projected in the United States in 2025 and rising incidence worldwide. Despite significant advances in immunotherapy and targeted therapies, drug resistance and disease recurrence remain major clinical challenges, and effective treatment options for resistant melanoma are urgently needed. Ferroptosis, an iron-dependent form of regulated cell death driven by lipid peroxidation, has recently emerged as a promising anticancer approach, particularly against therapy-resistant cancers. Ogremorphin (OGM), a small-molecule inhibitor of GPR68, an acid-sensing G protein-coupled receptor activated within the acidic tumor microenvironment, was previously shown to selectively induce ferroptosis via the ATF4/CHAC1 pathway in glioblastoma and, more recently, in lung and pancreatic cancer cells. Notably, GPR68 is expressed in various skin cancers, and Gpr68-knockout mice exhibit reduced melanoma

metastasis, suggesting GPR68 as a viable therapeutic target in melanoma. As a topically accessible malignancy, melanoma offers a clinically attractive context for OGM-based therapy, potentially circumventing challenges of systemic drug delivery and degradation by blood-borne enzymes that complicate treatment of deeper tumors such as glioblastoma. This study investigates the anticancer effects of OGM compared to the established ferroptosis inducer erastin in the amelanotic melanoma cell line C32. Using cell viability assays, glutathione quantification, and gene expression analysis, we aim to characterize OGM's potency and mechanism in melanoma cells, potentially expanding OGM's therapeutic application beyond glioblastoma to include cutaneous malignancies.

VISUALIZING PIEZO1-MEDIATED CALCIUM DYNAMICS IN PERIVASCULAR ADIPOSE TISSUE (PVAT) USING GENEPI FLUORESCENT REPORTERS
Presenter(s): Kyle Wolf
Category: Cell Biology, Genetics and Genomics
Mentor(s): Aitor Aguirre (College of Engineering)

This research involves the transfection of GenEpi, a green fluorescent marker designed to visualize calcium influx through Piezo1-mediated mechanically gated ion channels within perivascular adipose tissue (PVAT). By utilizing this genetic sensor, the study aims to monitor real-time mechanosensitive signaling across both in vitro organoid and in vivo mouse models. The overarching goal is to investigate how PVAT cells sense and respond to the mechanical stress generated by surrounding cardiac processes, providing a clearer understanding of the physiological pressures these cells experience in humans. Through this dual-model approach, the study seeks to elucidate the relationship between mechanical force and cellular calcium signaling, clarifying how the physical environment of the heart influences PVAT function and stress response.

ENGINEERING LISTERIA MONOCYTOGENES AS A STING ACTIVATOR FOR ANTI-CANCER IMMUNOTHERAPY
Presenter(s): Hannah Jabiro
Category: Cell Biology, Genetics and Genomics
Mentor(s): Christopher Contag (College of Engineering), Satyajit Hari Kulkarni (College of Human Medicine)

Macrophages and dendritic cells are innate immune cells that are central regulators of inflammation, tissue repair, and antitumor immunity. Building on prior work in the Contag lab developing intracellular bacteria as "quasiorganelles" to change the tumor microenvironment, this project advances engineered Listeria monocytogenes as a platform for cancer immunotherapy by reprogramming signaling pathways within tumor associated macrophages (TAMs). Specifically, this study focuses on enhancing delivery of cyclic di-nucleotides (CDNs) to activate the STING pathway and drive type I interferon-mediated antitumor responses. CDNs such as cyclic di-adenosine monophosphate (c-di-AMP) function as bacterial second messengers capable of stimulating STING, a key cytosolic nucleic acid-sensing pathway that links innate and adaptive immunity. Although Listeria naturally produces CDNs, attenuated strains used for

therapeutic applications do not generate sufficient levels to activate STING in tumors. To address this problem, we engineered Listeria monocytogenes to increase c-di-AMP production and secretion by overexpressing dacA, mdrT, and mdrM genes involved in CDN synthesis and export. The method includes molecular cloning, plasmid construction, bacterial transformation, and verification of engineered strains, followed by co-culture assays to evaluate intracellular CDN delivery and STING activation using Western blotting. This platform uses quasiorganelles-based immunomodulation to precisely activate innate immune pathways, advancing next-generation cancer immunotherapy.?generation cancer immunotherapy.

GENOMIC ARCHITECTURE OF RESILIENCE: EVALUATING GENE CONTENT VARIATION IN DROUGHT-RESPONSIVE LOCI OF CAMELINA SATIVA
Presenter(s): Alina Kendra, Ava Hasson, Bella Nole, Cole Novak, Ellery Gnesin, Sean Burk
Category: Cell Biology, Genetics and Genomics
Mentor(s): Patrick Edger (College of Agriculture & Natural Resources)

Recent evidence suggests that structural variation, including Presence-Absence Variation (PAV) and Copy Number Variation (CNV), plays a critical role in environmental adaptation in polyploids. In this study, we investigated the genomic landscape of drought-responsive genes across multiple Camelina cultivars to determine how gene content variation influences stress tolerance. By leveraging high-quality pangenome resources, we identified significant variation in the dosage of key orthologous groups involved in abiotic stress signaling. Our analysis reveals that cultivars with higher drought tolerance harbor unique genes and expanded gene families associated with stomatal regulation and ROS scavenging. This comparative genomic framework highlights the importance of structural diversity in shaping the Camelina phenome and offers a toolkit for marker-assisted selection in breeding programs.

ASSESSING H3K9 DEMETHYLATION IN 50% EPIBOLY ZEBRAFISH EMBRYOS AFTER MRNA INJECTIONS CODING FOR KDM4B.
Presenter(s): Victoria Grieve
Category: Cell Biology, Genetics and Genomics
Mentor(s): import-no first name Cibelli (College of Agriculture & Natural Resources)

Somatic Cell Nuclear Transfer (SCNT) entails placing the nucleus of a somatic cell into an enucleated oocyte. The goal is for the embryo to develop using the genetic material of the somatic nucleus, making it a clone of that individual. A possible cause of the low success rate is the presence of methylated Histone 4 at Lysine 9. As a consequence, genes that need to be expressed in early embryos are silent. We call these recalcitrant regions of the chromatin, reprogramming-resistant regions (RRRs). These areas hinder the development of clones but are necessary for normal cell function as tissues differentiate. Kdm4b is an enzyme in Zebrafish that removes methyl groups from H3K9, allowing RRRs to be reprogrammed when the enzyme is at a high enough concentration. In this experiment, my goal is to measure the level of H3K9me at the 50% epiboly stage when kdm4b mRNA is present. I will do this by injecting Kdm4b mRNA into in vitro fertilized (IVF) zebrafish embryos at the one-cell stage and fixing and

staining them once they reach 50% epiboly. I will stain with specific immunofluorescence antibodies against H3K9me, allowing me to visualize it in the cell and compare it with non-injected control embryos.

ENGINEERING HUMAN VASCULAR-ADIPOSE ASSEMBLOIDS TO ELUCIDATE MECHANISMS OF CARDIOMETABOLIC DYSFUNCTION
Presenter(s): Davis Christy
Category: Cell Biology, Genetics and Genomics
Mentor(s): Aitor Aguirre (College of Engineering), Freyda Mannering (College of Osteopathic Medicine)

Cardiometabolic diseases play a major role in cardiovascular health and affect a large portion of adults in the United States. An area of growing interest in understanding these diseases is the role of local vascular regulators. Perivascular adipose tissue (PVAT), the adipose tissue that surrounds blood vessels, regulates vascular tone and modulates inflammation through the release of adipokines, gaseous and small molecule mediators, lipids and fatty acids, immune-derived mediators/cytokines, and growth factors and morphogens. Further, dysfunctional PVAT has been associated with hypertension, atherosclerosis, obesity, and type II diabetes, among other cardiometabolic diseases. Although PVAT plays a key role in vascular health, its mechanisms are still poorly understood due to limited human models. This project aims to create a human in vitro model of PVAT using human vascular-adipose assembloids (hVAAs) derived from human induced pluripotent stem cells (hiPSCs). In this model, the vascular and adipose organoids are generated separately via exposure to various small molecules and growth factors, and they are later integrated into assembloids. These hVAAs recapitulate structural and functional characteristics of human PVAT tissue. hVAAs will be characterized using molecular and cellular techniques to analyze vascular organization, adipose maturation, and vascular-adipose crosstalk. Our human-based PVAT model will provide a new experimental platform for studying the vascular-adipose interactions underlying PVAT dysfunction in models of cardiometabolic diseases. In addition, this model can be used to improve current cardiometabolic therapeutics and to assess patient-specific responses.

INVESTIGATING A POTENTIAL ROLE OF MFGE8 IN WNT SIGNALING DURING CARDIAC DEVELOPMENT
Presenter(s): Mia Dionise, Sophie-Marie Paetzold
Category: Cell Biology, Genetics and Genomics
Mentor(s): Aitor Aguirre (College of Engineering), Shakhlo Aminova (College of Engineering)

MFGE8 encodes several proteins, one being lactadherin, which is well known for its role in apoptosis. However, its function in human heart development remains unclear. This project investigates the role of MFGE8 in cardiac development, focusing on its potential interaction with the Wnt pathway via integrin signaling, a pathway essential for proper heart formation. Previous experiments have shown that inhibition of integrin signaling alters β-catenin phosphorylation, suggesting a connection between integrin and Wnt signaling. Analyzing single-cell sequencing data from human fetal hearts and human heart organoids, revealed that MFGE8 expression is enriched in epicardial cells, which are known for communication involved in further development of cardiac cell types. We used human induced pluripotent stem cell-derived heart organoids with MFGE8 knockdown to study pathway activity.

Analyzing total β-catenin and phosphorylated β-catenin at Ser552 using western blots, showed altered Wnt activation, suggesting that MFGE8 may regulate β-catenin stabilization through AKT-mediated phosphorylation. Besides, integrin pathway drug inhibition tests were performed on the knockdown as well as control organoids to demonstrate the effects of disruption of the integrin pathway on β-catenin phosphorylation patterns. Functionally, MFGE8 knockdown organoids displayed significant developmental defects, including reduced numbers of major cardiac cell types, impaired action potential and beating behavior. These defects can be attributed to dysregulated Wnt signaling during cardiac development. Overall, if it shows that knockdown of MFGE8 and integrin signaling inhibition have effects on β-catenin phosphorylation, it suggests that the integrin and Wnt pathway are connected through MFGE8, which is an important finding for cardiac development.

PRIMER DESIGN AND PCR AMPLIFICATION ANALYSIS OF KLEBSIELLA PNEUMONIAE
Presenter(s): Nitish Natesan
Category: Cell Biology, Genetics and Genomics
Mentor(s): Brett Etchebarne (College of Osteopathic Medicine), Zenggang Li (College of Osteopathic Medicine)

Klebsiella pneumoniae is a widespread pathogen responsible for a variety of infections, including pneumonia, sepsis, and urinary tract infections. The burden of these infections is even greater in densely populated regions with limited access to quality medical care, such as Sub-Saharan Africa and South Asia. Left untreated, these infections can result in severe, often life-threatening conditions. As such, efficient and accurate detection and analysis of these bacteria are integral to their study and treatment. This present study focused on the testing and selection of various primers targeting a specific Klebsiella pneumoniae sample collected in Africa, followed by polymerase chain reaction (PCR) amplification to assess the specificity and quality of the primers for the bacterium. Primers were obtained from DNA strands that were evaluated for quality using bioinformatics tools and sequencing. PCR design and amplification were performed under standardized conditions, and agarose gel electrophoresis was used to verify and further examine the results. Procedures, equipment details, and results were documented and compiled using computational programs, including Microsoft Excel. The results of this study serve as a basis for further testing and examination of this pathogen, providing a foundation for greater research into its potential treatment.

THE INFLUENCE OF COMMERCIAL SOURCES OF FETAL BOVINE SERUM USED IN CRPMI MEDIA ON MAST CELL DIFFERENTIATION, GROWTH, AND HISTAMINE LEVELS
Presenter(s): Saanvi Sharma
Category: Cell Biology, Genetics and Genomics
Mentor(s): Adam Moeser (College of Veterinary Medicine), Ty Mitchell (College of Veterinary Medicine)

Bone marrow-derived mast cells (BMMCs) are commonly utilized as a model system to investigate the functions of mast cells in health and disease. A critical component of the culture media is Fetal Bovine Serum (FBS), which provides essential nutrients for cell growth. Given the high cost of FBS, which can

vary significantly between commercial sources, understanding the impact of different FBS sources on BMMC culture is important for both cost-efficiency and experimental reproducibility. To address this, we compared the effects of two commercially available FBS sources-one priced at $980 (GibcoTM) and the other at $500 (RMBio)-on BMMC differentiation, growth, and histamine levels. BMMCs from male and female adult C57Bl6 mice were cultured in a complete RPMI media containing either Gibco or RMBio for 5 weeks. An IgE-DNP assay was conducted to evaluate mast cell degranulation and histamine release. Preliminary results indicate that both male and female BMMCs cultured in GibcoTM exhibited higher live cell counts over a 5-week period compared to those cultured in RMBio. No differences were observed in cell size between sexes and FBS treatments. Weekly cytospins were prepared, and mast cell differentiation was confirmed using Toluidine blue staining and flow cytometry. Assessments of mast cell granule mediators levels via histamine ELISA and B-Hexosaminidase assays are currently in progress. Results from this study are expected to demonstrate that the choice of FBS source significantly impacts BMMC growth rates, differentiation rates, and histamine release. These findings are anticipated to underscore the importance of selecting appropriate and consistent FBS sources to ensure cost-effectiveness and reproducibility in future experimental results.

GROWTH AND MATURATION DYNAMICS IN A NOVEL MAST CELL-SPECIFIC ANDROGEN RECEPTOR KNOCKOUT MODEL

Presenter(s): Katherina Mandia
Category: Cell Biology, Genetics and Genomics
Mentor(s): Adam Moeser (College of Veterinary Medicine), Ty Mitchell (College of Veterinary Medicine)

Mast cells (MCs) are innate immune cells distributed throughout tissues and are best known for their pro-inflammatory roles in allergic disease and anaphylaxis. Sex differences in mast cell responses are well documented, with enhanced inflammatory activity reported in females. Sex hormones, particularly testosterone, influence immune function; however, how androgen receptor (AR) signaling shapes mast cell biology remains poorly understood. The objective of this study was to determine how mast cell-intrinsic androgen receptor signaling influences MC growth and maturation in males and females. We utilized a novel triple-transgenic mouse model (MCPT5-Cre; AR^fl/fl; Rpl22^HA/HA) enabling MC-specific deletion of the AR. Bone marrow was isolated from the femurs of MC-specific AR knockout mice (Cre+) and littermate control mice (Cre-) of both sexes. Cells were cultured for five weeks with IL-3 and SCF, and live cell counts, viability, and size were assessed weekly. Cytospin preparations were stained with toluidine blue to assess MC metachromatic granule content. Over the five-week culture, MCs from AR-knockout mice exhibited reduced live-cell numbers compared with controls across both sexes. Toluidine blue staining showed that while MCs from both sexes were fully matured by week five, Cre+ cells matured faster at weeks 2 and 3 than Cre− controls. In conclusion, the AR knockout MC cultures exhibited reduced live cell numbers across both sexes compared to controls (Cre-), indicating a faster terminal maturation and an earlier cell cycle exit. AR signaling in MCs may play an important role in regulating MC growth and differentiation programs.

JAK/STAT UPREGULATES THE GPR68-PROSURVIVAL PATHWAY IN GLIOBLASTOMA UNDER HIGH GLUCOSE CONDITIONS
Presenter(s): Akshara Kavuturu
Category: Cell Biology, Genetics and Genomics
Mentor(s): Hussain Basrai (College of Human Medicine)

Glioblastoma multiforme (GBM) is the most aggressive form of brain cancer in adults, characterized by a bleak prognosis and limited therapeutic options. Previous studies have shown that diabetes mellitus-induced hyperglycemia can exacerbate cancer malignancy including GBM, leading to poorer outcomes for patients with these comorbidities. A mechanism known to promote GBM cell survival is the GPR68-ATF4 pathway. GPR68 is a proton-sensing GPCR that detects subtle changes in tumor microenvironment acidification. Acidification is largely the product of the Warburg effect, or the tendency of GBM cells to undergo glycolysis even in the presence of oxygen. Upon activation, GPR68 promotes cell survival through the ATF4-mediated upregulation of glutathione, a potent antioxidant in the cell. The GPR68 inhibitor, Ogremorphin (OGM), has been implicated as a therapeutic modality for GBM due to its ability to elicit ferroptosis, a form of iron-mediated cell death. As aberrant glucose metabolism through the Warburg effect is a key pro-survival mechanism in GBM, we sought to investigate how high glucose conditions can impact the GPR68 pathway. Our RT-qPCR data suggested that glucose-induced inflammation promotes GPR68 expression through the JAK/STAT and NF-κB signaling pathways. Additionally, our synergy studies have shown that the co-treatment of GBM cells with OGM and JAK/STAT inhibitors can lead to cell death in a synergistic manner. These findings highlight an inflammation-driven signaling axis that promotes GPR68 expression under hyperglycemic conditions. Additionally, they position GPR68 inhibition as a precision therapeutic approach for patients with hyperglycemia-driven GBM.

APPLICATIONS OF VEGA ULTRASOUND (REVVITY) IN PANCREATIC CANCER IMAGING
Presenter(s): Tejaswini Sivalokanathan
Category: Cell Biology, Genetics and Genomics
Mentor(s): Lorenzo Sempere (College of Human Medicine)

Pancreatic Ductal Adenocarcinoma (PDAC) remains one of the deadliest cancer types. It is a highly heterogeneous disease with a dense stroma and reduced vascularization, which are challenges for effective therapies. Discovery of therapeutics and early detection of PDAC before the onset of signs and symptoms are crucial to improving survival. To address this, preclinical models are needed that closely mimic human disease progression. Genetically Engineered Mouse Models (GEMM), like the well-established Kras-driven, p53- deleted KPC model, mimics human PDAC and develops tumors spontaneously at 12-16 weeks of age. Imaging modalities (e.g., MRI and ultrasound) are essential tools for detecting tumors in preclinical models. While MRI provides anatomical imaging of the tumors, this study characterizes the applications of the Vega (Revvity), an innovative, specialized ultrasound system. Vega houses a three-mouse bay with a hands-free bottom-up imaging system. The imaging system conducts 2D/3D scans in under three minutes. The multi-mode application enables tumor stiffness analysis using shear wave elastography and microvasculature analysis using acoustic angiography - data

that would not be available with high-throughput MRI. The Vega system can be used with SonoEQ analysis software and Living Image Synergy AI. The AI analysis solution provides increased efficiency results with organ segmentation. The hands-free and AI analysis solution of Vega makes streamlining PDAC longitudinal imaging possible. Despite these advantages, the Vega ultrasound demonstrates reduced sensitivity for detecting early-stage tumors, requiring retrospective image analysis to confirm tumors compared to MRI. However, ultrasound remains applicable due to its lower cost, faster acquisition times, and accessibility.

INVESTIGATING THE INTERACTION BETWEEN THE SARS-COV-2 ORF8 PROTEIN AND THE IL-1 RECEPTOR COMPLEX
Presenter(s): Helenna Gallardo Lustosa, Julia de Melo
Category: Cell Biology, Genetics and Genomics
Mentor(s): Michael Bachmann (College of Human Medicine)

The COVID19-associated blood clotting disorder (CAC) is a major cause of morbidity and mortality in severely ill acute and Long COVID patients leading to excess heart attacks, strokes, and pulmonary embolisms. According to the currently favored "thromboinflammation" hypothesis CAC is an indirect effect of the hyperinflammation in high risk patients. In contrast, we are hypothesizing that CAC is directly driven by the SARS-CoV-2 ORF8 protein. ORF8 was shown by others to interact with >40 host proteins, among them the interleukin 17 receptor A (IL17RA). Our data show protein sequence similarity between ORF8 and not only IL17A, but also with other interleukins, most importantly interleukin 1. Here we examine whether ORF8 can bind to the interleukin-1 (IL-1) receptor complex consisting of the interleukin 1 receptor (IL1R) and the IL1 receptor accessory protein (IL1RAP). To test this hypothesis, we are cloning synthetic gene fragments encoding IL11R and IL1RAP as fusion proteins with split luciferase (NanoLuc) into mammalian expression vectors to be expressed in HEK 293T cells. We expect that adding IL1 or ORF8 to cells expressing the engineered IL-1 receptor complex will result in bioluminescence signaling. In addition, we are modeling the protein-protein interactions (PPI) between ORF8 and the IL-1 receptor complex using AlphaFold to analyze the molecular determinants of ORF8-ligand binding. These results will help us clarify whether ORF8 contributes to pro-inflammatory IL1 receptor signaling that may contribute to CAC and develop novel therapeutic interventions in severe COVID-19 cases that target ORF8.

EVALUATION OF LATE-STAGE GENE THERAPY TREATMENT IN CNGB1-AFFECTED DOGS
Presenter(s): Dylan Kwast
Category: Cell Biology, Genetics and Genomics
Mentor(s): Paige Smith (College of Veterinary Medicine), Simon Petersen-Jones (College of Veterinary Medicine)

A mutation in the cyclic nucleotide-gated channel beta-1 (CNGB1) gene causes progressive retinal atrophy (PRA) in dogs, initially impairing rod photoreceptor function and later leading to secondary cone degeneration and blindness. Gene therapy using an adeno-associated viral (AAV) vector to deliver a

functional copy of CNGB1 cDNA has been successful when administered during early disease stages, prior to substantial rod loss. This study evaluated therapeutic outcomes following treatment during late-stage disease characterized by established photoreceptor degeneration. Three CNGB1-/- dogs received a subretinal injection of a CNGB1-specific AAV vector (AAVS-hRHO196-hCNGB1a-SV40) in one eye (OD) at 4.5 years (n=2) or 5 years of age (n=1), with the contralateral eye (OS) serving as an untreated control. Retinal function and functional vision were assessed 3 months post-injection using electroretinography (ERG) and behavioral vision testing focused on rod-mediated (dim-light) responses. ERG recordings were obtained using scotopic and rod flicker protocols. Vision testing consisted of a dark box with four exit tunnels, one open at a time, where accuracy and time to exit was monitored. Dogs treated at approximately 4.5 years demonstrated faster navigation times and higher success rates using the treated eye compared with the untreated eye. Correspondingly, ERG responses were detected in treated eyes under both scotopic and rod flicker conditions, while untreated eyes showed no measurable responses. The dog treated at 5 years exhibited no significant ERG responses or evidence of functional vision rescue. Conclusion: These findings suggest that gene therapy may restore partial rod-mediated retinal function in late-stage CNGB1-associated disease when administered before advanced photoreceptor loss, indicating a possible age- or degeneration-dependent therapeutic window. Future studies incorporating immunohistochemistry may help define cellular correlates of treatment responsiveness.

INTERPLAY BETWEEN EPITHELIAL AND MESENCHYMAL SUBPOPULATIONS IN ORAL CAVITY SQUAMOUS CELL CARCINOMA

Presenter(s): Vrinda Khullar
Category: Cell Biology, Genetics and Genomics
Mentor(s): Marisa Buchakjian (University of Michigan)

Oral cavity squamous cell carcinoma (OCSCC) is an aggressive epithelial cancer often marked by epithelial-to-mesenchymal transition (EMT), a process where cells lose adhesion and gain invasive, motile traits. EMT not only drives tumor spread but may also alter drug sensitivity and aggressiveness. Using a validated SCC-9 EMT model spanning epithelial-like (9E), parental (9P), and mesenchymal-like (9M) subpopulations, drug testing revealed that 9M cells were more resistant to cisplatin and radiation, among other drugs. To explore underlying mechanisms, we performed GC-MS metabolomics, processed and normalized the data, and used MetaboAnalyst and iPathwayGuide for pathway mapping. Heatmaps revealed that mesenchymal cells had a distinct metabolic signature compared to the epithelial population. A few metabolic pathways were involved with these metabolites, including citric acid cycle, and arginine biosynthesis among others suggesting metabolic rewiring that may support mesenchymal survival and invasiveness. By linking metabolic adaptations to EMT, this work highlights potential therapeutic opportunities, such as combining metabolic inhibitors with conventional treatments, to disrupt invasion and improve outcomes for patients with aggressive oral cancers.

FGF21 AND THE METABOLIC REGULATION AND STRESS RESPONSES IN ZEBRAFISH
Presenter(s): Kalise Gerst
Category: Cell Biology, Genetics and Genomics
Mentor(s): Sreeja Sarasamma (College of Agriculture & Natural Resources)

Fibroblast growth factor 21 (FGF21) plays an important role in metabolic regulation and stress responses, yet its function in zebrafish remains incompletely understood. This project aims to generate and characterize an FGF21 knockout (KO) zebrafish line to investigate the biological consequences of fgf21 loss. The experimental approach involves routine genotyping of zebrafish using polymerase chain reaction (PCR), followed by agarose gel electrophoresis to identify KO individuals. Additional methods include PCR product purification, DNA quantification using NanoDrop spectrophotometry, preparation of E3 embryo medium and LB medium, bacterial plating, and maintenance and breeding of zebrafish KO lines. Basic imaging techniques are used to document experimental outcomes. The expected outcome of this work is the establishment of a molecularly validated FGF21 KO zebrafish line, providing a valuable model for future studies examining the role of FGF21 in zebrafish development and physiology.

DIFFERENTIAL GENE EXPRESSION ANALYSIS OF LOW EARTH ORBIT EFFECTS
Presenter(s): Rohan Bansal
Category: Cell Biology, Genetics and Genomics
Mentor(s): George Mias (College of Natural Science)

Humanity has always sought to explore the limits of our reach beyond Earth. As space travel becomes increasingly ambitious, understanding how space affects human health is critical. Astronauts are exposed to several major stressors, including space radiation, microgravity, isolation, confinement, distance from Earth, and closed environmental systems, all of which can disrupt normal physiological function and lead to major health problems such as kidney stones, cancer, and muscular atrophy. To investigate how these stressors impact human biology at the molecular level, we turn to transcriptomics. Mouse models provide a controlled system for examining how spaceflight affects gene expression across various tissues. Using differential expression analysis (DESeq2) coupled with functional enrichment analysis (FGSEA), we identify genes that are upregulated or downregulated during spaceflight and map these changes to biological pathways associated with known health risks, such as immune dysfunction, muscle atrophy, metabolic disruption, and stress responses. By characterizing pathway-level alterations induced by spaceflight, this work provides insight into the molecular mechanisms underlying physiological decline in space. Ultimately, these findings contribute to the long-term goal of translating transcriptomic signatures from mice to humans, thereby improving our ability to predict and mitigate the health challenges associated with long-duration space missions and bringing us closer to enabling safe and sustainable exploration beyond Earth.

ALTERED GROWTH FACTOR ENVIRONMENT DISRUPT PLATELET-DERIVED GROWTH FACTOR RECEPTOR BETA SIGNALING REGULATION DURING EARLY VASCULAR DEVELOPMENT
Presenter(s): Christopher Cosma
Category: Cell Biology, Genetics and Genomics
Mentor(s): John Chappell (Virginia Tech Carilion School of Medicine)

Pericytes play a crucial role in early vascular development, contributing to capillary stability and integrity, with additional microvascular functions that are still emerging. Pericyte recruitment to the endothelial cells in early vascular development is essential for angiogenesis. During vasculogenesis, endothelial cells proliferate and migrate, forming initial vessel structures. Once this primitive vasculature is formed, angiogenic endothelial cells secrete growth factors such as platelet-derived growth factor-BB (PDGF-BB), which recruits pericytes. PDGF-BB binds and activates platelet-derived growth factor Receptor-β (PDGFR-β) on the pericyte cell surface. We hypothesize that the addition of growth factors Vascular endothelial growth factor (VEGF) and Platelet-derived growth factor (PDGF) will likely decrease synthesis of Soluble PDGFRβ (SR-β) isoforms to allow for increased pericyte differentiation, proliferation, and migration.

FUNCTIONAL PROFILING OF RNA DEMETHYLASES IDENTIFIED IN TUMOR GENOMES
Presenter(s): Charlotte Gullion, Ella Mislevy, Lily Mitchell
Category: Cell Biology, Genetics and Genomics
Mentor(s): Christina Fitzsimmons (College of Human Medicine)

Chemical modifications of RNA play a critical role in post-transcriptional gene regulation. To date, over 150 different modifications have been identified. Among these, methyl modifications account for 66% of the distinct modifications to coding and non-coding RNAs, and play important roles in splicing, stability, and translation. Critically, enzymes that modify RNA modifications are often dysregulated in cancer. Here, we chose to focus on two members of the alpha ketoglutarate-dependent (aKG) dioxygenase family: fat mass and obesity-associated protein (FTO), which acts on N6-methyladenosine (m6A) in mRNA, and Alkb homolog 7 (ALKBH7) which acts on N2,N2-dimethylguanosine (m2m2G) in mitochondrial tRNA. Single nucleotide polymorphisms (SNPs) in the FTO and ALKBH7 gene have been associated with breast, colon, gastric, pancreatic, and prostate cancers. In this study, we investigated the mutational landscape of FTO and ALKBH7 and assessed the potential functional consequences of cancer-associated variants. Significant mutations were identified through analysis of publicly available datasets from The Cancer Genome Atlas and cBioPortal. Selected variants were cloned into bacterial and mammalian expression vectors and validated by sequencing. Current and future work will evaluate the effects of the point mutations on FTO demethylase activity using in vitro demethylation assays, as well as assess in vivo regulation through cancer phenotype assays. Taken together, these studies may ultimately inform novel targeted bio-therapeutic approaches.

DIFFERENTIAL EFFECTS OF CHOLESTEROL DISRUPTION ON NATRIURETIC PEPTIDE AND NITRIC OXIDE-DEPENDENT CGMP PRODUCTION IN PITUITARY TUMOR CELL LINES
Presenter(s): Brea Sofferman
Category: Cell Biology, Genetics and Genomics
Mentor(s): Kyan Strong (College of Veterinary Medicine), Robert Fowkes-Gajan (College of Veterinary Medicine)

Cyclic guanosine monophosphate (cGMP) is an integral secondary messenger that relays signals from cell surface receptors to induce intracellular responses, including activation of kinases and phosphorylation. In tumor cells, this plays a key role in cell proliferation and drug resistance. Natriuretic peptides are hormones that play numerous critical roles in multiple organ systems. We hypothesized that natriuretic peptides, atrial natriuretic peptide (ANP) and C-type natriuretic peptide (CNP), would increase cGMP in pituitary tumor cells via receptors located on lipid rafts. To test this, we pretreated pituitary tumor cell lines, alpha-T3-1 and GH3, with a cholesterol depleting compound, methyl-beta-cyclodextrin (MβCD) or a cholesterol sequestering compound, filipin, and then stimulated with increasing doses of natriuretic peptides or with a nitric oxide donor, S-Nitroso-N-acetyl-DL-penicillamine (SNAP). Our results show that natriuretic peptides and SNAP increased cGMP levels in tumors cells. We also showed that cholesterol removal via MβCD and filipin inhibits CNP and ANP-induced increases in cGMP, but did not alter responses induced by SNAP, which may be attributed to a different mechanism of action. These results demonstrate that cholesterol is integral to cGMP signaling. Future studies will assess receptor and signaling protein expression in lipid rafts via Western Blot.

GENE EXPRESSION CATEGORIZATION IN IDIOPATHIC PULMONARY FIBROSIS
Presenter(s): Sneha Nandimandalam
Category: Cell Biology, Genetics and Genomics
Mentor(s): George Mias (College of Natural Science)

Idiopathic pulmonary fibrosis (IPF) is a chronic, progressive interstitial lung disease characterized by permanent lung tissue scarring and deteriorating respiratory function. Because of its delayed diagnosis, limited treatment options, and rising incidence-especially in older populations-IPF poses a substantial global health burden. The disease is characterized by abnormal lung tissue wound-healing responses that result in excessive extracellular matrix deposition and fibrosis. Despite numerous proposed molecular pathways, the underlying biological processes and reliable biomarkers that differentiate IPF from other lung diseases remain poorly understood. In this study, we present results from our analysis of differential gene expression associated with IPF. We used publicly available RNA sequencing datasets curated from several independent studies to perform a re-analysis comparing IPF and healthy cohorts. Data were obtained from the Gene Expression Omnibus (GEO) and filtered to include datasets with appropriate clinical metadata, such as disease status, age, and sex. Raw sequencing data were processed using a standard bioinformatics workflow, including quality control, alignment to the human transcriptome, and quantification of gene expression levels. Differential gene expression was assessed using statistical models that account for batch effects and population demographics. Gene sets were then evaluated using gene set enrichment analysis (GSEA) to identify biological pathways associated with

IPF. In summary, this integrative approach enables the analysis of multiple RNA sequencing studies to identify gene expression patterns linked to IPF. These findings may help identify potential biomarkers for improved diagnosis and provide insight into molecular pathways that could guide future therapeutic development.

MITOCHONDRIAL DYNAMICS EFFECT ON FEMALE FERTILITY
Presenter(s): Ava Miciuda
Category: Cell Biology, Genetics and Genomics
Mentor(s): Yuan Wang (College of Agriculture & Natural Resources)

Mitochondria play a critical role in cellular energy production and are especially important in female reproduction, where >100,000 mitochondria can be detected in mature oocytes, 500-fold more than most somatic cell lineages. Proper mitochondrial activities and mitochondrial fitness are thus crucial for maintaining ovarian development and functions. Accumulating evidence supports that mitochondrial fusion and fission not only enable coordinated responses of individual mitochondria to developmental stimuli and metabolic needs but also ensure mitochondrial fitness. This project tests our hypothesis that augmented mitochondrial dynamics improve mammalian female reproduction via minimizing dysfunctional mitochondria with mutated mitochondrial DNA (mtDNA) in female germ cells. We utilized mtDNA mutator mice and assessed the impact of a mitochondrial fusion agonist on female reproduction. After agonist treatment, ovarian tissues were collected for histological analysis, and follicle counting was performed to quantify changes across developmental stages. Oocyte numbers were also assessed to evaluate ovarian reserve, and mtDNA content and mutation load were analyzed using PCR and Hi-sequencing approaches. Preliminary data suggest that the treatment of the mitochondrial fusion agonist may alter follicle development and oocyte numbers, with possible changes in mtDNA mutation loads. This ongoing work aims to provide insights into regulation by upregulated mitochondrial fusion on mitochondrial fitness and female reproduction.

OBESITY MODULATES KRAS-DRIVEN MICROTUBULE DYNAMICS AND THERAPEUTIC RESPONSE IN COLORECTAL CANCER
Presenter(s): Emily Saksewski
Category: Cell Biology, Genetics and Genomics
Mentor(s): Jonathan Diedrich (College of Osteopathic Medicine)

KRAS mutations are among the most prevalent oncogenic drivers in colorectal cancer (CRC) and are associated with altered cytoskeletal organization, therapeutic resistance, and metabolic rewiring. Obesity further modifies tumor cell behavior through both systemic and cell-intrinsic mechanisms, yet how obesity interacts with KRAS-driven regulation of the microtubule network remains poorly understood. We used SW48 KRAS isogenic CRC cell lines expressing wild-type (WT), G12D, G12S, G12V, G12A, or G13D KRAS to investigate mutation-specific and obesity-associated effects on microtubule dynamics and therapeutic response.

To model obesity, adipocytes were differentiated in vitro to generate adipocyte-conditioned media, which was applied to CRC cells. Cell growth and morphology were measured, and high-content imaging was used to assess proliferation, cytoskeletal organization, microtubule polymerization, and post-translational modifications of tubulin. EB1-GFP imaging was used to quantify microtubule growth dynamics. Quantitative PCR was performed to evaluate expression of genes involved in microtubule assembly and disassembly. Cell viability assays were used to determine sensitivity to microtubule-targeting agents (MTAs) alone or in combination with MEK inhibitors. We hypothesize that obesity-associated factors differentially alter microtubule dynamics and MTA/MEK inhibitor responses in SW48 CRC cells in a KRAS mutation-dependent manner. Distinct KRAS variants displayed unique baseline morphologies and differential growth responses to adipocyte-conditioned media. EB1-GFP and gene expression analyses revealed variant-specific effects of KRAS signaling on microtubule polymerization. KRAS mutations also conferred resistance to paclitaxel and docetaxel relative to KRAS WT cells. Collectively, these results identify microtubules as a key mechanistic link between KRAS mutations and obesity that shapes therapeutic response in CRC.

INVESTIGATION OF THE ROLE OF BOND IN DROSOPHILA MELANOGASTER TRACHEAL SYSTEMS
Presenter(s): Tyler Irving
Category: Cell Biology, Genetics and Genomics
Mentor(s): Henry Chung (College of Agriculture & Natural Resources)

Pleiotropic genes affect several unique, unrelated traits and can serve as a driver for evolution. Some traits affected by these genes may be more conserved than others, suggesting their possible roles in more essential functions. The gene bond (james bond) is an elongase involved in many biological processes of Drosophila melanogaster and is conserved within different Drosophilidae species. The Chung Laboratory investigated bond expression across different Drosophilidae species and demonstrated that its expression varied across different tissues. However, bond expression in the larval trachea system remained conserved across many Drosophilidae species, suggesting its potential role in an essential trait. This was supplemental by recent work using RNAi knockdown within the tracheal system, which demonstrated that bond led to developmental arrest of D. melanogaster pupae. With this information, my project aims to answer the question of: What is the function of the bond within the D. melanogaster tracheal system? This project involved two major experiments. First, I will use the GAL4/UAS system in D. melanogaster to drive tissue specific bond RNAi expression. After obtaining the bond knockdown F1 generation, observations of the number of emerging adults that have the stubby (Sb) phenotype will be recorded to illuminate bond's necessity in D. melanogaster's development. The second experiment involves feeding second and third stage larvae from the bond knockdown lines with a blue dyed diet. Through digestion of blue dye by larvae, bond's impact on several anatomical regions can be observed; thus, providing insights of its role.

IDENTIFYING THE HLA HAPLOTYPES IN HPV-POSITIVE HEAD AND NECK CANCER CELL LINES.
Presenter(s): Ian Nikesch
Category: Cell Biology, Genetics and Genomics
Mentor(s): Lexi Vu (College of Natural Science)

MHC-l are proteins found on the surface of almost every cell in the human body and they signal T-cells to kill. They have three genes HLA A, B, and C. It's been shown that specific HLA alleles correlate with survival outcomes in cervical cancer patients. We have previously shown that MHC-I protein is degraded by MARCHF8 in HPV + head and neck cancer (HNC). However it is still unknown which HLA is being targeted in the degradation process. Preliminary data suggests B and C are regulated at the mRNA level. Therefore we hypothesize that MARCHF8 predominantly regulates HLA-A. To test this hypothesis we first identified the HLA haplotypes and overexpressed them in the HPV+ HNC cells. We will knock out MARCHF8 in the cell lines using CRISPR and evaluate the expression of HLA by qPCR and western blots. We predict that on the western blot we would see an overexpression of HLA-A compared to B and C. The qPCR would show no changes for any of the HLA haplotypes. Our findings would show how we could over express specific haplotypes leading to better responses to cancer treatment.

STORAGE TIMING OF WHITE BLOOD CELLS
Presenter(s): Jazzy Zimmer
Category: Cell Biology, Genetics and Genomics
Mentor(s): Kelly St George (UNIVERSITY HEALTH AND WELLBEING)

White blood cells are an important part of the body's immune system. They can help defend against illnesses and are one of the biggest signs that something may be wrong. One of the tools that medical providers use to identify illnesses can be done through collecting a blood sample and evaluating the white blood cell (WBC) count in a test called a Complete Blood Count (CBC). A higher WBC count may indicate an infection, as the body produces more WBC's in an immune response to the infection. While it is relatively easy for laboratories to obtain a WBC count, many sample collection locations and doctors' offices do not have the correct instrument to complete the testing onsite, and send their samples to a larger laboratory or testing facility. Additionally, with the merging of many larger hospital systems with smaller hospitals to cut costs and improve financial efficiency, more tests are being sent to and tested at a centralized laboratory location. Consolidating operations and streamlining processes by sending these samples to a single laboratory may affect performance and cause a delay in result reporting. Current guidelines for CBC samples require that the sample be tested within 24 hours. This study will be evaluating the effects on WBC stability to see how long blood samples can be stored and still give an accurate result. In this experiment, approximately 10 CBC samples collected on Monday will be refrigerated and retested each weekday until Friday. and the results of the WBC count will be recorded. Using linear regression, these results will be evaluated to see if there is a statistical difference in the results throughout the week.

ELEVATED APOPTOSIS AND TISSUE REMODELING ALTERATIONS IN E2F5 KNOCKOUT MAMMARY GLANDS
Presenter(s): Ryan Corfixsen
Category: Cell Biology, Genetics and Genomics
Mentor(s): Eran Andrechek (College of Human Medicine)

Mammary gland involution is a tightly regulated developmental process characterized by epithelial apoptosis and tissue remodeling following lactation. Dysregulation of involution has been implicated in increased breast cancer risk, yet the transcriptional programs controlling this process remain incompletely understood. Loss of E2F5-a transcription factor-accelerates involution, with knockout glands exhibiting higher levels of apoptosis early in the process compared to wild-type. To investigate transcriptional consequences of E2F5 loss, RNA-sequencing data from wild-type and knockout mouse mammary glands were analyzed. Differential gene expression analysis did not identify significant individual gene changes at this stage. In contrast, gene set enrichment analysis (GSEA) revealed widespread dysregulation of immune and inflammatory pathways, with more limited changes in extracellular matrix (ECM) pathways. These findings suggest that although apoptosis occurs in both genotypes, elevated early apoptosis in knockout glands reflects accelerated progression, while the transcriptional profile at the sampled stage is dominated by immune and inflammatory signaling, with ECM remodeling as a secondary feature. This underscores the temporal complexity of involution and indicates that E2F5 may coordinate multiple aspects of mammary gland remodeling. Ongoing analyses aim to refine affected pathways and identify candidate downstream targets of E2F5 regulation. Together, this work provides insight into the transcriptional programs underlying mammary gland involution and offers a framework for understanding how disruptions in developmental processes may contribute to breast cancer susceptibility.

TRACING ANCIENT HABITABILITY THROUGH CARBON AND SAMPLE RETURN IN THE MARS SYSTEM
Presenter(s): Mohammad Rayan, William McNeece
Category: Cell Biology, Genetics and Genomics
Mentor(s): Michael Velbel (College of Natural Science)

The Ancient Biosignatures and Carbon & Sample Return (ABC2-SR) science theme focuses on evaluating whether Mars once supported habitable environments through the study of preserved carbon and potential biosignatures. Carbon-bearing materials are central to this effort because carbon is a fundamental component of biological systems and can persist in the geologic record under favorable conditions. Identifying and interpreting these materials requires analytical precision beyond the capabilities of in situ instruments, making sample return missions essential.Missions such as Tianwen-3 and the Martian Moons Exploration missions are designed to collect and return geologically contextualized samples that align with the objectives outlined by the International Mars Sample Return Objectives and Samples Team.

EFFECTS OF PRODH2 OVEREXPRESSION AND INHIBITION ON CANCER CELL BEHAVIOR
Presenter(s): Rawan Talib
Category: Cell Biology, Genetics and Genomics
Mentor(s): Eran Andrechek (College of Human Medicine), Jesus Garcia-Lerena (College of Natural Science)

PRODH2 is a gene primarily expressed in the liver and kidney that has been implicated in promoting metastasis in cancer. However, its functional role in tumor progression remains poorly understood. This study investigates how modulation of PRODH2 expression influences cancer cell behavior. Using RNA extraction and RT-PCR, changes in gene expression will be quantified following PRODH2 overexpression or reduction through CRISPR-mediated knockout and inhibitor-based approaches. The effects of altered PRODH2 activity will be evaluated using cell viability assays, as well as migration, invasion, and scratch assays to assess changes in proliferative and metastatic phenotypes. By characterizing how PRODH2 impacts cancer cell growth and motility, this work aims to clarify its contribution to cancer progression and evaluate its potential as a therapeutic target.

EFFECTS OF IRF6 REGULATORY VARIANTS ON PALATAL DEVELOPMENT IN MOUSE MODELS
Presenter(s): Alexandria Page, Dalton Dubiel
Category: Cell Biology, Genetics and Genomics
Mentor(s): Brian Schutte (College of Osteopathic Medicine)

IRF6 (Interferon Regulatory Factor 6) is a gene that encodes for a transcription factor that is essential for craniofacial development, including of the lip and palate, in humans. In the mouse, loss of Irf6 causes cleft palate by disrupting the normal function of periderm, resulting in abnormal oral adhesions (AOA) between developing palatal shelves and oral cavity surfaces. Recently, a single nucleotide variant (SNV) was found in a conserved enhancer that regulates IRF6 expression and is associated with cleft palate in the Finnish population. This study tests the hypothesis that this IRF6 regulatory allele increases the risk for AOA and cleft palate in mouse.

STRESS, SIGNAL, SURVIVAL: TRANSCRIPTOMIC STRATEGIES FOR COMBATING DROUGHT
Presenter(s): Ava Francis, Avani B, Braeden Klaty, Ella Graybill, Megan Luke, Suvetha Nithiyaragawan
Category: Cell Biology, Genetics and Genomics
Mentor(s): Patrick Edger (College of Agriculture & Natural Resources)

Drought remains a primary constraint on the yield and oil quality of Camelina sativa. To understand the molecular mechanisms underlying drought resilience, we performed a comparative transcriptomic analysis of three distinct Camelina cultivars. Plants were subjected to controlled water-deficit conditions, and leaf and root tissues were sampled for high-throughput RNA-sequencing. Our results identify a core set of conserved drought-responsive genes, as well as cultivar-specific expression patterns. Functional enrichment analysis revealed that the most resilient cultivar exhibited accelerated activation of ABA-signaling and osmoprotectant biosynthetic pathways compared to its counterparts. These findings

provide a high-resolution map of the Camelina drought "regulome" and identify key candidate genes for future crop improvement.

Communication Arts & Sciences

WELLBEING AMONG INDIVIDUALS WITH A TOTAL LARYNGECTOMY: CONSIDERATION OF GENDER
Presenter(s): Isabel Pascua
Category: Communication Arts and Sciences
Mentor(s): Jeffrey Searl (College of Communication Arts Sciences)

A total laryngectomy is a surgical procedure involving the complete removal of the larynx (voice box), resulting in the permanent separation of the lower from the upper airway. This procedure necessitates breathing through a stoma (hole) in the neck and leads to significant changes in speech, respiration, and other body functions, often with subsequent reduction in quality of life. The aim of this study was to determine if there are differences in well-being between individuals with a laryngectomy and those without, and whether well-being differs as a function of gender. An online survey was completed by 171 people with a laryngectomy and 138 without. The survey gathered demographic information, medical history, and cancer-related information. Survey respondents also completed the Five Factor Wellness Inventory (FFWEL) to measure their wellbeing. The FFWEL provides an overall well-being score as well as 5 sub-scores. A series of 2 (Laryngectomy status) x 2 (Gender) analysis of variance tests were run for the Total and the 5 sub-scale scores. There were statistically significant main effects of Laryngectomy status (lower well-being for laryngectomy) and Gender (lower for female), but the interaction was not significant. Laryngectomy participants had significantly lower scores for all second order factors (Creative, Coping, Social, Essential, Physical), and females had significantly lower well-being scores than males for the Creative and Coping Self scores (no significant interactions). The results support the conclusion that well-being is significantly lower post-laryngectomy across multiple domains, and gender differences are present for two subcomponents of well-being regardless of laryngectomy status.

PHYSICAL MOBILITY AND ACCESS TO COMMUNITY STORYTELLING NETWORKS: IMPLICATIONS FOR CIVIC ENGAGEMENT MODES
Presenter(s): Michelle Parson
Category: Communication Arts and Sciences
Mentor(s): David Ewoldsen (College of Communication Arts Sciences)

This study aims to investigate how physical mobility is associated with individuals' engagement in community storytelling networks and their online and offline civic participation within local communities. Specifically, the study examines multiple forms of storytelling networks, including interpersonal communication, engagement with community organizations, local media use, and digital platforms. It further assesses how variations in neighborhood mobility relate to civic engagement across online and offline contexts through differing levels of embeddedness in local storytelling networks. To our knowledge, this study is among the first to examine these relationships simultaneously within a

single dataset. We believe this study could offer an integrated view of physical mobility, community embeddedness, and civic participation in everyday neighborhood settings.

EYE-TRACKING IN VIDEOFLUOROSCOPIC SWALLOW STUDY ANALYSIS: EXPERIENCED VS NOVICE SPEECH-LANGUAGE PATHOLOGISTS
Presenter(s): Autumn Highstreet, Elise Stevens, Jewell Tyler, Katherine Steiner
Category: Communication Arts and Sciences
Mentor(s): Busra Ensar Yilmaz (College of Communication Arts Sciences), Jeffrey Searl (College of Communication Arts Sciences)

Eye-tracking, an objective measurement of visuoperceptual behavior, is an emerging technology showing great promise in the field of speech-language pathology. However, the current research is limited regarding understanding the eye-gaze behavior of speech-language pathologists (SLPs) during the interpretation of visual diagnostic tasks such as endoscopic and fluoroscopic examinations. The purpose of this study was to analyze the eye-gaze patterns of 13 experienced SLPs (i.e., completing 4 or more videofluoroscopic swallow studies (VFSS) per month) and 13 novice SLP masters degree students during the interpretation of VFSS still images. Participants reviewed four still images extracted from VFSS videos and made decisions about potential abnormalities. During VFSS viewing their eyes were tracked using a screen-based eye-tracker (Tobii Pro/x3-120) and fixation metrics were extracted at a later date. Research assistants digitally drew 5 clinically relevant areas of interest (AOIs) for the study: oral cavity, oropharyngeal cavity, hypopharyngeal cavity and upper esophageal sphincter, laryngeal vestibule and upper tracheal space, and bolus. Additionally, 1 non-AOI was mapped, encompassing all non-relevant anatomical features and the background of the image. The data gathered from this eye-tracking study, information regarding accuracy of the diagnostic decisions as well as duration and number of fixations on both relevant and non-relevant AOIs, revealed differences in fixation gaze metrics between novice and experienced SLPs. This data has implications for the education of future practitioners, as educators will better understand the tendencies of student clinicians relative to experienced SLPs, and thus can consider optimal training approaches regarding the evaluation of VFSS .

DISABILITY OF ARM, SHOULDER, AND HAND IN LARYNGECTOMEE
Presenter(s): Abigail Kochanowski, Alyssa Hurley, Katherine Steiner
Category: Communication Arts and Sciences
Mentor(s): Jeffrey Searl (College of Communication Arts Sciences)

Patients who undergo a total laryngectomy (removal of the larynx) following head and neck cancer often experience dysfunction of the arm, shoulder, and/or hand. The purpose of this study was to assess the relationship between the extent of this dysfunction on communication and neck/airway care that patients must complete. An online survey was conducted via Qualtrics to people who have had a total laryngectomy (TL). This survey utilized the Disability of Arm, Shoulder, and Hand (DASH) questionnaire and additionally included questions regarding demographics, cancer history, and current neck/airway care and communication abilities. Two hundred twelve participants completed the survey. A series of

Spearman rank order correlations were computed to assess the relationship between DASH scores and participants' ratings of the extent of limitations in communication and neck/airway care. There were statistically significant correlations ($p<.05$) between DASH scores and limitations with communication ($r=.567$), managing use of heat-moisture-exchange device ($r=.454$), and cleaning the neck and stoma ($r=.537$). To explore possible influences on DASH scores, independent sample t-tests were computed to compare DASH score based on radiation therapy and neck dissection status (yes/no), respectively. Those who underwent radiation therapy ($t=3.297$, $p<.001$) and those who had a neck dissection ($t=3.426$, $p<.001$) had significantly higher (worse) DASH scores. The results supported the conclusion that arm, shoulder, and hand dysfunction are associated with limitations in key tasks that people with a TL need to complete. Additionally, neck dissection and positive radiation therapy history may be causes of increased dysfunction in the arm, shoulder, and hand.

HOW STUTTERING IS DISPLAYED ON TIKTOK AND EXAMINING TIKTOK'S ROLE IN SHAPING ATTITUDES TOWARD STUTTERING
Presenter(s): Sydney Schulte
Category: Communication Arts and Sciences
Mentor(s): Amir Hossein Rasoli Jokar (College of Communication Arts Sciences)

This study examines how stuttering is represented on TikTok and how these portrayals influence public perception among people who stutter. While prior research on text and image based platforms such as Instagram and X suggests that stuttering is often framed positively, there remains a gap in understanding how video based platforms shape perceptions through dynamic, highly visible content. As short form video platforms increasingly shape public discourse, representations of disability and speech differences may reinforce or challenge existing stereotypes. By analyzing TikTok content and its reception, this study aims to evaluate whether the platform normalizes communication differences or inadvertently reinforces unrealistic expectations or stigma grounded in lived experience.

ARTICULATORY CONTACT PRESSURE DURING PRODUCTION OF LINGUAL PHONEMES
Presenter(s): Abigail Kochanowski, Lauren Garrison, Margaret Ver Steeg, Olivia Jackson
Category: Communication Arts and Sciences
Mentor(s): Jeffrey Searl (College of Communication Arts Sciences)

Articulatory contact pressure (ACP) has been proposed as a surrogate measure of perceived articulatory effort for labial and lingual phonemes that require obstruction or constriction of air such as fricatives and stop consonants. Earlier work established a link between ACP and self-rated effort for patients with head and neck cancer. However, several questions remain regarding the ACP measure itself. The purpose of this study was to determine the extent to which ACP during lingua-alveolar phonemes is symmetrical (right-left alveolar ridge and anterior-posterior hard palate) for a set of nine consonants (t, d, s, z, k, g, l, ,n, sh) produced in the initial position of a real word embedded in a linguistically meaningful phrase as tongue-to-palate contact pressures were measured (kPa): the alveolar ridge just behind the central incisors on the right and left, and on the palate laterally where the first molar emerged on both the left

and right side. All stimuli were repeated three times in random order in two speaking conditions: habitual and loud (a commonly used therapeutic condition for some speech conditions). Miniature pressure sensors were embedded in custom-molded wax molds of each participants mouth and the data were digitally recorded simultaneously from the four transducers along with an audio recording of the spoken sample. This poster describes the background, methods, and preliminary data from a case series of young adults with typical speech. Additionally, it describes the evolution of the protocol and experimental methods used. Future plans for the study are also discussed.

SILENCED BY STRESS: PSYCHOLOGICAL FACTORS ASSOCIATED WITH FUNCTIONAL STUTTERING
Presenter(s): Alyssa Hurley, Amelia Patten, Reagan Lozo
Category: Communication Arts and Sciences
Mentor(s): J Scott Yaruss (College of Communication Arts Sciences), Jia Bin (College of Communication Arts Sciences), Molly Stevenson (College of Communication Arts Sciences)

This study investigates the psychological factors most strongly associated with the onset of functional (psychogenic) stuttering and examines how these factors vary across different age groups and genders. Functional, also known as psychogenic stuttering is, a type of speech disfluency that arises from psychological or emotional factors rather than neurological or developmental causes. Drawing on existing clinical research, we will focus on stress-related influences such as trauma, anxiety disorders, and emotional conflict that may contribute to the development of this condition. The study also analyzes demographic patterns to determine whether certain populations are more vulnerable to specific psychological triggers. By integrating psychological and demographic perspectives, the research aims to provide a clearer understanding of the underlying causes and risk factors associated with functional stuttering.

FAITH AND FREEDOM: NEWS COVERAGE OF RELIGIOUS FREEDOM IN THE CAUCASUS
Presenter(s): Katherine Dyal
Category: Communication Arts and Sciences
Mentor(s): Eric Freedman (College of Communication Arts Sciences)

Our research centers on the countries of Azerbaijan, Armenia, and Georgia and news reporting on restrictions of religious freedom in the decades since the collapse of the Soviet Union. We have focused on the work of journalists from Forum 18, a specialized news service working for freedom of religion and belief in regions once part of or adjacent to the former Soviet Union. Forum 18's journalism is important because domestic news outlets in the Caucasus generally do not report on their government's failure to protect human rights, including the freedom of religion, largely due to the omnipresence of state-controlled media and fear of government reprisals. Therefore, we have studied how Forum 18 covers news regarding constraints on religion in the Caucasus, emphasizing the number and type of sources used. Our methods focused on the collection and examination of news articles, including content analysis and measuring and recording variables (such as the number and type of sources used). In our analysis, we have found a large number of government officials refusing to speak with press and high

usage of anonymous sources, which indicate the repressive nature of the governments in Azerbaijan, Armenia, and Georgia. We hope to shine light on the issues of religious freedom in the Caucasus by emphasizing news coverage of the region and call for greater press scrutiny of government protections or violations of human rights in other countries.

EGO-DEFENSIVE RESPONSES TO EGO-THREATENING MESSAGES: A CONTENT ANALYSIS OF THOUGHT VALENCE IN THE CONTEXT OF ATTITUDES TOWARD UNAUTHORIZED IMMIGRATION MESSAGES IN THE US

Presenter(s): Owen Polanich, Ryan Stewart
Category: Communication Arts and Sciences
Mentor(s): Maria Lapinski-LaFaive (College of Communication Arts Sciences), Moonsun Jeon (College of Communication Arts Sciences)

Introduction: This study tests the ego-defensive function of attitude, demonstrating that individuals resist persuasion by activating defensive mechanisms when a message threatens their valued self-concept. We explore the impact of 1) political affiliation as one's valued social identity and 2) in-group versus out-group message source on message outcomes (i.e., thought valence and attitude), in the context of attitude toward unauthorized immigrants in the U.S. Methods: Participants (n = 590) residing in the US-Mexico border states (Arizona, California, New Mexico, and Texas) were randomly assigned to one of the four experimental conditions: 2 (Ego-threatening vs. Non-ego-threatening message) x 2 (in-group vs. out-group source) between-subjects design. Thought valence was coded by two undergraduate research assistants, including establishing a codebook and practicing with sample data, and coding a total of 3,316 thoughts. They coded the valence of participant thoughts as positive, negative, neutral, or irrelevant to the message. Following two months of practice coding over two rounds, the researchers achieved an intercoder reliability of Krippendorff's $\alpha = .778$; an acceptable range. Proposed Results & Implications: We anticipate that ego-threatening messages will elicit more negative thoughts and unfavorable attitudes toward message arguments. Furthermore, out-group source as a moderator will intensify these ego-defensive reactions. This research offers critical implications for intergroup communication; understanding these defensive processes is a vital step toward developing communication strategies that reduce prejudice, mitigate negative interactions, and facilitate more constructive dialogue between diverse social groups in increasingly polarized contexts.

INTERPRETING SPEECH TIMING WITH AUDITORY AND VISUAL FEEDBACK IN CHILDHOOD STUTTERING

Presenter(s): Elaina Bortolini, Megan Moore, Nina VanOtteren, Rachel Erdmann, Trevor Moran
Category: Communication Arts and Sciences
Mentor(s): Bridget Walsh (College of Communication Arts Sciences), Katelyn Gerwin (College of Communication Arts Sciences)

Developmental stuttering is a communication disorder that involves disruptions in the rhythmic flow of speech, such as sound repetitions, prolongations, and blocks. Previous research suggests that individuals who stutter may have a sensorimotor deficit that affects speech-timing mechanisms. Speaking to the

beat of a metronome, for example, dramatically reduces stuttering in individuals. This suggests that external timing support may compensate for internal timing deficits. However, much of this research has focused on adults who stutter. Studying children who stutter offers critical insights into early speech development and may clarify whether an internal speech-timing deficit is a core feature of stuttering and a risk marker for persistence. Using a novel video-game format, children who do and do not stutter complete a task requiring them to produce a word to the beat of a metronome during a synchronization phase and then maintain the beat during a continuation phase in which sensory (i.e., visual and auditory) feedback was systematically removed. Acoustic speech signals are recorded and analyzed to assess speech rhythm patterns between groups. The results of this project will contribute to a clearer picture of sensorimotor processes in childhood stuttering that could support the development of novel treatment approaches, such as rhythm-based interventions.

EXPLORING ACCEPTANCE AND COMMITMENT THERAPY (ACT) ON QUALITY OF LIFE AMONG ADULTS WHO STUTTER
Presenter(s): Carly Kontowsky, Edona Prenaj, Hailey Tocco, Jordyn Tepper
Category: Communication Arts and Sciences
Mentor(s): Erika Mueller (College of Communication Arts Sciences), J Scott Yaruss (College of Communication Arts Sciences), Molly Stevenson (College of Communication Arts Sciences)

This literature review examines the effects of Acceptance and Commitment Therapy (ACT) on quality of life among individuals who stutter. This review synthesizes findings from existing studies evaluating quality of life, life satisfaction, and acceptance of stuttering following ACT-based interventions. Various assessment tools may be considered across studies, including the Overall Assessment of the Speaker's Experience of Stuttering (OASES) and other validated quality of life measures. By analyzing reported pre-intervention and post-intervention outcomes, this review seeks to explore whether ACT is associated with meaningful improvements in quality of life for people who stutter. The results may help support the role of acceptance-based approaches within stuttering therapy and inform future research on outcome measurement in this area.

ACOUSTIC FEATURES ACROSS SPEAKING CONDITIONS IN PARKINSON'S DISEASE AND PARKINSONISM
Presenter(s): Chloe Glabach, Rachel Chomas
Category: Communication Arts and Sciences
Mentor(s): Maura Philippone (College of Communication Arts Sciences), Thea Knowles (College of Communication Arts Sciences)

People with Parkinson disease (PD) often experience speech difficulties because of declines in motor function. A primary symptom is hypophonia, characterized by a quiet, breathy-hoarse voice that can be difficult to understand. Many individuals with PD benefit from speech therapy techniques that involve using "clear" or "loud" speech styles to compensate for symptoms. Another approach involves the use of speech amplification devices to improve vocal loudness, which does not require the person to alter their speech. The goal of this study is to identify how the combined use of speech amplification devices and

clear speech techniques improves listener abilities to understand individuals with PD. Speech was elicited from 5 speakers with PD using a picture description task with a partner. This task was completed with two speech style conditions (habitual or clear) and two amplification device conditions (unamplified or habitual). Recorded sentences were played for naive listeners who transcribed the speech and identified the amount of effort it took to understand. Outcome measures include the percentage of words correctly transcribed, the effort level reported, and acoustic measures of voice quality. Listener ratings and acoustic analysis are currently in progress. We anticipate that the highest accuracy of transcription and lowest effort ranking will stem from the combination of amplified and behavioral voice changes, and that these will be associated with improved acoustic indices. Overall, this study looks to enhance speech treatment outcomes in those with PD through the combination of behavioral and technological speech strategies.

ALGORITHMIC REFLECTION ON GROUP IDENTITY: SHORT-FORM CONTENT AS IT RELATES TO BELONGING
Presenter(s): Ada Tussing, Connor Nitchie
Category: Communication Arts and Sciences
Mentor(s): Allison Eden (College of Communication Arts Sciences)

Apps featuring short-form content, such as TikTok, have been on the rise in recent years. With these apps come fears of social disconnection and isolation, however some people have become more interconnected than ever before, and found belonging in different communities. We evaluated the effects of TikTok's highly personalized algorithm, by mimicking the feed with a selection of videos, on the sense of belonging participants self-report under the identity categories of "introvert" and "extrovert." We suspect that when individuals who align themselves with the "introvert" or "extrovert" personality type view content that supports their identity, their levels of belonging within the group will increase, and when viewing content that supports an opposing identity, their levels of belonging within the group will decrease.

ANNOTATION OF GLOTTAL CLOSURE CONFIGURATION IN HIGH-SPEED VIDEOENDOSCOPY DATA
Presenter(s): Reagan Lozo, Shrea Dharanokota
Category: Communication Arts and Sciences
Mentor(s): Jeffrey Searl (College of Communication Arts Sciences), Maryam Naghibolhosseini (College of Communication Arts Sciences), Mohsen Zayernouri (College of Engineering)

The configuration of the vocal folds during glottal closure is of significant clinical importance, as it directly influences acoustic output, vocal efficiency, and perceived vocal quality, often contributing to breathy or hoarse vocal qualities when closure is insufficient. Although complete glottal closure was once considered the standard configuration in vocally normal speakers, more recent studies have identified a range of glottal closure configurations in both normophonic and disordered speakers. To date, however, there remains a lack of standardized approaches for classifying these configurations, particularly using laryngeal high-speed videoendoscopy (HSV), an imaging modality capable of capturing

intra-cycle vocal fold vibrations in intricate detail. The goal of this study is to complete the annotation of glottal configuration in HSV data. This will be done on the data collected during sustained phonation in vocally normal individuals and those with voice disorders. Following data collection, two raters analyzed various vibratory cycles in the HSV recordings to categorize the glottal closure configuration into several distinct categories previously described in the literature. The results of this study will lead to an improved understanding of glottal closure patterns in both vocally normal and disordered speakers, supporting more precise characterization of vocal fold function and improve the clinical interpretation of laryngeal imaging data. Acknowledgments: We acknowledge the support from NIH NIDCD R21DC020003 and K01DC017751, also Michigan State University Discretionary Funding Initiative.

NIC-NIX MSU VIP
Presenter(s): Emma Ebeling
Category: Communication Arts and Sciences
Mentor(s): Jeffrey Siarto (College of Communication Arts Sciences)

Nicotine has been a persistent public health concern that continues to morph each generation's needs in such a way that makes it increasingly difficult to fight. Corporations continue to seek consumer reliance and addiction to their products for gain. Nic-Nix is a product being designed and researched to do the exact opposite; the goal is to quit using it. This app-controlled vape aims to implement each individual user's habits and traits to create patterns and limitations to help each user quit; a personalized reduction plan through physical product-to-app tracking systems. The focus of this project is on iterative prototyping, user research, and cross-disciplinary exploration to research and create a product that users can personalize for their journey. It explores the overlap of harm reduction, long-term disengagement from a product, and interactive tracking technologies.

BEHAVIORAL INTERVENTIONS FOR COMMUNICATION AFTER LARYNGEAL CANCER: A SCOPING REVIEW
Presenter(s): Ella French
Category: Communication Arts and Sciences
Mentor(s): Jeffrey Searl (College of Communication Arts Sciences)

The purpose of this scoping review was to summarize the literature from 1960 to the present regarding behavioral speech therapy aimed at improving communication and related outcomes for adults with laryngeal cancer. A comprehensive literature review was completed in PubMed, CINAHL, and Cochrane databases. Manuscript inclusion criteria were 1) human research, 2) head and neck cancer focused, and 3) behavioral speech-language therapy outcomes focused. Exclusion criteria were 1) non-English language, 2) unavailability of abstract, and prosthetic/instrumental treatment only. Abstract/title and full manuscript reviews were completed in Covidence by teams of trained undergraduate researchers who worked by consensus to resolve disagreements about inclusion and exclusion of articles. A total of 4473 articles were identified across databases. After removal of duplicates and abstract/title screening for inclusion/exclusion criteria, 124 articles remained. After completion of full text review, 73 articles were

retained for data extraction. Of these, 50 studies reported outcomes for populations that included individuals with laryngeal cancer. Analysis of extracted data is underway and will be reported for each of these four domains: 1) study design characteristics, 2) patient population characteristics, 3) intervention characteristics, and 4) intervention outcomes. Preliminary analysis reveals large variability in intervention approaches, outcome measures, and study designs. Initial findings highlight the long-standing clinical interest in communication rehabilitation for this population and the need for more targeted, methodologically rigorous research specific to laryngeal cancer.

THE LONG-TERM EFFECTIVENESS OF THE MSU DUCK CAMPAIGN TO REDUCE HIGH-RISK DRINKING: 2018-2025
Presenter(s): Mariana Bakus
Category: Communication Arts and Sciences
Mentor(s): Monique Turner (College of Communication Arts Sciences)

According to et al Hembroff: Objective: Evaluate effectiveness of a university-wide social norms marketing campaign to reduce high-risk drinking and its consequences among students at MSU. Participants: Campaign messages regarding descriptive and injunctive norms were distributed campus-wide from 2018 to 2025 to correct norm misperceptions. Methods: Random samples of students surveyed most semesters to monitor message saturation, dosage, and believability along with drinking attitudes, behaviors and harm related to celebratory events. NCHA conducted biennially since 2000 to assess overall progress. Results: Perceived drinking norms declined along with measures of actual drinking intensity, frequency, and frequency of intense drinking. Use of protective behaviors most often addressed in campaign messages increased while driving after drinking declined. Importantly, reported adverse effects of drinking on academic performance declined substantially. Conclusions: The evidence suggests the social norms approach has been effective at reducing adverse academic outcomes of drinking. Changes in perceptions, attitudes, behaviors and outcomes appear to be continuing.

PERCEIVED ATTRACTIVENESS AND ROMANTIC COMPETENCE IN PEOPLE WHO STUTTER: EXPLORING THE IMPACT OF PSYCHOLOGICAL AND COMMUNICATIVE FACTORS
Presenter(s): Tara Fleury
Category: Communication Arts and Sciences
Mentor(s): Amir Hossein Rasoli Jokar (College of Communication Arts Sciences), J Scott Yaruss (College of Communication Arts Sciences), Molly Stevenson (College of Communication Arts Sciences)

The purpose of this study was to explore how people who stutter perceive their own attractiveness and romantic competence, and which factors such as internalized stigma, communication anxiety, disclosure experiences, coping strategies, and stuttering severity are associated with these perceptions. We collected data through semi-structured interviews in which we asked participants questions about how they perceive their attractiveness and romantic competence, and whether it is impacted by different psychological and communicative factors. We want to know how stuttering affects the romantic self-perception of people who stutter. Past research studies have been conducted on how people who do not

stutter perceive people who stutter, but we want to look at how people who stutter perceive themselves in terms of attractiveness and in a romantic situation.

FAST FORWARDING AND BOREDOM: HOW DOES TIKTOK AFFECT OUR WELL-BEING?
Presenter(s): Ashley Childs, Benni Ellis-Goertler, Taylor Brogan
Category: Communication Arts and Sciences
Mentor(s): Allison Eden (College of Communication Arts Sciences)

Short-form video content platforms, especially TikTok, has become an integral aspect to the modern media environment. However, much research on media focuses on longer form media, which does not provide much insight on the effects of the structure of short-form media on attention, which is vastly different. For instance, it is more accessible to fast forward through short-form video rather than traditional media. This has left a gap in research for how short-form media can impact a user. To address this gap our research is asking if the ability to fast forward impacts how bored a user may get while consuming short-form media, and how a person's boredom is affected by short-form media. To investigate these questions, we have created an experimental design study, where participants are split into two groups. Both groups will begin by filling out a Multidimensional State Boredom Scale Survey to assess a person's boredom before. Both groups will then watch the same seven videos, group one was given the ability to fast forward throughout the videos, whereas group two was not. After watching, everyone is asked to fill out another survey to measure the change in boredom after viewing the videos. We then compare group one and group two, to see the difference. Our hypothesis is that fast forwarding will be positively related to boredom experienced. Data collection is currently ongoing. This research should help flesh out the understanding and knowledge of how our interactions with social media affect us psychologically.

SYMPATHETIC AROUSAL AND SPEECH VARIABILITY IN CHILDREN WHO STUTTER: A VIRTUAL REALITY INVESTIGATION
Presenter(s): Caroline Crago
Category: Communication Arts and Sciences
Mentor(s): Bridget Walsh (College of Communication Arts Sciences)

Stuttering is a complex neurodevelopmental condition that affects approximately 1% of the global population. It is characterized by disruptions in the forward flow of speech, such as sound prolongations, blocks, and repetitions. One of the hallmarks of stuttering is variability-it is well known that individuals who stutter experience fluctuations in their stuttering depending on the communicative context. It is suggested that increased autonomic nervous system arousal could affect speech motor control, leading to increased stuttering; however, empirical support for this is limited. This could explain, however, why stuttering increases in more demanding or stressful speaking situations. This study aims to assess how communication context impacts sympathetic nervous system arousal and the speech production of preschool-aged children who do and do not stutter (CWS and CWNS). Children answer age-appropriate questions in two virtual reality speaking scenarios: one presenting a higher stress load (e.g., talking to a

classroom of children), and one presenting a lower stress load (talking to a pet kitten). Children's electrodermal responses will be analyzed to index sympathetic arousal across the two contexts. We will also analyze children's utterances, and for the group of CWS, syllables stuttered. Findings from this study will provide insight into how different stress communication contexts affect children's autonomic arousal and speech production and increase understanding as to why variability is a hallmark of stuttering.

TIKTOK AND COPING WITH ACADEMIC STRESS
Presenter(s): Ananya Naik, Liliana Gutierrez
Category: Communication Arts and Sciences
Mentor(s): Allison Eden (College of Communication Arts Sciences)

TikTok has grown in use over the past decade, especially popular among young adults. Many report using TikTok for more than just entertainment, but rather to distract from or seek solutions to their life stressors. This research examines the relationship between TikTok and stress-coping mechanisms among college students. Knobloch-Westerwick (2009) demonstrated that stress-coping strategies fall under three categories: problem-focused approach, emotion-focused approach, and escapism. We hypothesize that students will predominantly use TikTok for problem-focused and escapism-focused coping strategies to cope with their academic stress. We used a survey to obtain quantitative data from 60 university students, in which we measured current academic stress, as well as perceptions of TikTok videos that were previously rated as being predominantly problem-focused (e.g., study plans), emotion-focused (e.g., meditation), or escape-type content (e.g., dance videos). Using linear regression analysis, we analyzed the relationship between the engagement ratings and time spent watching TikToks that were coded for each coping strategy approach and the score for perceived academic stress. We hope that the findings of this study will give us insight into the uses of TikTok beyond entertainment and help others better understand the ways in which they use short-form content, like TikTok, to cope with stressors and regulate moods and emotions.

CRISIS REPORTING IN FOREIGN COUNTRIES: THE VALENCIA FLOOD
Presenter(s): Patrick Ferrino
Category: Communication Arts and Sciences
Mentor(s): Manuel Chavez (College of Communication Arts Sciences)

The Valencia flood was a 2024 tragedy that should not have happened due to the level of disaster warning infrastructure already in place, but not properly used. Regional authorities failed to notify residents quickly enough, evident by the fact that thousands of emergency calls were made before an official alert was sent and many victims were already trapped when warnings reached their phones. Many residents first learned of the danger through news coverage, social media or direct exposure rather than official government communication. The tragedy exposed failures in Spain's regional disaster response system and demonstrated how delays in government decision-making can worsen the human impact of a natural disaster.

E-BILE AND DIGILANTISM: HOW RAPE CULTURE SPREADS AND TRANSFORMS ONLINE SPACES
Presenter(s): Allison Miller
Category: Communication Arts and Sciences
Mentor(s): Ruth Shillair (College of Communication Arts Sciences)

This poster based on a literature review describes how rape culture perpetrates throughout online spaces, including image-based sexual abuse, as well as community efforts to pushback against rape culture infiltration. Rape culture is a widespread ideology that works to excuse or support sexual assault, with "e-bile" which further describes misogyny on the Internet. Using the available research, it was discovered that rape culture ideologies (e.g., rape myths, reinforcing traditional gender roles, among others) are present in numerous online spaces, including X (previously Twitter), gaming spaces, and more. This was also prevalent on pornography sites where users nonconsensually posted images of women, often their ex-partners or people they knew and dehumanized them. With the growth of deep-fake tools the spread of harmful images and videos are growing exponentially. However, it was also observed there was large pushback from communities, where some individuals aimed to take matters into their own hands, including "digilantism," and started grassroots activism organizations. Because of the serious harm caused by image-based abuse there is a growing call for legislation with penalties for those who create such content. This poster proposes action-orientated research to help empower survivors and further educational efforts to reduce this harm.

CSD CLINICAL CASE STUDY DATABASE (MSU VIP)
Presenter(s): Isis David, Sarah Newman
Category: Communication Arts and Sciences
Mentor(s): Jeffrey Siarto (College of Communication Arts Sciences)

The purpose of this study is to provide an updated database for head/neck/swallowing clinical case studies. The system will be designed where researchers and clinicians can upload and find case studies in a standardized format. The goal for this team is to design a system that achieves those objectives. Students working on the project have used user research, prototype design, and project management to continue the progression of this project. Sarah Newman is the project manager and Isis David and Iraj Tambat are the other students working on this project.

FROM THIRST TRAPS TO HARASSMENT: GENDER DIFFERENCES IN TIKTOK COMMENT CULTURE
Presenter(s): Evie McDonald, Saniya Beasley
Category: Communication Arts and Sciences
Mentor(s): Allison Eden (College of Communication Arts Sciences)

With the increased usage of social media over the past two decades, an environment has been cultivated where sexual harassment has been normalized. On the social media app TikTok, users are able to watch, post, comment, and engage with often highly sexualized videos (e.g., dance videos or "thirst traps"), and engage with the creator via responses known as comments. In these spaces, harassing

comments may often go unchecked, which especially affects female creators. In this study, participants will view two TikTok videos with sexualized content from one male and one female creator. Participants will then be shown a simulated TikTok comment section with 5 "sexualized" comments and 5 "unsexualized" comments, and asked to interact with each comment. After reading through the simulated comment section, they will be given the opportunity to post their own comments. Participants' tolerance for sexual harassment will be assessed based on their reactions or "comments" they wrote under the video, as well as their engagement with simulated comments. We hypothesize that participants will engage in more sexualized commenting behavior and tolerance of sexualized comments with female versus male creators. Overall, this work illuminates how gender differences impact commenting behavior on sexualized content on TikTok.

SEPARATING ENJOYMENT FROM APPRECIATION IN FILM: HOW DO PERSONAL VALUES IMPACT EACH?
Presenter(s): Ava Crozier
Category: Communication Arts and Sciences
Mentor(s): Allison Eden (College of Communication Arts Sciences)

From where do we draw enjoyment and appreciation for films? Prior literature suggests that these impacts arise from the presence of values in the narrative: whether they are activated and whether they align or conflict with those of the viewer. This study examines how perceived value activation, alignment, and conflict relate to anticipated enjoyment and appreciation of movie descriptions. We surveyed 165 participants (Mage = 19.57, 71% Female) on their interpretation of the values of 10 randomly assigned movie posters and summaries from 77 inspirational films selected in previous research. When the film's values were relevant and congruent with those of the viewer, we saw a positive relationship with anticipated enjoyment. Unsurprisingly, we saw a negative relationship between value conflict and anticipated enjoyment. We also saw positive relationships between anticipated appreciation of the film and value relevance, congruence, and perceived challenge. Regression analyses show that enjoyment is negatively related to perceived emotional challenge ($b = -.427$, $t = -2.817$, $p = .006$). Appreciation is positively related to perceived value relevance ($b = .414$, $t = 3.6$, $p < .005$), emotional challenge ($b = .326$, $t = 5.208$, $p < .001$), and intellectual challenge ($b = .176$, $t = 3.26$, $p < .005$). Overall, challenge is negatively related to enjoyment but positively related to appreciation. Value relevance predicts appreciation only. Future work will extend these findings to media like television, podcasts, news, and social media.

THE ROLE OF LANGUAGE STYLE SIMILARITY IN INFLUENCER CREDIBILITY AND CONSUMER PURCHASE LIKELIHOOD
Presenter(s): Annabelle Meyer, Dominick Kaunelis, Genevieve Lippincott
Category: Communication Arts and Sciences
Mentor(s): Allison Eden (College of Communication Arts Sciences)

Prior research has indicated that people report positive social interactions with others who match their language style, a metric calculated by the frequency of style words (e.g., articles, pronouns). This study

seeks to determine how positive interactions between individuals with similar language styles affect purchase intention. This study predicts that greater language style matching (LSM) will be associated with higher purchase intention (H1), greater enjoyment (H2), higher perceived credibility/trustworthiness (H3), and increased engagement/relatability (H4). Approximately 250 participants will first be asked to answer three 100-word written response questions. Viewers will watch six randomized TikTok videos out of a pool of ten and rate their likelihood of purchasing the products, the enjoyment of the video, trustworthiness, and connection with the influencer. Responses and video transcripts will be put through Linguistic Inquiry Word Count (LIWC) software to measure language matching level. The implications of this research can help inform companies on how language style matching between influencers and viewers on short-form media platforms can increase product discovery and consumption.

THE RELATIONSHIP OF TIKTOK USE AND SUSTAINED ATTENTION
Presenter(s): Gia Jhangiani, Tamara Stoner-Sleight
Category: Communication Arts and Sciences
Mentor(s): Allison Eden (College of Communication Arts Sciences)

TikTok has become a widely used media platform over the past decade, but has created concerns over how this short-form media app affects the user's sustained attention. This study aims to answer the question: Is there a relationship between usage of TikTok and sustained attention? Using the Sustained Attention to Response Task (SART) game as well as collecting the participants average daily screen time on TikTok, we hypothesize that results may show the more time spent on TikTok is negatively related to sustained attention scores. We will measure sustained attention through the number of no-go errors made on a SART game. Results have implications for understanding short form video content policy and usage.

UNDERSTANDING NEWS AVOIDANCE, FATIGUE, AND OVERLOAD AND THEIR IMPLICATIONS TO DEMOCRACY
Presenter(s): Nora May
Category: Communication Arts and Sciences
Mentor(s): Manuel Chavez (College of Communication Arts Sciences)

This paper summarizes the literature related to news avoidance. First, it clarifies the definition of avoiding the news in comparison to the news overload and news fatigue. Fundamentally, news avoidance is described as the behavioral decision to intentionally or habitually disengage from news content, either by actively avoiding it or by consistently consuming very little news. One major consequence of not paying attention to avoiding the news relates to democracy as lower exposure to political information can reduce citizens' ability to stay informed about public affairs and participate meaningfully in civic life. Drawing on national survey research, studies, interview-based research, and theoretical frameworks, this paper argues that news overload, news fatigue, and news avoidance are three separate but related phenomena. While overload can contribute to fatigue and fatigue can

increase avoidance, research shows that avoidance is also shaped by political interest, identity, and media infrastructure. Treating these concepts as interchangeable disregards important differences in how they work and what they mean for democratic engagement.

ANNOTATION OF LARYNGEAL LANDMARKS FOR TRAINING DEEP NEURAL NETWORKS
Presenter(s): Shri Keerthi Alla
Category: Communication Arts and Sciences
Mentor(s): Maryam Naghibolhosseini (College of Communication Arts Sciences), Mohsen Zayernouri (College of Engineering)

Laryngeal imaging is a vital component of the clinical voice assessment, allowing clinicians to visualize the vocal folds and surrounding laryngeal tissues in healthy and disordered voices. The main clinical tool for laryngeal imaging, videostroboscopy, requires a periodic acoustic signal, limiting its use to sustained phonation for functional voice evaluation. However, most human communication occurs during connected speech, where many voice disorders are observed. As a result, imaging methods capable of capturing laryngeal behavior during connected speech provide more clinically relevant information than sustained vowel phonation alone. Laryngeal high-speed videoendoscopy (HSV), has emerged as a powerful tool for laryngeal imaging. HSV does not rely on a periodic acoustic signal, and when combined with a flexible nasolaryngoscope, can capture the intra-cycle vibrations of the vocal folds with intricate details due to its high temporal resolution. Despite the clear advantages of HSV over videostroboscopy, its clinical use remains limited, largely because HSV generates a large number of frames, making manual analysis difficult. As such automated approaches are therefore necessary to fully utilize HSV data. Deep learning methods offer a promising solution for reliable, scalable analysis of large HSV datasets. In this study, four laryngeal regions were manually annotated to train deep learning models: the aryepiglottic folds, vocal folds, glottal area, and epiglottis. In total, 1,500 images from eight normophonic and seven disordered speakers were manually labeled for the creation of a deep learning method. Model performance was evaluated using these annotations, with test set accuracy exceeding 90%.
Acknowledgments: We acknowledge the support from NIH NIDCD R21DC020003 and K01DC017751, also Michigan State University Discretionary Funding Initiative.

Criminal Justice & Legal Studies

UNDERSTANDING HOW OUTREACH WORKERS PERCEIVE PROGRAMMATIC SUCCESS WITHIN A FOCUSED DETERRENCE FRAMEWORK
Presenter(s): Emma Defries, Hannah Salgado, Neyda Isidoro-Martinez, Reagan Ruatto
Category: Criminal Justice and Legal Studies
Mentor(s): Jordan Parker (College of Social Science), Julie Krupa (College of Social Science)

Focused deterrence programs, such as Detroit Ceasefire, employ a multidisciplinary approach to violence reduction by integrating law enforcement, community mobilization, and social service strategies. Much

of this work is carried out by trusted community members known as Outreach Workers. To date, research has largely assessed the success of violence prevention programs through the reduction of shooting incidents. However, outreach teams employ a multitude of strategies to prevent violence that aren't often captured in these assessments. Drawing on three semi-structured focus groups with 18 Outreach Workers, this study examines how Outreach Workers conceptualize and assess participant and programmatic success. Findings suggest that success within focused deterrence programs extends beyond reductions in violence to include broader social and individual-level outcomes. By expanding dominant definitions of success, this study offers a more nuanced understanding of the impacts of focused deterrence programming.

OUTREACH WORKERS' CHALLENGES WORKING WITHIN A FOCUSED DETERRENCE PROGRAM
Presenter(s): Grace Lakinske, Lauren Petroff, Lily Tinnion
Category: Criminal Justice and Legal Studies
Mentor(s): Jordan Parker (College of Social Science), Julie Krupa (College of Social Science)

Focused deterrence programs, such as Detroit Ceasefire, employ a multidisciplinary approach to reduce violence by combining law enforcement, community mobilization, and social service strategies. Much of this work is led by trusted community members known as Outreach Workers who seek to prevent violence by working directly with individuals at-risk of violence perpetration. This study identifies individual and organizational challenges faced by Outreach Workers in a local focused deterrence program. Using three semi-structured focus groups with 18 Outreach Workers, the study highlights key challenges and offers recommendations to strengthen focused deterrence initiatives through improvements to outreach work.

UNDERSTANDING OUTREACH WORKERS' MOTIVATIONS AND DRIVES
Presenter(s): Kaylyn McDowell, Kelsy McCormick, Sophia Crova
Category: Criminal Justice and Legal Studies
Mentor(s): Jordan Parker (College of Social Science), Julie Krupa (College of Social Science)

Detroit Ceasefire is a locally implemented focused deterrence strategy designed to influence the behavior of individuals at-risk of perpetrating violence and has been a central component of violence reduction efforts in Detroit, Michigan. Like other focused deterrence initiatives, the strategy integrates law enforcement, community mobilization, and social service approaches. Within Detroit Ceasefire, Outreach workers play a pivotal role by responding to violent incidents and providing supportive services to affected individuals and communities. Using qualitative focus group data (n = 18), this study examines the motivations of Outreach team members to better understand the factors that drive their engagement in this work. By understanding their motivations, we hope to identify factors that can support effective programming and recruitment.

EXPLORING OUTREACH WORKERS' STRATEGIES TO REDUCE VIOLENCE
Presenter(s): Camrynn Sanders, Meghan Gustin, Natalie Stangis, Ty Thurston
Category: Criminal Justice and Legal Studies
Mentor(s): Jordan Parker (College of Social Science), Julie Krupa (College of Social Science)

Detroit Ceasefire is a locally implemented focused deterrence strategy designed to influence the behavior of individuals at-risk of perpetrating violence and has been a central component of violence reduction efforts in Detroit, Michigan. Like other focused deterrence initiatives, the strategy integrates law enforcement, community mobilization, and social service approaches. Within Detroit Ceasefire, Outreach teams play a pivotal role by responding to violent incidents and providing supportive services to affected individuals and communities. This study examines the actions and strategies employed by the Ceasefire Outreach team to reduce violence and influence individual behavior, with particular attention to the routine practices that characterize their day-to-day work. Results from this study provide additional insight into the mechanism through which violence prevention occurs. Data were drawn from three semi-structured focus groups with 18 Outreach Workers on the Detroit Ceasefire team.

DIGITAL CRIME REPORTING: ASSESSING OPPORTUNITIES AND PRACTICES IN MICHIGAN
Presenter(s): Reina St Juliana
Category: Criminal Justice and Legal Studies
Mentor(s): Anna Gurinskaya (College of Social Science)

Crime reporting is the primary gateway through which citizens interact with police, shaping opportunities for protection, prevention, and trust-building. Yet underreporting remains persistent, often driven by mistrust, fear, and perceived costs of engaging the system. As policing undergoes digital transformation, agencies increasingly offer online reporting portals and related tools, but little is known about how these platforms are actually implemented in practice within the highly decentralized U.S. policing system. This project systematically maps digital crime reporting tools across more than 100 police agencies in Michigan using a structured coding protocol to examine the availability, format, and presentation of online reporting options. By focusing on the tools themselves rather than citizens' perceptions, the study establishes a baseline picture of how reporting opportunities are designed and communicated, laying the groundwork for future research on how digital reporting design may influence public engagement and trust in law enforcement.

ASSESSING LEGAL NEEDS AMONG MARGINALIZED PARENTS IN TREATMENT FOR SUBSTANCE USE DISORDER
Presenter(s): Lucas Warren, Nathan Elliston
Category: Criminal Justice and Legal Studies
Mentor(s): Meghan O'Neil (College of Social Science)

Through the use of survey data, we were able to get a better understanding of how court fees and court processes present barriers to the recovery process

Digital Humanities

CONTEMPORARY TRENDS IN ECONOMIC JUSTICE AND AMERICAN DEMOCRACY
Presenter(s): Laila Komis
Category: Digital Humanities
Mentor(s): Elizabeth Drexler (College of Social Science), Eric Montgomery (College of Social Science)

This project focuses on deep-rooted economic injustices built within the system's foundation as well as examining how those inequalities and abuses of power have infiltrated into the possible downfall of democracy. This is a project will compare previous data to current times. With ever widening economic inequality, and greater unchecked corporate and PAC money, American democracy is teetering on the brin, of disaster. Many of the traditional guardrails and checks and balances of the federalist constitutional democracy are eroding. As the rich get richer and the middle class disappears-- the intimate ties between economic justice and American Democracy have never been more important.

DEMYSTIFYING ARTIFICIAL INTELLIGENCE THROUGH CORE CONCEPTS, INFRASTRUCTURE, AND HANDS-ON TEXT ANALYSIS
Presenter(s): Rebecca Ryan, Tianyi Zhou
Category: Digital Humanities
Mentor(s): Tianyi Kou-Herrema (College of Arts & Letters)

Artificial Intelligence has become increasingly common in our lives, yet many people still have a limited understanding of how it works and how it may shape our future. This project shows how AI can be demystified through learning core concepts, visiting physical infrastructure, and working on a hands-on text analysis project. Using ICER's High Performance Computing service (specifically LM Studio), we compared the outputs of various open-source language models of different sizes and origins by asking identical prompts and observing how responses varied. To ground AI in physical reality, we visited ICER's on-campus data center, where we experienced the heat generated by computing infrastructure and learned about hardware lifecycles. In the final collaborative project, we intentionally compared two approaches of doing text analysis: an AI-assisted topic modeling service provided through ProQuestTDM, and a Python code-based Latent Dirichlet Allocation (LDA) workflow developed in Jupyter notebook (also hosted by ProQuestTDM). By comparing these two approaches, we see how preprocessing decisions and parameter choices shape topic modeling outcomes. It also shows why transparency matters in scientific research. Grounded in AI literacy, our project demonstrates that learning how AI works and working with it critically can reduce anxiety and build critical awareness. As AI continues to develop and shape many aspects of work and daily life, knowing how to navigate the AI landscape can help ease fears and counter misinformation.

NETWORK ANALYSIS OF UNDERGROUND COMIX
Presenter(s): Theo Scheer
Category: Digital Humanities
Mentor(s): Kristen Mapes (College of Arts & Letters)

The underground comix community was a seminal artistic group and movement popular in the 60s and 70s that challenged authority and transformed the medium of sequential graphic art. Robert Crumb, whose crude and often grotesque depictions of American culture and his own mind have received praise and infamy, is often credited as its face. Using Crumb's authorized biography, Crumb: A Cartoonist's Life, by Dan Nadel - the most comprehensive account of the cartoonist's life to date - I created a network analysis of individuals in and around the underground comix scene to understand how an artists community is constructed on a quantitative level. Using the network analysis site GraphCommons, I created a graph that displays 284 individual people and the 650 relationships between them. My graph outlines 44 different types of relationships in total, everything from "collaborators" to "weed dealer." I also wrote short biographies for 257 of the people in my graph, based on information online and in the book, totaling 7,980 words. GraphCommons allows users to analyze where "clusters" of highly-interconnected nodes (in my case, people) appear in a network, allowing me to explore spheres of influence and connectivity within the underground comix scene. For example, I found that Crumb's ex-wife, Dana Morgan, and his occasional collaborator and Mad creator Harvey Kurtzman were centers of clusters of connectivity within the scene. And Kathy Gooddell, Crumb's ex-girlfriend, acted as a "bridge" between different sub-groups within the network.

MEMORIALIZING TIMES OF CRISIS: CREATIVITY IN THE TIME OF COVID-19
Presenter(s): Abigail Brooks, Brayden Chrisman, Lorraine Inman
Category: Digital Humanities
Mentor(s): Natalie Phillips (College of Arts & Letters)

Our presentation assesses Creativity in the Time of COVID-19: Art as Medicine, an exhibition drawing on a database of art made in response to the Covid-19 pandemic collected between 2020 and 2022. We examine the showcase done by the Digital Humanities and Literary Cognition Lab (DHLC) at Michigan State University in the Fall of 2024 to determine how successful we were in creating an exhibit of artistic expression marginalized community experiences during the Covid-19 pandemic, calling to attention the systemic oppressions and individual struggles they faced. Attendees were surveyed about their emotional experience with the exhibit in order to get feedback on our exhibit design for improving the display in future iterations, and determine what thematic and emotional takeaways came from their experience. We found points of significant tension throughout the exhibit, both with the heavy content the art explored and how close it was to viewers' own emotional experiences of the pandemic. While the quantitative and qualitative data collected highlights these points of tension, we seek to point towards resolution of that tension, focusing future iterations of the exhibit on processing and visions of the future as a method of memorialization, with a particular focus on visions of systemic change as conveyed through artistic expression. We also argue that these points of tension may in fact serve the exhibition's

goal rather than hinder it, with the increased emotional impact creating a stronger impression in the viewer tied to their memory, thereby also serving the project of memorialization.

TIMELINE OF TECHNO: THE DEVELOPMENT OF A COUNTER-CULTURAL GENRE AND MOVEMENT IN DETROIT
Presenter(s): Allison Doneth, Madelyn Corgan, Yigit Akan
Category: Digital Humanities
Mentor(s): JULIAN CHAMBLISS (College of Arts & Letters), Natalie Phillips (College of Arts & Letters)

Techno, a musical genre which emerged in the 1980s, has its roots in the area surrounding Detroit, Michigan. Despite having gained world-wide popularity, there is not yet a thoroughly documented, succinct historical description of the events surrounding its development and distribution. This project, which takes the form of a digital archive, will fill in the gaps that currently exist in the historical narrative of techno's musical and cultural development, placing a particular emphasis on the marginalized voices responsible for its philosophy and goals of its artists. We are creating an interactive multimedia timeline that utilizes images, archival video, audio, and more multimodal forms in an effort to archive various aspects of this movement. The chronology will draw on interviews conducted with prominent figures and scholars in the techno movement, as well as previously collected exhibition material. Eventually, it will be freely available online and embeddable through our use of digital humanities tools, and its multimodal presentation will encompass the various visual, philosophical, and aural influences on the movement and subculture. This final project mirrors the development and stylistic ethos of techno itself, drawing from many sources to create a work both artistic and political, in a format which pushes towards the future of its medium.

NETWORKING THE REVOLUTION
Presenter(s): Morgan Fox
Category: Digital Humanities
Mentor(s): Gillian MacDonald (College of Social Science)

Networking the Revolution is a digital humanities project focused on studying political communication during the late seventeenth century in Scotland and the wider British Isles. It combines early modern history with data science methods to better understand how people were connected through correspondence during a period of major political change. In this project, I help build the foundation of the analysis by creating structured datasets from historical letters. This involves extracting information from manuscript and printed sources, standardizing names, dates, and locations, and organizing sender and recipient relationships into usable formats. Once compiled, these datasets allow for deeper analysis of communication patterns that would be difficult to see through traditional methods alone. I then use tools such as network analysis and mapping to visualize these relationships and explore how information and influence moved between individuals and across regions. By examining who was connected, how frequently they communicated, and where letters traveled, the project reveals patterns of alliance, power, and information flow. Overall, Networking the Revolution offers a more data-driven perspective

on the Glorious Revolution, showing how early modern communication functioned as a complex and interconnected network.

ASK BEFORE YOU'RE EVICTED: AI TOOLS FOR HOUSING JUSTICE
Presenter(s): Emily Porco, Rithi Aree, Roberto Garcia, Sumaiya Imad
Category: Digital Humanities
Mentor(s): John Waller (College of Social Science)

Low-income tenants are at tragically high risk of eviction, and they often lack access to meaningful legal assistance. In 2023, the number of cost-burdened tenants reached a record high. Federal housing assistance has been unable to accommodate this rise, with approximately 5 million households receiving assistance, and over 14 million very low-income renters are eligible for aid but go unassisted. No housing organization can meet the need for permanent housing. These tenants are often unaware of their rights as renters. Where cases of eviction are heavily concentrated in low-income communities, these tenants cannot afford an attorney and therefore rely on the limited availability of public defenders. This creates a national disproportionality where a mere 4% of tenants receive representation, while 83% of landlords do. America needs an innovative approach to provide for the millions of at-risk tenants with a mechanism that addresses the extreme asymmetries in income and legal knowledge. Using AI chatbots as a method of information gathering, tenants and low-income residents will be able to understand their rights in comprehensive ways while mitigating the wait and cost of a lawyer. We have been working to create a housing AI chatbot from the ground up, sourced solely on peer-reviewed legal statutes and caselaw in Michigan.

Diversity & Interdisciplinary Studies

DIGNITY, COMMON GOOD, AND COLLECTIVE FUTURES
Presenter(s): Peter Styx
Category: Diversity and Interdisciplinary Studies
Mentor(s): Elizabeth Drexler (College of Social Science)

My independent study presentation examines the imaginary and advancement of collective futures through human-centered social movements, with particular attention to memorialization, photography, and group activism exhibited in response to the events of Minnesota in early 2026. Drawing on the theoretical anchoring of Dignity and Commons, this presentation centers the importance of dignity within the politics of representation and collective struggle. Through an analysis of protest imagery this project emphasizes the importance of civic participation, truth-telling, and accountability in a broader conceptualization of collective futures. As memorials operate as political demands and solidarity emerges in response to injustice, collective memory is defined through representation and dignity. This project aims to demonstrate the importance of community activism in resisting injustice and curating a more dignified collective future.

ENACTING KARBALA: SOUTH ASIAN SHIA DIASPORIC YOUTH'S ENGAGEMENT WITH RELIGION AND POLITICS
Presenter(s): Ahmed Amir
Category: Diversity and Interdisciplinary Studies
Mentor(s): Linda Sayed (James Madision College), Nareman Amin (College of Arts & Letters)

For Shia Muslims, the Battle of Karbala in the 7th century (in which Husain, the Prophet Muhammad's grandson, was murdered by other Muslim political opponents) is a focal point in Islamic history. Remembering, commemorating, and mourning the tragic sacrifice of Husain at Karbala is central to their religious identity. South Asia has a rich heritage of Shia mourning rituals and traditions surrounding the Muharram period. These traditions have been exported to diasporic communities where first- and second-generation immigrants continue (or reinterpret) them in their specific contexts. This study, relying on qualitative interviews with South Asian Shia youth who have grown up in the United States, analyzes how these groups understand, (re)interpret, and (re)enact their religious traditions and history in America. This study focuses on generational differences in practice and interpretations, connections to more "traditional" forms of mourning (azadari) in younger generations, and the impact of religious teachings on political engagement. This study finds that while younger members do continue religio-cultural traditions unique to South Asian Shia mourning, there is an emphasis on understanding the "why" behind each practice or ritual, therefore practicing intentionally rather than blind conformity. Additionally, Karbala serves as a powerful paradigm through which to understand the world around them; the values and lessons learned from Karbala instill a strong sense of justice and activism, as Husain's stand against tyranny and oppression is an essential theme in the Karbala narrative. Whether these lessons lead to actual political activism, however, varies greatly.

BIODEGRADABLE FOOTWEAR DESIGN: EVALUATING PLANTAIN PEELS AS A MIDSOLE MATERIAL
Presenter(s): Ikenna Iyioke
Category: Diversity and Interdisciplinary Studies
Mentor(s): Daniel Uyeh (College of Agriculture & Natural Resources)

At the global level, the footwear industry is largely built upon a "take-make-dispose" model, resulting in significant environmental repercussions, one of the many being massive landfill waste due to complex, multi-material construction that limits or forgoes disassembly and recycling. The average shoe is composed of over 23 different components, complicating end-of-life affairs. Circular Design (CD) offers a transformative, sustainable approach by prioritizing products that are made to be durable, repairable, and, most importantly, designed for disassembly and biodegradability at the end of their life cycle.

This project investigates the feasibility and effectiveness of using plantain peels in shoe design, initially focused on prototyping single-material, biodegradable, and functional midsoles. This approach transcends synthetic, "bio-based" polymer designs, focusing on agricultural waste-based alternatives that address global concerns. The end goal is a fully plantain peel-derived shoe design.

ALTERED MULTISCALE KINEMATICS IN A CHLAMYDAMONAS MODEL OF CYSTIC FIBROSIS
Presenter(s): Selina Tripathy
Category: Diversity and Interdisciplinary Studies
Mentor(s): Hannah Thompson (Lyman Briggs College), Jennifer Doherty (Lyman Briggs College), Nicholas Licata (University of Michigan - Dearborn)

In Cystic Fibrosis (CF), the airway surface liquid becomes dehydrated and highly viscoelastic,leading to the mechanical failure of mucociliary clearance. To model this biophysical collapse, we utilized the biflagellate Chlamydomonas reinhardtii, whose flagella are structurally homologous to human respiratory cilia. Using high-speed microscopy and automated tracking, we quantified cellular motility across varying methylcellulose (MC) concentrations to mimic CF- like environments. Our kinematic analysis revealed that turn angle intervals in water followed a double-exponential distribution, exposing two distinct timescales: a microscopic flagellar beat time (ms) and a macroscopic phase-slip turn time (ms). As MC concentration increased, these timescales decoupled non-monotonically. Initial shear-thinning and hydrodynamic coupling briefly accelerated both beat and turn mechanics, but severe rotational resistance and polymer entanglement at higher concentrations ultimately stalled both processes. Crucially, this multiscale mechanical disruption destroyed the organism's standard navigation strategy. While cells in healthy control media exhibited a biphasic mean squared displacement-diffusive at short timescales and highly ballistic at long timescales-the high-viscosity CF model completely broke down this behavior. The transport exponent dropped significantly, collapsing the long-time ballistic motion into a homogenized, diffusive state. These findings demonstrate that C. reinhardtii effectively recapitulates the multiscale mechanical failure observed in CF airways, highlighting how fluid viscoelasticity does not merely slow ciliary beating but fundamentally traps the system in a stifled, diffusive regime.

Education

MARGINS OF THE EQUATION: TRANSGENDER MATHEMATICIANS NAVIGATING SOCIO-ECONOMIC INEQUALITY
Presenter(s): Emerson Bogacki
Category: Education
Mentor(s): Justin Gutzwa (College of Education), Reagin McNeill (Lyman Briggs College)

Since 2017, shifts in U.S. political discourse and policy have intensified socio-economic challenges faced by transgender individuals, including those working and studying in mathematics and other STEM fields. Although mathematics is often framed as an objective and neutral discipline, structural inequalities continue to shape access to education, employment opportunities, and professional advancement. The political climate during and following the Trump administrations contributed to heightened barriers for transgender people through policy changes, public rhetoric, and the weakening of certain legal protections. Drawing on recent scholarship on transgender inclusion in STEM, educational access, and labor inequities, this analysis of interviews with 20 transgender mathematicians living and working in the

United States highlights several interconnected challenges affecting transgender mathematicians. These include workplace discrimination, limited institutional support, restricted access to healthcare and legal documentation, and broader economic instability. Such factors can influence hiring practices, workplace safety, career advancement, and long-term financial security within academic and professional mathematical communities. Situating participants' narratives within the broader socio-political context of the past decade demonstrates how public policy and institutional structures shape participation and equity in STEM fields. Greater attention to inclusive policies, institutional accountability, and supportive professional environments remains essential to ensuring equitable access and sustained participation for transgender scholars in mathematics.

**DON'T JUST CODE IT-EXPLAIN IT: EVALUATING EXPLAIN-IN-PLAIN-ENGLISH ASSESSMENTS IN COMPUTER SCIENCE EDUCATION **
Presenter(s): Hussein Alanbari
Category: Education
Mentor(s): Ritam Ganguly (College of Engineering)

The rise of agentic coding tools powered by large language models (LLMs) that can read codebases, edit files, and execute commands has made code comprehension an essential skill for modern programmers. However, these models are not always reliable, increasing the need for individuals who can effectively prompt them and critically evaluate their outputs. This has led to the emergence of "Explain in Plain English" (EiPE) questions in computer science education, which assess students' understanding by asking them to describe code behavior and logic in clear, human-readable terms. A key challenge with EiPE questions is grading, as manual evaluation is inefficient and existing automated approaches struggle with differentiating if the student has a relational understanding of what the code is doing or if they provide a line-by-line explanation. In this study, we propose a modified Code Generation Based Grading (CGBG) approach that leverages LLMs to generate code from student explanations and evaluates correctness using unit tests. We also impose character limits on responses to encourage concise, relational reasoning rather than line-by-line descriptions.

COLLISIONS AND CHEMISTRY ON SCREEN: EVALUATING KINETICS CONTENT ON YOUTUBE
Presenter(s): Ana Ivanov, Kripa Paudel, Lindsey Geiger, Makenna Rendeiro, Olivia Kollovozi
Category: Education
Mentor(s): Deborah Herrington (Grand Valley State University), Ryan Sweeder (Lyman Briggs College)

Students frequently use YouTube to support their learning of chemistry concepts; however, the conceptual quality of these videos varies widely. Novice learners, especially those still developing foundational chemistry concepts, may struggle to identify high-quality videos. The Chemistry on Screen project evaluates general chemistry educational content that students may find on YouTube using a research-based framework. YouTube videos related to kinetics were evaluated with this rubric to determine the extent to which they incorporated elements found to support student conceptual understanding development. The research-based framework used to examine Youtube videos included

conceptual content such as Johnstone's triangle, core ideas, science practices, and causal mechanistic reasoning. Additionally, the framework includes several production and engagement elements (multimedia use, analogies, captions, and self-assessment). Our initial video screening process identified 36 videos for in-depth coding. Of these, only 20 videos met the concept of interest and were included in our final dataset. These results were compared with prior analyses of other general chemistry concepts to examine patterns regarding how chemistry topics are represented in online educational videos. Notably, evaluation of kinetics videos highlighted the value of grounding instruction in macroscopic phenomena. This poster will present our detailed findings regarding patterns, strengths, and areas for improvement from our set of kinetics videos and compare the set of videos to previously evaluated general chemistry topics.

STATISTICAL METHODS' EFFICACY IN DETECTING BIAS IN ESSAY SCORES OF UPPER ELEMENTARY STUDENTS
Presenter(s): Colleen Blackwood, Isabella Berch, Isabella Chan, Rebecca Jankowski
Category: Education
Mentor(s): Adrea Truckenmiller (College of Education), Lindy Johnson (College of Education), Pamella Moura-LaMer (College of Education)

Most teachers seek to be as equitable when grading as possible, but research shows that often comparing the scores of subgroups of a population such as ethnicity and gender can reveal an inequitable difference in scores (De Lamo White & Jin, 2011; Laing & Kamhi, 2003). However, detecting the enemy of equity, bias, can be very difficult. For this analysis, bias is defined as statistically significant differences in essay scores between genders, indicating that an exterior factor, such as a faulty prompt or unequal teaching methods, might be affecting the student's performance. This study weighs the benefits and drawbacks of some of education research literature's bias-identification statistical methods. In addition, this study thoughtfully implements the researched analyses on genders in a data set of 3rd-5th grade students from Florida to determine which bias analysis method holds the most efficacy. Then, recommendations are given as to which statistical method most effectively detects this bias and how bias can be mitigated in future writing tests.

IMPACT OF MAJOR ON UNDERGRADUATE SUCCESS IN UPPER LEVEL MICROBIOLOGY COURSE
Presenter(s): Logan Sheard
Category: Education
Mentor(s): Phillip Delekta (College of Natural Science)

MGI-301, Introductory Microbiology, is a large-enrollment course serving multiple colleges with many prerequisite pathways feeding into MGI-301. We wondered if college, major, or specific prerequisite coursework (AP biology, BS-161, LB-145, or transfer credit) influenced their retention of foundational knowledge or correlated with success in MGI-301. At the start of the semester, students took a survey to assess molecular biology concepts that we expected them to know from their prerequisite course. Surprisingly, the time elapsed since students took their prerequisite course did not correlate with survey

scores. While we found that overall survey scores (50%) were similar regardless of their prerequisite, we observed prerequisite-specific deficiencies in key content knowledge. Incoming cumulative GPA was also shown to be correlated with student success in the course with the general trend being that students who entered with a higher GPA were more likely to perform well in MGI-301. Additionally, overall student performance on the survey, particularly on central dogma-related and vocabulary questions, showed a relationship with final course grade in MGI-301. Further analysis will determine if there is a relationship between undergraduate college and major and student outcomes in MGI-301. The insights from this study will be used to identify indicators for student success in MGI-301, improve alignment between prerequisite courses and MGI-301, and to design tools to remediate prerequisite content deficits for MGI-301 students.

RESEARCHING NEEDS OF DIGITAL TEACHING AND LEARNING COMMUNITIES
Presenter(s): Maren O'Connor, Peyton Johnson
Category: Education
Mentor(s): Imari Tetu (College of Arts & Letters), Scott Schopieray (College of Arts & Letters)

This research investigates user experiences with digital tools to support teaching and learning communities of practice. For this study, the team conducted user interviews to learn about participant experiences with digital platforms while facilitating or participating in communities of practice. The information gained from these interviews helps inform best practices when creating digital tools to support teaching and learning communities of practice.

INVESTIGATING HOW NEUROSCIENCE UNDERGRADUATES REASON WITH ION FLUX FIGURES
Presenter(s): Jordan Temple
Category: Education
Mentor(s): Aeryn VanDerSlik (College of Natural Science), Jennifer Doherty (Lyman Briggs College)

The ability to interpret graphs is critical to students studying neuroscience, however, a majority of students struggle with this skill. Examining how students draw on different cognitive reasoning skills when interpreting graphs can provide insight into how scientific reasoning develops across undergraduate courses. The goal of this study is to develop a better understanding of how students use practical resources to interpret neuroscience graphs throughout their undergraduate coursework. I analyzed 13 student interviews using Resource Theory. Resource Theory is the idea that a student's cognitive performance is dependent on a limited collection of resources, such as conceptual and practical knowledge that consists of small, context-dependent pieces that can be activated in different situations. The way students reason depends on which resources they activate in response to a task and how those resources are used to construct an explanation (Hammer & Elby 2002). During these interviews, students were asked to reason with three different types of neuroscience graphs: an action potential, a current graph, and an IV curve. I found that students further along in their coursework tended to begin with practical reasoning and then build toward conceptual reasoning when interpreting graphs. In contrast, students earlier in their coursework relied more heavily on conceptual reasoning and

were less likely to use practical reasoning as part of their approach. Overall, students further in their coursework incorporated practical reasoning as a foundation for their conceptual explanations, whereas students earlier in their coursework primarily depended on conceptual reasoning.

MAINTAINING EQUILIBRIUM: INVESTIGATING EDUCATIONAL CONTENT OF BUFFER VIDEOS ON YOUTUBE
Presenter(s): Ana Ivanov, Kripa Paudel, Lindsey Geiger, Makenna Rendeiro, Olivia Kollovozi
Category: Education
Mentor(s): Deborah Herrington (Grand Valley State University), Ryan Sweeder (Lyman Briggs College)

Youtube is frequently used by students to supplement learning about educational topics, however, the conceptual quality of these videos varies greatly. Novice students often lack the ability to determine the quality of educational videos, especially when still learning core chemistry concepts, like buffers. The Chemistry on Screen project aims to identify what students are finding on YouTube by evaluating chemistry instructional videos across a variety of general chemistry concepts using a research-based framework. This poster presents the results of an analysis of buffer focused Youtube videos to determine how effectively they support students' learning. Selection criteria including conceptual focus, video length, number of views, and language of video were used to filter the initial set of buffer YouTube videos from 37 down to a set of 21 videos for detailed analysis. The research-based framework used to evaluate the videos included both conceptual content (Johnstone's triangle, core ideas, science practices, and causal mechanistic reasoning), and video production and engagement elements (multimedia use, analogies, captions, and self-assessment). Results from this analysis were compared to those from similar analyses on other introductory chemistry concepts, such as Gas Laws and Enthalpy, to identify similarities as well as topic specific differences.

DEMO DESIGN FOR UNDERSTANDING AC ELECTRIC MOTORS
Presenter(s): Maggie Gaunt
Category: Education
Mentor(s): Daryl McPadden (College of Natural Science)

Electricity and Magnetism Projects & Practices in Physics (EMP-Cubed) is a flipped-classroom, active course that teaches principles of electricity, circuits, and magnetism in introductory physics. Rooted in Project Based Learning (PBL) and Communities of Practice (CoP), EMP-Cubed is focused on developing scientific skills like creating scientific models, evaluating those models, and teamwork. Using a Backwards Design approach, this project created a new in-class problem and demonstration for EMP-Cubed focused on understanding alternating current (AC) electric motors. First, learning goals were identified, then a complex problem was created that requires a team to solve, following CoP principles. The problem was designed to give students the freedom to make creative decisions and evaluate their solution and model, following PBL principles. Additionally, a demonstration for the problem was created to help students visualize and connect physics to real-world situations, meeting universal design for learning guidelines. The problem was tested with the EMP-Cubed undergraduate learning assistants, feedback was collected,

and changes were made to the problem based on this initial testing, with the problem finally running in class with over 230 students. In this presentation, we show how multiple educational frameworks were woven into the design of this problem and highlight the iterative design process used to reach the final version.

THE QUALITY OF EDUCATIONAL APPS PARENTS REPORT PROVIDING TO THEIR PRESCHOOLERS
Presenter(s): Amy Dillon
Category: Education
Mentor(s): Burcu Ozkum (College of Social Science), Lori Skibbe (College of Social Science)

In recent years, young children's engagement with digital media has increased. With this change comes an influx of apps labeled as "educational," though their quality likely varies. We plan to examine the quality of these apps directly. Thirty parents of preschoolers were interviewed to see which apps they used within their homes. Thirty-two different educational apps were mentioned, which will be evaluated using Kolak's (2021) app quality tool. The study will examine only apps labeled as educational, excluding entertainment apps such as YouTube and Netflix, which parents also mentioned. The evaluation tool assesses apps based on fifteen categories, incorporating Hirsh-Pasek et al.'s (2015) four pillars of learning. In addition, this study provides five more categories: instruction, character quality, absence of disruptive features, privacy and security, and equity and affordability. The apps are scored on a scale from 0 to 2 for each category, adding up to a total quality score from 0 to 30, with higher scores representing higher educational quality. This refined evaluation framework provides an assessment of apps' educational quality that emphasizes children's development, highlighting the importance of choosing well-rounded apps. We will discuss the implications that this has for parents, including recommendations for how to select high-quality educational apps.

WHAT HELPS ULAS FLOURISH? UNDERGRADUATE LEARNING ASSISTANTS' PERSPECTIVES ON THEIR SUPPORT STRUCTURES IN INTRODUCTORY CHEMISTRY LABS
Presenter(s): Chanel Issa
Category: Education
Mentor(s): Rachel Barnard (Lyman Briggs College)

Undergraduate Learning Assistants (ULAs) are important help for faculty and students, but they need support to be effective in their work. LB 171L is Lyman Briggs College's introductory chemistry laboratory course that has 24 sections each fall, each supported by 2 ULAs. This course teaches first-year students safety, lab techniques, and inquiry-based exploration of lecture ideas into a chemistry lab environment. ULAs are students who did academically well in the courses they are assisting and are hired to elicit student thinking and learning about course material. ULAs in LB171L take attendance, start the lab, answer students' questions, ensure safety requirements are met, help professors give feedback to students, and hold office hours. Support structures specifically for the ULAs include a 20 minute pre-lab meeting, weekly 60 minute teaching team meetings, a post-lab conversation, and a library of curriculum resources. In this project we are exploring which course structures the Fall 2025 LB 171L ULAs perceived

as helpful in order for them to flourish in their work as ULAs. We are also exploring these differences between first-time and experienced ULAs in this course. To explore these questions, the ULAs were surveyed at the end of the semester. Future work could include exploring differences in perceived course structure helpfulness between the ULAs and the instructors.

PHYSIOLOGY IN ACTION: HOW EMERGENCY MEDICINE RESIDENTS THINK UNDER PRESSURE
Presenter(s): Morgan Kasyouhanan
Category: Education
Mentor(s): Jennifer Doherty (Lyman Briggs College)

Physiology is taught as a core science topic, yet its role in real-time clinical decision-making is rarely seen in undergraduate training. This qualitative study explores how emergency medicine residents apply physiological knowledge while evaluating and managing patients in the emergency department. We conducted interviews with emergency medicine residents to explore when and how physiological knowledge informs their clinical decision-making. We conducted interviews with emergency medicine residents, focusing on how and when physiology comes into play; residents worked through three emergency department case scenarios and were asked to think aloud as they explained their thought process. Interview transcripts were analyzed using coding to identify patterns in reasoning strategies. Several recurring themes were evident, including pattern recognition, systems thinking, risk factors, and the prioritization of "can't-miss" diagnoses. Rather than jumping directly to diagnoses, participants explained which physiological systems were failing and how those failures interacted across organ systems. Our findings highlight that physiology serves as a cognitive tool that supports quick paced decision-making. Understanding how clinicians actively use physiological reasoning may help bridge the gap between preclinical education and clinical practice.

"BEING A ULA HAS MADE ME FEEL LIKE I BELONG AT MSU:" UNDERSTANDING THE IMPACTS OF BEING AN UNDERGRADUATE LEARNING ASSISTANT IN ACTIVE LEARNING PHYSICS COURSES.
Presenter(s): Maggie Gaunt, Truman Bauer
Category: Education
Mentor(s): Daryl McPadden (College of Natural Science), Rachel Henderson (College of Natural Science)

Undergraduate Learning Assistants (ULAs) help increase student success and are the backbone of interactive and discussion-based learning environments. Additionally, being a ULA has considerable effects on the ULAs themselves, which is often understated or an afterthought. In this study, we share results from the experiences of our current and previous ULAs within the Projects and Practice in Physics course sequence (EM/P-cubed) at Michigan State University (MSU). EM/P-cubed is a transformed introductory calculus-based physics course sequence that engages students in scientific practices using complex, real-world problems. Students work in small groups to model physical phenomena while ULAs, as small group instructors, act as facilitators by encouraging students to discuss physics concepts and problems-solving strategies. To better understand the ULA experience, we sent out a survey to all past and present EM/P-Cubed ULAs since 2014. This survey included 11 open-ended, free-response questions

focused on aspects such as student success, career development, interpersonal connections, and being a Spartan. Qualitative analysis showed how the program positively impacted ULAs ranging from succeeding in their careers to developing scientific skills (such as groupwork, professional, and technical). In this poster, we will discuss the numerous ways in which ULAs are positively impacted by the EM/P-Cubed learning assistant program at MSU.

A FOREVER FIELD TRIP: ZOO-BASED STEM EDUCATION AND LONG-TERM SCIENTIFIC LITERACY
Presenter(s): Claire Shriner
Category: Education
Mentor(s): Eva Farre Prokosch (College of Natural Science)

AZA-accredited zoos and aquariums have become one of the most accessible methods of familiarizing children with applied science and conservation learning, particularly for children with limited access to hands-on, science learning in formal classrooms. Despite growing recognition of the role they play in STEM-education development, it remains unclear how effective their education standards are at fostering sustained scientific literacy and interest in scientific research after high school. Previous research has largely examined short-term learning outcomes for animal-centered programming, which leaves a gap in understanding how systems-based, planet-inclusive approaches contribute to long-term impacts on both education and the workforce. This research adopts a more holistic perspective that treats plant and ecosystem processes as foundational to scientific understanding.To address this question, a synthesis of survey-based research, program evaluations from AZA-accredited institutions, and an exploration of how these learning frameworks are developed will be conducted, paying particular attention to learning standards aligned with Next Generation Science Standards (NGSS) with conservation biology foundations. The primary contribution of this research is to reframe zoo-based STEM education as a critical, early-stage component of the science and research-based workforce, as opposed to solely an enrichment experience. The analysis conducted suggests that interdisciplinary learning standards strengthen scientific literacy and conservation thinking in ways that support a path towards research-based STEM careers and highlights the importance of informal education in preparing future scientists to address complex environmental issues.

EARLY CHILDHOOD EDUCATION: WALKING A FINE LINE
Presenter(s): Madalena Garneau
Category: Education
Mentor(s): Heather McCauley (College of Social Science)

School readiness is a vital component of early childhood education, alongside funding and the quality of these programs. When creating policy surrounding the future of ECE, it is important that policy makers consider sustainable, blended sources of funding for publicly funded programs. It is also important to prioritize kindergarten readiness by providing a high quality curriculum that doesn't teach to a standardized test. Finally, policymakers must consider removing the financial barriers for future early childhood educators by providing more funding to accredited programs and public, low interest loans.

Changes based on these three focuses will help improve the quality of early childhood education programs and create equitable education for children across the United States.

HOW DO STUDENTS USE METACOGNITION TO INTEGRATE INTUITIVE AND DISCIPLINARY KNOWLEDGE IN UNDERGRADUATE BIOLOGY?
Presenter(s): Ava Taylor
Category: Education
Mentor(s): Alexander Waugh (College of Natural Science), Jennifer Doherty (Lyman Briggs College)

Learning occurs by building on and reshaping existing knowledge rather than replacing it outright. For example, when students learn the disciplinary core concept of flux (gradient-driven flow), they might leverage their intuitive understanding of how food coloring in water dissipates from high to low concentration to deepen their understanding of diffusion. Metacognition can support students during problem solving by helping them monitor what they do and do not know. However, little is known about how students use metacognition to integrate their intuitive and disciplinary knowledge during problem solving. In this study, we interviewed undergraduate biology students using think-aloud interview protocols to elicit their reasoning as they solved novel, open-ended flux problems. By interviewing students at the beginning and end of the semester, we captured the effects of more and less developed disciplinary knowledge on their use of metacognition and intuitive knowledge. Analyses of interviews with two focal students revealed how metacognition facilitates integration of intuitive and disciplinary knowledge. Metacognitive actions created opportunities for students to recognize productive and unproductive aspects of intuitive ideas which facilitated integration with disciplinary knowledge, even early in the semester when their knowledge of flux was relatively naive. It emerged that students' epistemic framing, their interpretation of the intellectual work demanded by a problem, influenced whether and how they used metacognition and the degree to which they incorporated intuitive knowledge during problem solving. Instruction that scaffolds metacognition while emphasizing the productivity of intuitive knowledge can support students in using disciplinary core concepts to solve novel problems.

MAKING ANSWERS OR MAKING SENSE? INTERPLAY BETWEEN METACOGNITION AND EPISTEMIC FRAMING IN THE UNDERGRADUATE BIOLOGY CLASSROOM
Presenter(s): Micah Ecclestone
Category: Education
Mentor(s): Alexander Waugh (College of Natural Science), Jennifer Doherty (Lyman Briggs College)

Mechanistic reasoning is a fundamental cognitive process of the STEM disciplines, enabling scientists to explain observable phenomena. However, students often rely on memorizing steps to solve problems rather than reasoning mechanistically. Students monitor and regulate their own thinking during problem solving via metacognition and their epistemic frame toward the intellectual work demanded by a problem-solving context influence how students reason. However, metacognition and epistemic framing have largely been examined as separate influences on student reasoning, typically using clinical

interviews, and never in the natural setting of an undergraduate biology course. In this study, we investigated the interplay between epistemic framing and metacognition and how that influences mechanistic reasoning. We video-recorded two groups of four students working together in class on reasoning tasks during all four lessons of a single unit of the Spring 2025 semester. We developed a theoretically grounded qualitative coding scheme informed by metacognition and epistemic framing theories. This allowed us to identify and describe episodes of interplay between metacognition and epistemic framing. For example, answer-making frames oriented metacognition toward monitoring correctness relative to authority, accelerating answer production while constraining mechanistic reasoning. In contrast, sensemaking epistemic frames, in which students aim to go beyond presented information to build coherent explanations, directed metacognition toward monitoring gaps of knowledge in order to build coherent models. Our findings suggest instructional practices that underlie productive and unproductive forms of interplay between metacognition and epistemology. Scaffolding metacognition alone may be insufficient to support mechanistic reasoning without also fostering sensemaking frames.

RETENTION IN GERMAN PROGRAM
Presenter(s): Julia Malone
Category: Education
Mentor(s): Senta Goertler (College of Arts & Letters)

Secondary language learning outcomes vary greatly across students and circumstances. This study analyzes data from sixty-six MSU students in their first year of German (GRM101 and GRM102) to identify factors that make students more successful in German and more likely to continue with it. Course modality, prior language-learning experience, assignment completion rates, and engagement with the course are explored as possible factors. The analysis of survey results was informed by literature on language acquisition such as Lightbrown and Spada's Popular Ideas About Language Learning Revisited and The Routledge Handbook of Language Program Development and Administration. Initial findings suggest that students who were taking German for reasons independent of an external language requirement were more likely to turn in a high percentage of assignments, students who had taken German in high school were more likely to continue to study the language into college regardless of language requirement, and students with strong external motivators (language requirement, desire for fluency) were more likely to earn higher grades. This implies that students with previous exposure to the language and higher levels of external pressure are more likely to succeed in German and continue learning the language past their first year.

SPARTANS WILL, BUT THEY WON'T: WHY TEACHER EDUCATION ACADEMY PARTICIPANTS DO NOT MATRICULATE INTO THE TEACHING PREP PROGRAM AT MSU
Presenter(s): Maliyah H Drain
Category: Education
Mentor(s): Kelley Johnson (College of Education)

Across the United States, teacher preparation programs have experienced a rapid decline in enrollment, resulting in an ongoing shortage in educators and reduced diversity within the profession. MSU has created pre-college pipeline initiatives to address this issue by allowing high school students to gain exposure to teaching careers and to encourage them to pursue teacher education at MSU. However, there is a questionable number of students who participate in MSUs teacher education programs but do not ultimately enroll in the institution's Teacher Preparation Program. This research project examines why students who complete Michigan State University's Teacher Education Academy (TEA), a summer pre-college teacher pipeline program, do not matriculate into Michigan State University's (MSU) Teacher Preparation Program. As a preview, a significant barrier for participant matriculation is the financial burden associated with attending MSU. Although this program is available for all students with teaching aspirations, it was created to provide students in urban communities the opportunity to nurture their aspirations while allowing them to explore campus. While students may develop interest in the institution through participation in the TEA program, many ultimately decide not to enroll because of concerns about tuition costs, limited scholarship opportunities, and overall affordability. By identifying these systemic barriers including financial accessibility the study aims to provide recommendations for strengthening recruitment alignment, improving communication about scholarships and financial aid opportunities, and increasing collaboration to keep students interested in MSU's Teacher Preparation Program.

UNDERSTANDING INSTRUCTOR EXPERIENCES AND PERCEPTIONS OF HUMAN-INFORMED GENERATIVE AI FEEDBACK
Presenter(s): Nazifa Begum
Category: Education
Mentor(s): Michele Weston (College of Engineering), Tammy Long (College of Natural Science)

The growing presence of generative artificial intelligence (AI) in higher education has sparked widespread conversations about teaching, learning, and assessment. As the use of this emerging technology continues to expand across academic spaces, instructors report mixed feelings, ranging from excitement about its potential to concerns regarding accuracy, ethics, and instructional value. While much of the current discourse focuses on instructors' views of the potential applications of AI in higher education, comparatively less attention has been paid to examining instructors' experiences and perceptions of this technology as it is implemented in instructional contexts. This study explores instructors' experiences with and perceptions of a customized generative AI feedback system implemented in an undergraduate biology course. The system was developed with involvement from the lab coordinator to ensure alignment with project objectives, standards, and expectations. As part of a qualitative case study design, interviews were conducted to examine how instructors engaged with the

system, how they evaluated its feedback effectiveness, and how it influenced their feedback practices. Reflexive thematic analysis was used to identify patterns across instructor reflections. By centering instructors' lived experiences with a human-centered AI feedback system, this study contributes to a deeper understanding of how AI-enabled feedback is interpreted, negotiated, and integrated into formative feedback practices. Rather than focusing on what AI can do, the findings show how instructors make meaning of human-centered AI-enabled feedback and reflect on its role within their instructional decision-making.

HOW DO MEDICAL PROFESSIONALS THINK ABOUT PATIENT COMMUNICATION: A NEED FOR INCREASED EDUCATION ON NON-EXPERT COMMUNICATION?
Presenter(s): Nicole Rockett
Category: Education
Mentor(s): Jennifer Doherty (Lyman Briggs College), Keenan Noyes (College of Natural Science)

Mechanistic reasoning is a way of thinking that relies on knowledge of the underlying process of a system (Machamer et al., 2000). It involves breaking a system down into its parts, identifying the relevant properties of those parts, and connecting those properties to the behavior of the overall system (Krist et al., 2018). This thinking strategy has been shown to be helpful in biology education by supporting reasoning to understand content at a deeper level (Southard et al., 2017; Doherty et al., 2023). Our recent research suggests that mechanistic reasoning may also be useful for supporting communication with non-experts, given its structured approach to breaking down processes, but there is little existing research into the simplification of complex processes for non-experts. Our research question is (1) how do pre-medical undergraduates and medical professionals simplify complex processes in explanations to non-experts and (2) where they learned these communication strategies. We are recruiting pre-medical students in biology (N=10) and physiology (N=10) courses, as well as medical students (N=10), and practicing physicians (N = 10) to be interviewed as part of this qualitative study. Our interview protocol explores how they simplify complex biological processes in explanations to hypothetical patients and where they learn to simplify complex information.The results of this study could provide guidance on ways in which students could be taught to simplify complex information, especially considering that early results indicate that students are drawing on other non-school experiences to inform their communication strategies.

EFFECTS OF NOVEL DATA COLLECTION ON MOTIVATION AND PROJECT OWNERSHIP IN A COURSE-BASED UNDERGRADUATE RESEARCH EXPERIENCE
Presenter(s): Hudson Beals
Category: Education
Mentor(s): Michele Weston (College of Engineering), Tammy Long (College of Natural Science)

Course-based undergraduate research experiences (CUREs) embed research into undergraduate courses and have been shown to support a range of student outcomes. While the general benefits of CUREs have been studied, the role of novel data collection in influencing student motivation and project ownership is

underexplored. This question is important because both CUREs and novel data collection require significant time and resources. This study investigates whether participation in novel data collection influences levels of student motivation and project ownership in CUREs. Across two semesters, students developed original research questions about autumn senescence (leaf color change and leaf fall) in relation to environmental factors. In the fall semester, students collected weekly tree phenology data from assigned trees, while in the spring semester, students analyzed instructor-provided datasets. Survey responses from 161 students were used to measure motivation (students' interest, value, and effort) and project ownership (students' personal investment in their work). Mixed-effects regression models were used to compare outcomes between treatments while holding GPA, credit level, and group effects constant. Novel data collection did not significantly affect motivation scores ($b = 0.46$, $p = 0.869$). However, students who collected their own data reported significantly higher project ownership than students who used instructor-provided data ($b = 4.54$, $p = 0.005$). These findings suggest that while novel data collection may not increase overall motivation, it can meaningfully strengthen students' sense of ownership in a CURE project.

Engineering, Computer Science, & Mathematics

ELECTRONICS WORLD ACROSS DIFFERENT DEPARTMENTS
Presenter(s): Ava Curtin, Jeevan Polisetty, Rron Rexha, Sanjay George
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Demet Korucu (College of Natural Science)

In this undergraduate project It is aimed to work together students from different departments to learn how electronics knowledge and lab skills can be applied in real life.

WHEN MACHINE LEARNING MEETS PERSISTENT HOMOLOGY FOR MRI RECOGNITION
Presenter(s): Sarthak Kale, Shantanu Ingalagi
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Nkechi Nnadi (College of Natural Science), Yemeen Ayub (College of Natural Science)

Magnetic resonance imaging (MRI) plays a central role in the diagnosis of brain tumors, yet automated classification remains challenging due to high dimensionality, noise, and structural variability across patients and imaging protocols. In this work, we investigate the integration of topological data analysis (TDA) with machine learning to extract robust geometric signatures from MRI scans for multi-class tumor recognition. We develop a preprocessing pipeline consisting of cropping, skull-stripping, and contrast-limited adaptive histogram equalization (CLAHE), followed by cubical persistent homology computed directly on voxel intensities. Persistence diagrams in homology dimensions zero and one are transformed into persistence landscapes to obtain fixed-length vector representations suitable for learning. These features are then used to train a Neural Network from scratch and a pre-trained Random Forest model to classify the type of tumor present in the MRI. Our pipeline differs from traditional image classification

model frameworks such as Convolutional Neural Networks (CNNs), which rely on the arrangement of pixels across the image to determine the output class of an image. Instead, we rely on the topological signature present in an MRI to determine the type of tumor present in the image.

DRY-X: AN EFFICIENT, PORTABLE HEATED-AIR DRYING SOLUTION FOR HIGH-THROUGHPUT FOODWARE REUSE
Presenter(s): Alvaro Anaenugwu, Kaniz Fatema Promee
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Michael Lavagnino (College of Engineering)

As global efforts to mitigate single-use plastic waste accelerate, foodware-reuse organizations like "Takeout Takeout" face significant operational bottlenecks due to the slow 12-hour passive air-drying requirements mandated by FDA guidelines. Conventional industrial dish-drying solutions are often incompatible with small-scale kitchen facilities due to high costs ($16,000+), excessive power demands, and large spatial footprints. This paper presents the development of Dry-X, a low-cost ($743), portable, shelf-integrated drying system designed to operate within standard 110V/15A electrical constraints. The final design utilizes a repurposed three-tier stainless steel shelving unit retrofitted with a modular 6 kW heating and filtered-airflow subsystem. By employing a thermal tarp enclosure and a ducted distribution network, the system achieves uniform heat distribution and moisture removal. Experimental results demonstrate a reduction in drying time from 12 hours to approximately 12-15 minutes per cycle, increasing throughput to 60 containers per cycle. Psychrometric modeling confirmed the system's efficacy, showing a decrease in absolute humidity from 10.9 g/m^3 to 6.38 g/m^3 during the cycle. This solution provides a scalable, FDA-compliant framework for expanding reusable foodware programs while significantly improving worker ergonomics and sanitation standards.

GEO-ML: AN ONLINE TOOLKIT FOR PROBABILISTIC ANALYSIS OF GEOTECHNICAL ASSETS USING MACHINE LEARNING TECHNIQUES
Presenter(s): Anas Shaaban
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Raja Jaladurgam (College of Engineering), Surya Sarat Chandra Congress (College of Engineering)

Typical landslide risk management involves tasks such as hazard and consequence identification, risk analysis, calculation, evaluation, and acceptance, as well as risk mitigation, project execution, and monitoring. Accurate risk analysis and evaluation are essential to effective risk management and treatment, particularly in slope stability problems within the geotechnical domain. However, this process presents challenges in decision-making and in evaluating alternatives under conditions of uncertainty in field conditions, material properties, and analysis methods. These challenges are faced by field inspectors, geotechnical practitioners, designers, and researchers in selecting appropriate statistical parameters for uncertainty analysis, probability distributions, correlation coefficients, spatial variability parameters, suitable reliability methods, and acceptable risk levels. In this study, a comprehensive and logical framework, in the form of a web-based toolkit application, is developed from a compilation of past literature to provide guidelines and enhance the accuracy of risk estimation. This toolkit uses vision-

based Large Language Models (LLMs) to parse borehole log data and to extract location information. The extracted borehole information is displayed on an interactive map within the web interface. The proposed toolkit is designed to serve as a practical resource for field inspectors, geotechnical practitioners, and designers, guiding them in selecting and quantifying uncertainty in soil and model parameters, and in assessing the advantages and limitations of various probability distributions for specific hazards. Furthermore, an inbuilt chatbot provides recommendations for suitable reliability methods and establishes standard acceptable risk levels for different hazard scenarios. This toolkit ensures robust risk assessment and facilitates the adoption of effective risk management strategies to achieve safety goals and optimize the design process using probabilistic analysis.

MAPPING GROUNDWATER STORAGE IN MICHIGAN'S AGRICULTURAL IRRIGATED LANDSCAPES USING ADVANCED GEOPHYSICAL SURVEY TOOLS
Presenter(s): Maddie Andreatta
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Younsuk Dong (College of Agriculture & Natural Resources)

Michigan is known for its freshwater, a high concentration of which is stored in the five North American Great Lakes, with Michigan lying in the center. Something that is not as well known is that Michigan is also home to what is sometimes called the "sixth great lake", groundwater. This is a great resource, however a recurring problem is that there is very little understanding of Michigan's groundwater resources compared to the understanding of the state's surface water. Additionally, there is essentially no data about groundwater and its effects on farming and irrigation. To combat this, we have been utilizing tTEM (Towed-Transient Electromagnets) to gather data about the groundwater storage in agricultural areas of Michigan. The tTEM (towed Transient Electromagnetics) is a geophysical surveying method in which electromagnetic signals are transmitted into the ground from a towed system, and the returning signals are measured to map subsurface properties, especially variations in soil layers and groundwater. We conducted survey at 3 irrigated farms in Michigan. The collected data was compared to the nearest monitoring well to validation.

REDUCING T GATE COUNTS VIA GATESET ROTATION
Presenter(s): Hrishikesh Belagali
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Ryan LaRose (College of Engineering)

Quantum computers require a particular class of gates called the non-Clifford, or T gates in order to perform computations that classical computers cannot. These gates are error-prone on today's quantum computers, and very expensive to simulate using classical methods. This limits the scope of practical quantum computing and hampers the testing of novel quantum algorithms. Therefore, minimizing the number of non-Clifford gates is an important problem for realizing the benefits that quantum computers can provide. In this work, we investigate how controlled changes to the conventional quantum gate library can reduce the number of expensive gates in a circuit. Specifically, we apply a change of reference

frame to the conventional choice of operations, which results in lower costs for quantum circuit simulation and execution. To do this, we extend an existing framework known as the Gottesman-Knill formalism, which allows specific quantum circuits to be simulated efficiently on classical computers. We prove that circuits represented in terms of our modified gate libraries remain efficiently simulable, and derive results describing the achievable reductions in resource cost for circuits of different sizes. The theoretical analysis relies on the intrinsic symmetry of quantum operations, and we verify these reductions empirically using Python, NumPy and IBM's Qiskit package. In this presentation, I will discuss the motivation for modifying the conventional quantum gate library, explain how our extension of the Gottesman-Knill formalism functions, and present results covering provable average-case reductions as well as empirical improvements for circuits used in quantum machine learning and molecular simulation.

COMPARING STATE OF THE ART MEDICAL IMAGE CLASSIFIERS IN TERMS OF RESILIENCE TO REAL WORLD IMAGE VARIATIONS
Presenter(s): Emre Alyamac
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Adam Alessio (College of Engineering)

Generalization of image classifiers remains challenging with multiple studies demonstrating that high-performing models can fail when they inference on out-of-distribution data in real world environments. We propose a stress testing method to evaluate the resilience of models to input image degradation. This approach relies on calculating classification performance versus image degradation curves and characterizing performance breakdown in a gradual Deterioration regime and a Failure regime. We hypothesize that image classification performance as a function of domain shift away from training data can be characterized with simple measures offering a novel approach to stress test models. Methods: Multiple state of the art image classifiers (ResNet, Swin, ViT) were trained on datasets. Stress testing of these models was performed by evaluating the AUC as a function of increasing image degradation, modeled as a random application of common image processing degradations (brightness, gaussian noise, blur, contrast). Apparent image degradation for a set of images was estimated with the Deep Image Structure and Texture Similarity metric (DIST, Ding et al, 2020). We propose quantitative metrics to characterize the early Deterioration and Failure mode where performance gradually decreases as compared to where it drastically fails for increasing image degradation. Results: Curves of AUC vs. image degradation reveal that most models tend to fail gradually (deteriorate) and then rapidly (failure) as input images degrade.

COMPUTATIONAL PREDICTION OF BACTERIAL FLAGELLIN BINDING TO THE PLANT IMMUNE RECEPTOR FLS2

Presenter(s): Samantha Schulte
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Ben Dolgikh (College of Natural Science), Daniel Woldring (College of Engineering)

Numerous pathogen infections throughout history have devastated crop populations; emerging plant diseases continue to threaten global food security. Plants rely on an innate immune system consisting of machinery (i.e., proteins) to detect and fend off invaders. One such immune receptor, FLAGELLIN-SENSING2 (FLS2), detects fragments of bacterial flagellin and triggers an immune response. However, some bacteria have evolved to have modified flagellin peptides that enable them to evade perception. Additionally, some flagellin peptides bind FLS2 but block immune signaling (called antagonists) as opposed to triggering a defense response (called agonists). This project aims to engineer variants of FLS2 capable of recognizing and responding to evasive pathogens. To accomplish this, we are evaluating the ability of computational modeling tools such as AlphaFold and Rosetta to predict how mutations to FLS2 affect its ability to bind bacterial flagellin peptides, and to predict whether a given peptide will behave as an agonist or antagonist. Ultimately, this works aims to develop a computation pipeline that guides the design of engineered FLS2 receptors capable of reliably initiating plant immune responses to pathogenic bacteria.

PYRIDINIUM-BASED ANOLYTES FOR NON-AQUEOUS REDOX FLOW BATTERY APPLICATION.

Presenter(s): Tanvi Satoor
Category: Engineering, Computer Science, and Mathematics
Mentor(s): David Hickey (College of Engineering), Emmanuel Yankson (College of Engineering)

Redox flow batteries are promising systems for large-scale energy storage, particularly for grid applications. Organic redox-active molecules have gained attention as tunable and potentially sustainable alternatives to metal-based systems. Pyridinium-based compounds have shown potential for use in non-aqueous redox flow batteries due to their favourable physicochemical properties. This project focuses on the synthesis of a series of pyridinium-based organic molecules designed for battery applications. The compounds are prepared using established synthetic routes and purified using standard laboratory techniques. Structural confirmation and purity are evaluated through spectroscopic and analytical characterization methods. The goal of this work is to generate well-defined pyridinium derivatives that can be further evaluated for electrochemical performance in non-aqueous systems. Careful control over synthetic conditions and purification is essential to ensure reproducibility and reliability in downstream testing. By developing efficient synthetic strategies and producing high-quality redox-active materials, this research supports ongoing efforts to improve organic redox flow battery technologies. The resulting compounds contribute to the broader development of scalable and sustainable energy storage systems.

DIAMOND MINING, ENVIRONMENTAL DEGRADATION AND LOCAL LIVELIHOOD IN KONO DISTRICT, SIERRA LEONE
Presenter(s): Mingjie Wen
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Leonard Johnson (College of Natural Science)

This study seeks to examine the complex connection between diamond mining in Sierra Leone and its environmental impacts on the livelihood of families in affected communities. In a broad range of statistical analyses, we will investigate how such activities increase community conflicts, impact education and take away agricultural lands from members of these societies. We've integrated logistic regression model, and other quantitative analytics tools to provide a comprehensive assessment of livelihood response to diamond mining induced land changes over a significant period of time. The results of this study demonstrated that households in environmentally degraded areas have approximately seven times the odds of experiencing income or livelihood losses compared to households in non-degraded areas.

DESIGNING CONFIDENCE-AWARE QUESTION-ANSWERING SYSTEMS: A MULTI-SIGNAL APPROACH
Presenter(s): Rohan Banerjee
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Nicholas Panchy (Research & Innovation)

Organizations maintain extensive documentation and FAQs to help users solve problems independently, reducing support overhead while improving response time. However, users often struggle to navigate large knowledge bases, leading to repetitive support requests and delayed problem resolution. Automated question-answering systems address this by directly matching user queries to relevant documentation, but traditional FAQ retrieval systems struggle to distinguish genuine matches from "best of bad options," often delivering incorrect answers with false confidence. We address this through ensemble-based confidence scoring with adaptive routing between retrieval and generation. Our system combines bi-encoder semantic search, cross-encoder re-ranking, and LLM synthesis using a four-signal ensemble that evaluates: (1) semantic similarity, (2) absolute match quality, (3) relative ranking, and (4) score gap between candidates. This approach prevents normalized scores from making poor matches appear confident. Queries route adaptively based on ensemble evaluation: high-confidence matches use direct retrieval (1-2 seconds) while uncertain queries trigger LLM synthesis (5-10 seconds). Persistent model loading minimizes latency, achieving 3-6x speedup over always-LLM baselines. Developed for the ICER QA support system at Michigan State University, the system processes 60-80% of queries through the fast path. The ensemble approach reduced false-positive high-confidence responses by 85% compared to single-threshold baselines. Included calibration tools enable threshold optimization for new domains. This work demonstrates that multi-signal confidence scoring significantly improves both accuracy and efficiency in question-answering systems, making hybrid retrieval-generation architectures practical for production deployment.

CASE STUDIES IN A MULTISECTOR VIEW INTO IMPLIED VOLATILITY TERM STRUCTURE VIA BINOMIAL COX-ROSS-RUBINSTEIN MODEL SIMPLIFICATION
Presenter(s): Emily Sklenicka
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Albert Cohen (College of Natural Science)

We address the computational complexity of interpreting implied volatility (IV) term structures by utilizing a reduced-form model derived from the Cox-Ross-Rubinstein binomial framework. While IV is a critical indicator of market sentiment, traditional models often lack the speed required for rapid, multi-sector interpretation. This work is vital for financial analysts and economists who require efficient tools to assess firm-specific and sector-wide volatility in real-time. Building on decades of research, we extend existing literature by simplifying the binomial model-which assumes asset prices follow a discrete random walk-into a linear approximation. By calibrating the asset price movement factor against current call option prices and Treasury interest rates, we account for modern market conditions like inverted yield curves. This approach allows us to demonstrate a direct comparison between market-expected volatility and historical volatility calculated from annualized three-month daily returns. Through our analysis across sectors such as technology and retail, we identify significant outliers in individual firm volatility values. These findings suggest that our streamlined modeling can effectively highlight market anomalies and potential sector-wide distress. Ultimately, we conclude that elevated implied volatility levels within these sectors may serve as a leading indicator for broader recessionary trends. By providing a faster alternative to traditional pricing engines, we offer a scalable method for monitoring economic stability and firm-specific risk.

CHARACTERIZING THE MASS SHIFT OF A PENNING TRAP FOR STUDIES OF N=Z NUCLEI
Presenter(s): Isabella Robles
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Ryan Ringle (Facility for Rare Isotope Beams)

Nuclei are made up of protons and neutrons, and changing the number of neutrons in an element results in different isotopes with varying stability. Exotic isotopes, which are neutron-poor or neutron-rich, have shorter lifetimes and can change from the standard spherical shape to enhance their stability. A particular area of interest is the self-conjugate isotopes, where the number of protons and neutrons is equal. One such nucleus in this region, Zr-80, is predicted to have enhanced stability from shape deformation despite being neutron-poor. One measure of the underlying nuclear structure is the binding energy, which can be determined with precision mass measurements of the nucleus. At the Low Energy Beam and Ion Trap (LEBIT) facility, the nucleus of interest is trapped as an ion in a Penning trap, which gives access to its characteristic cyclotron frequency via the magnetic field. This frequency is measured via the Phase-Imaging Ion Cyclotron Resonance (PI-ICR) method and converted to a mass. Along with the measurement of the ion of interest, measurements of a reference ion are needed to calibrate the magnetic field. In this work, mass measurements were made of various reference ions to characterize the mass shift from higher order imperfections in the Penning trap. It was found that the mass shift is [X

orders of magnitude] smaller than the statistical error of the Zr-80 measurement, which increases the confidence in the mass value found for Zr-80.

DESIGN AND FABRICATION OF PNEUMATIC SOFT GRIPPERS USING ECOFLEX ELASTOMERS
Presenter(s): Eleazar Asase
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Shaoting Lin (College of Engineering)

Soft robotics is a rapidly growing field focused on creating compliant machines capable of safely interacting with delicate objects. This research aims to design and fabricate a pneumatic bending actuator for a soft gripper, based on the PneuNets (Pneumatic Networks) architecture described by Mosadegh et al. (2014). The actuator design consists of an extensible EcoFlex 031 elastomer layer bonded to a stiff cardstock strain-limiting layer. When pressurized, the stiffness asymmetry forces the actuator to bend. The geometry was reverse engineered in SolidWorks, and molds were fabricated using resin and PLA 3D printing. A significant challenge involved creating internal air channels without compromising the seal; this was solved using a multi-stage casting process where the base and strain-limiting layer were cast separately before being bonded to the main chambers. Bubble formation was mitigated using a conditioning mixer, and demolding issues were resolved with Mann Ease Release 200. The current phase demonstrates successful bending actuation. Future work involves integrating electro-adhesive tips to enhance gripping capabilities through controlled electrical impulses.

OPTIMIZING MALDI MATRIX APPLICATION FOR SPRAY AND SUBLIMATION
Presenter(s): Marie Shibata
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Tian (Autumn) Qiu (College of Natural Science)

An important imaging technique is Matrix Assisted Laser Desorption/Ionization Mass Spectrometry (MALDI-MS), which allows detection of the compounds present in biological tissues as well as their spatial localization. High spatial resolution is important to show how chemical markers spread through a sample. To generate gas phase ions, a matrix is applied to each sample that allows the molecules present to be ionized and desorbed by the MALDI laser, where they can be measured by the mass spectrometer. Precise matrix application is an important step in the imaging process, as image resolution and detection sensitivity are dependent on the density and size of matrix crystals. Pneumatic sprayers are commonly used to apply a matrix solution, which can cause delocalization due to sample diffusion when exposed to solvent. To combat this delocalization, a matrix sublimator prototype was constructed. The sublimator can apply matrix without solvent spray, decreasing the chances of delocalization in the sample and providing smaller crystals. To optimize both the pneumatic sprayer and the sublimator, a design of experiment (DoE) study will be carried out in order to quantitatively determine the matrix density as well as the effect of each method on crystal size. This study aims to measure important spray and sublimation parameters to create a template for ideal matrix application conditions for future experiments.

EVALUATING THE POTENTIAL OF FPV IN MICHIGAN
Presenter(s): Benjamin Vito
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Annick Anctil (College of Engineering), Ebne Rashid (College of Engineering)

Floating Photovoltaic (FPV) has become a popular method for installing photovoltaic systems worldwide. In addition to reducing land use, FPV is also expected to generate greater amounts of electricity than ground-mounted photovoltaic (GPV) systems due to the cooling effect of water. Some previous studies have accounted for this difference by applying a flat increase in energy production on modeled FPV systems, while others have considered lower air temperatures compared to ground systems. This research compares the energy generation of theoretical GPV and FPV systems over a year at the Muskegon Wastewater Treatment Plant to evaluate the potential of FPV in Michigan using the System Advisor Model. The GPV and FPV systems differ in their tilt angles, albedo values, and ambient temperature. Weather data from the National Solar Radiation Database (NSRDB) are used for the GPV system, while the FPV system data are adjusted to represent cooling effects of up to 5°C, and albedo values are set to appropriate values for water and ice surfaces. The energy generated by the FPV system increases by about 0.33% with each degree of cooling. The FPV generated less energy annually than the GPV in all cases but outperformed the GPV in May, June, and July regardless of cooling. Though previous literature shows that the cooling effect is stronger for FPV with a lower tilt angle, future research may need to consider higher tilt angles for locations with higher latitude such as Michigan.

CRYSTALLIZATION AND MECHANICAL PROPERTIES OF SEMICRYSTALLINE POLYMER NANOCOMPOSITES UNDER COLD DEFORMATION
Presenter(s): Qingchu Yang
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Juncheng Zheng (College of Engineering)

Due to their enhanced thermal stability and high Young's modulus, semicrystalline polymer nanocomposites have found widespread application as structural materials in engineering. However, the incorporation of nanoparticles often reduces the stretchability and ductility of semicrystalline polymers, limiting their use in high-performance environments. In our previous work, we demonstrated that cold deformation can induce a highly ordered, alternating crystalline/amorphous lamellar structure with ~10?nm periodicity in semicrystalline polylactic acid (PLA), which simultaneously enhances the Young's modulus, thermal stability, and ductility. In this study, we investigate the role of cold deformation on the crystallization behavior and mechanical properties of model semicrystalline polymer nanocomposites, specifically PLA/SiO? nanocomposites. We characterize the overall crystallinity, lamellar thicknesses, spatial distribution of the crystalline phase, and mechanical properties across a series of PLA/SiO? nanocomposites with varying nanoparticle loadings and particle sizes. A systematic comparison with semicrystalline neat PLA is conducted to evaluate the combined effects of nanoparticles and cold deformation on the mechanical performance of PLA/SiO? nanocomposites.

SCANNING ELECTRON MICROSCOPY CHARACTERIZATION OF MO/FE NANOPARTICLES FOR THE DEVELOPMENT OF METAL-EMBEDDED CATALYTIC MEMBRANE
Presenter(s): Jacob Dillenbeck
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Catalytic membranes provide a unique opportunity to combine the catalysis of chemical transformations and the separation of product from waste into a single stage. However, for this to be successful, both the membrane 'sieve' and the embedded metal catalysts must be precisely tailored to the specific reaction. The Ball Catalyst Design Lab focuses on developing these metal-embedded catalytic membranes for the sustainable conversion of nitrogen and methane. A critical challenge in this design is ensuring the Mo/Fe nanoparticles are correctly integrated into the membrane matrix. This research utilizes Scanning Electron Microscopy (SEM) to characterize the morphology and distribution of these nanoparticles. By analyzing particle size, surface area, and elemental dispersion, we can evaluate how the catalyst's physical structure influences its overall performance within the membrane.

AN ANTIBODY-GUIDED MACHINE LEARNING FRAMEWORK FOR IMPROVED DIAGNOSIS OF PEDIATRIC TRAUMATIC BRAIN INJURY
Presenter(s): Jillian Lynch
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Annie Needs (College of Engineering)

Each year, over 500,000 children visit the ER in the U.S. due to a traumatic brain injury (TBI). In addition to the initial head injury, secondary injury responses are occurring beneath the surface, including a strong antibody response. The Woldring Lab hypothesizes that the immune response triggered by a TBI provides insight into secondary effects of TBIs and can be developed into a blood-based diagnostic tool. This hypothesis was tested by collecting data from 18 TBI patients and 10 non-TBI controls and creating a classification model that would predict a TBI based on the antibody sequence inputted. In collaboration with Helen DeVos Children's Hospital, blood-samples were collected and RNA-sequenced to find the antibody sequences of the patients, which were then put into a machine learning (ML) model. In the ML model k-mer lengths, motif lengths, and filtering strategies were tested and produce. These variables were then used to calculate model accuracy, true positive rate, and true negative rate all following a leave-one-out validation approach. The best model is still being decided upon further calculations and graphical analysis. Ultimately, this prediction model will be programmed to take an input- such as the patients' blood- and give a quantitative output of a TBI.

METEORITE CUTTING FORCES
Presenter(s): Aman Goenka
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Nevzat Bugdayci (College of Engineering)

In-Situ Resource Utilization (ISRU) is essential for viable long-duration space missions, reducing reliance on Earth-based supply chains. While asteroids and meteorites provide accessible raw materials, their inhomogeneous structures pose unique challenges for precision manufacturing. Standard machining relies on static cutting parameters derived from homogeneous materials; applying these to variable meteoritic substrates risks critical tool failure. This study characterizes the machinability of the Muonionalusta meteorite relative to Aluminum 6061 and 1020 Steel. Through comparative milling tests at varying spindle speeds, the research attempted to derive standard linear cutting coefficients. Data analysis revealed that while the control metals followed predictable linear force profiles, the meteorite exhibited irregular force peaks and nonlinear behavior, rendering traditional linear calibration methods invalid for force prediction. To overcome this, the research proposes a nonlinear optimization framework to accurately model cutting forces in inhomogeneous space materials. Future work will focus on developing an algorithm for real-time parameter adjustment and designing mechanical fixturing systems suitable for space environments, replacing terrestrial epoxy solutions. These findings represent a crucial step toward safe, autonomous manufacturing in space.

STOWAWAY ARMREST DESIGN FOR A MEDICAL RECLINER
Presenter(s): Colin Koot
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Justin Scott (College of Engineering), Tamara Bush (College of Engineering)

Long-term care facilities average almost 2 falls per room per year. These occur during patient transfers when going from beds to chairs, sending residents to the emergency room. Patient transfers also lead to overexertion injuries in many nurses. Impediments to patient transfers such as fixed armrests can interfere with a caregiver's ability to transfer a patient into a chair and increase the risks associated with transfers. The goal of this work was to design a stowaway armrest for a medical recliner that allows a patient to be transferred into a medical recliner from the side without interference. A mechanical armrest design was completed using CAD software to model the proposed stowaway motion. The design components were manufactured in the MSU Manufacturing Teaching Laboratory and then assembled to build a fully functional prototype. The assembled armrest rotates from a fully horizontal to a fully vertical position, then slides downward along the vertical support bar. This design allows the armrest to be completely stowed away without using any additional space, an important consideration for use in medical settings. Additionally, the armrest is stowed away rather than completely detached, eliminating the risk of misplacing a detached armrest. This design improves the efficiency of patient transfers while also providing patients with a functional armrest when seated in a medical recliner. By minimizing spatial requirements and making the armrest simple to stow away, this armrest design provides a functional solution to help reduce demands on caregivers.

A DOUBLE-NETWORK, DOUBLE-SIDED, AND DYNAMIC ADHESIVE EFFECTIVE FOR DIFFERENT UNDERWATER APPLICATIONS.
Presenter(s): Khang Nguyen
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Caroline Szczepanski (College of Engineering)

Adhesives "adhere" to substrates via different intermolecular interactions. Challenges arise when traditional adhesives are applied to wet surfaces or applied in aqueous environments as water molecules disrupt prescribed intermolecular interactions at the adhesive-substrate interface. Hydrogels, three-dimensional polymer networks swollen with water, emerge as a solution to this challenge as their flexible and stretchable nature help achieve substantial adhesion underwater. Currently, hydrogel adhesives have been the subject of significant research, however their network and adhesive properties in different aqueous solutions (i.e. as a function of salinity or pH) have not been fully understood; this study aims to investigate this knowledge gap. In this study, we developed various double-network hydrogel adhesives, characterizing the kinetics of polymerization via real-time fourier-transform infrared spectroscopy (FTIR). Prior work confirms that they remain adhered to wet surfaces for ~30 mins and are flexible enough to be applied to dynamic and moving surfaces. Here we show that by increasing the solvent pH, equilibrium swelling significantly increases, while increasing the density of the secondary polymer network (polyvinyl alcohol or chitosan) decreases equilibrium swelling at the same pH. The effect of solvent pH on the mechanical properties and adhesive strength of the polymer (at equilibrium and similar swelling ratios) are investigated. These findings inform how these adhesive systems may be applied in diverse environments and mediums (seawater, in vivo tissue therapy, etc.).

BACKPACKS FOR INDIVIDUAL HEN MONITORING
Presenter(s): Ana Toradze
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Daniel Morris (College of Agriculture & Natural Resources)

Today, poultry is increasingly being transferred to large cage-free environments. As much as this environment allows poultry to exhibit natural behaviors, it can also lead to harmful behaviors, such as injurious pecking and piling. To address this problem, our research goal is to develop an automated poultry management system using LED interventions, because poultry reacts strongly to light. To achieve this, it's necessary to have an effective monitoring system, which can be provided through the use of chicken backpacks. These backpacks are hen identification devices that are used to monitor poultry in real time through cameras and track their movement on the aviary floor. Each of the backpacks has an AprilTag printed on top of it, so the ceiling-mounted camera can capture them, while it's recording the floor poultry for 24 hours. The fiducial markers give each hen a unique identification number. ApriTtag readings then return each chicken's identification number and its floor position at 1 frame per second throughout the day. This allows us to continually observe the hens' activity. The aim of this study is to study the chickens' behaviors in response to the interventions, to evaluate the effectiveness of each LED intervention pattern accordingly.

FORCE-DEFLECTION CHARACTERIZATION OF CUSHION FOAMS FOR PRESSURE ULCER PREVENTION
Presenter(s): Matthew Taylor
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Sydney Bush (College of Engineering), Tamara Bush (College of Engineering)

Background Pressure ulcers are deep penetrating wounds located on the bottom of the buttocks. These wounds are a major issue for low mobility patients in hospitals. Not only are they an issue for the patient but they can also put strain on the nursing staff, who must adjust the patient more often. Finding a seat cushion that is stiff while also being comfortable for the patient in the hospital setting is a necessity. As the seated position is beneficial to the patient and a key transition necessary for returning home. Objective The goal of this work is to lower the likelihood of pressure ulcers while in hospital care by finding a foam that deflects force and is comfortable. Methods A round 8-inch pan was placed in the center of the foam block, and 4 reflective makers were placed around the top edge of the pan. Three sets of weights (11.8, 23.6, and 35.4 kg) were placed in the pan to cause compression on the foam. Using motion capture cameras, the change in location of the reflective markers was tracked during three separate testing sessions. This was conducted for 3 different foams. Results One foam has been tested where force data were obtained and calculations of deflection conducted. Two other foams are in the process of being measured. The foam will be assessed for the stiffness, density and comfort of each. Impact Understanding the deflection of the foam can help to design chairs that support the healing of pressure injuries and make medical chairs more comfortable.

COMPARING DRUGSTORE AND LUXURY COSMETIC PIGMENTS
Presenter(s): Thalia Cease
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Cosmetic pigments have been around for thousands of years, contributing to culture, art, and self-expression. These pigments are sold at numerous different price points, but does their value truly correlate to the quality of the product? This research study will analyze several different brands and types of cosmetic pigments, which will include luxury and drugstore pigments. The composition and microstructure were examined by Scanning Electron Microscopy (SEM) and also with Energy Dispersive Spectroscopy (EDS). The SEM will also help identify the effectiveness of each pigment where I will be dispersing the same mass amount of pigment around an equal amount of area for each and seeing each pigment's coverage. The results of this research study correspond with literature findings from the past, and examination of pigment composition and effectiveness of pigments versus price will be discussed.

DESIGNING CUSTOM CIRCUITRY FOR LASER SHUTTER CONTROL IN QUANTUM CONTROL & SENSING
Presenter(s): Andrew Ciacchella
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Nicholas Emtage (College of Natural Science), Xing Wu (Facility for Rare Isotope Beams)

The Quantum-Enhanced teST for fundamental symmetry (QuEST) lab at the Facility for Rare Isotope Beams (FRIB) requires highly stable and precise laser systems to investigate atomic parity violation. Currently, the control system exists as a prototype breadboard, which is relatively unstable and is unsuitable for long-term use. Using the circuit logic from the breadboard, along with previous research on similar issues, the prototype was replaced with a Printed Circuit Board (PCB). The circuit drives a voice coil actuator, which can rapidly toggle a laser shutter, critical for experimental data collection. Utilizing KiCad software, the circuit, which incorporates an LMD18200 H-Bridge driver, was built as a schematic. Paying specific attention to potential thermal issues and spatial limitations, the PCB was carefully designed to be a compact solution. The final design of the PCB reduces the footprint of the driver and allows it to be replicated with ease for future use. This project demonstrates the critical role of custom hardware in experimental physics and provides the QuEST lab with a reliable tool for future data collection.

USING CAD TO MODEL EXPERIMENTAL DESIGNS
Presenter(s): Connor Furlong
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Shane Wilkins (Facility for Rare Isotope Beams)

The Spectroscopy for Precision Exploration of Cold jeTs of Radioactive spEcies (SPECTRE) experiment at the Facility for Rare Isotope Beams (FRIB) will provide new opportunities to study molecules composed of radioactive nuclei, which are important for our understanding of the matter-antimatter asymmetry of the universe. The SPECTRE project is currently in its design phase where CAD and simulation tools are being employed to build a state-of-the art system capable of pushing the limits of experimental science. This contribution will outline the use of CAD software (Autodesk Inventor) to adapt, improve and produce designs of the experimental apparatus and how it will be integrated into the available space at FRIB.

IMAGING-BASED QUANTIFICATION OF CARDIAC REMODELING INDUCED BY LVAD SUPPORT
Presenter(s): Kayla Archey
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Lik-Chuan Lee (College of Engineering), Sandra Hager (College of Engineering)

The left ventricle is accountable to supply the body with oxygen rich blood through the aorta. Various diseases such as heart valve diseases, coronary artery diseases, cardiomyopathy etc. can increase the risk of heart failure of the left or right side of the heart. In patients with end-stage left heart failure, a left

ventricular assist device (LVAD) can be utilized to replace the function of the left ventricle. This process is either applied as a temporary solution as a bridge to transplantation or as a permanent resolution for patients that are unsuitable for transplantation (destination therapy). In some cases, the implantation of the LVAD may trigger reverse remodeling of the left ventricle observed as structural and functional changes that rarely lead to a level of recovery that allow the LVAD to be removed. Additionally, changes in the left heart affect the right heart and might also initiate right heart failure. To identify how an LVAD implantation can lead to structural changes in the heart, patients were given computer tomography (CT) scans before and after implantation. These CT images were subsequently used to create 3D segmentations of the entire heart which allowed a quantification of changes in cavity volumes of blood pools of the left and right ventricle and thickness alterations of walls to be measured. These segmentations were then converted to 3D models (*.stl files) which allowed a personalized mesh generation that can be utilized in simulations.

SEGMENTED TARGET FOR MONA EXPERIMENTS
Presenter(s): Alexander George
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Thomas Baumann (Facility for Rare Isotope Beams)

In a recent experiment conducted at the Facility for Rare Isotope Beams, a specialized assembly was required to house carbon targets and silicon detectors within a vacuum chamber integrated into the beamline. The design incorporated actuating shafts that enabled precise rotation of both the target array and the detector array in and out of the particle beam's path. When the scandium beam simultaneously interacted with both arrays, a proton was removed through a nuclear reaction, effectively transmuting the scandium into calcium. This presentation will detail the mechanical design of the vacuum chamber and rotating arrays, explain the underlying proton-removal reaction mechanism, and describe the data analysis techniques used to identify and confirm the resulting beam transformation.

TURTLEBOT RACING GAME
Presenter(s): Liam Wells
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Mae Frost (College of Engineering)

Autonomous racing requires robotic agents to balance speed, safety, and competition when operating in a shared environment. We adopt a game-theoretic approach to balancing these concerns developed in our lab's previous work. Utilizing two TurtleBot3 robots running ROS2, the system recreates the competitive racing scenario outlined in the digital simulation of the previous work as a physical implementation operating in real time. This implementation demonstrates how game-theoretic racing strategies developed in simulation can be translated to robotic systems operating under real-world sensing paired with control and error constraints. We implement this technique on our TurtleBots and observe how the resulting game operates in a real-world environment.

INTEGRATING EXPERIMENTAL AND COMPUTATIONAL TECHNIQUES TO INVESTIGATE PLANT IMMUNITY
Presenter(s): Anish Pravin Jadhav
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Daniel Woldring (College of Engineering)

Strengthening plant immunity depends on our ability to counteract the molecular mechanisms by which a wide spectrum of pathogens degrade the cell wall and initiate infection. Fungal pathogens infect plants by emitting enzymes like xylanases and polygalacturonases that destroy cell walls. Plants can defend themselves in response with highly evolved inhibitors such as xylanase inhibitors (RIXI) which bind to xylanases and block their activity. Xylanase binding on RIXI also triggers a defense signaling cascade with immune gene activation(e.g. OsPR1a, OsPR1b, PR4), hormone-mediated signaling, and the buildup of reactive oxygen species. To predict the structure of the resulting protein complex, the protein pairs were docked using AlphaFold3 on MSU ICER's High Performance Computing Cluster. Using PyMol, several parameters such as close contact regions, buried surface area (BSA), hydrogen bonds, and salt bridges were visualized and analyzed to predict which factors were important for strong binding of the target proteins to their respective receptors. This structural information provides a foundation for future experimental work that will elucidate inhibitor-enzyme binding kinetics. To experimentally characterize these interactions, the proteins were expressed on the surface of yeast and analyzed using flow cytometry to assess target binding. This work contributes to ongoing efforts in our group to engineer plant immune receptors through machine learning and wet-lab screening. Together, these approaches aim to enhance plant defenses against cell wall-degrading pathogens.

UTILIZING QUANTUM ENTANGLEMENT TO PLAY THE CHSH GAME
Presenter(s): Jason Gilbert
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Jianrong Wang (College of Natural Science)

Physical theory allows one to experience physical reality with certainty. Within the CHSH game a number of theories can be applied. Quantum entanglement strengthens players' correlation beyond classical theories. The current study aims to capture the divergence of classical and quantum strategies within a CHSH game model. This model may be representative of the real world.

COMPARING COMPUTATIONAL PIPELINES IN PREDICTING ANTIBODY THERAPEUTIC SELECTIVITY FOR NEUROBLASTOMA TREATMENT
Presenter(s): Andrew Lilly
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Annie Needs (College of Engineering), Daniel Woldring (College of Engineering)

To develop antibody treatments to neuroblastoma that selectively attack cancerous cells, we must be confident that the chosen antibody selectively binds to OAcGD2, an antigen specifically expressed on cancerous nerve cells. Existing treatments target GD2, which is expressed by tumors, but also by healthy

nerve cells. Selectively targeting only OAcGD2-expressing cells will minimize off-target effects such as neuropathy, which results from the treatment inadvertently attacking healthy nerve cells. One common method to predict specificity is to generate a predicted protein structure using AlphaFold2, generate 1000 docked poses between the protein and a chosen ligand with Rosetta, and then use OnionNet2 to find the binding affinities for those poses, revealing if an interaction is favorable. Alternatively, AlphaFold3 can both predict structures and perform docking, so a simplified workflow of AlphaFold3 followed by OnionNet2 can also be used. In this presentation, I will analyze the performances of both pipelines in correctly identifying negative controls that do not bind favorably to OAcGD2. We expect that a successful pipeline will produce results that show known non-binders of OAcGD2 to have the highest affinity when binding their native ligands and lower affinities when binding various non-native ligands, including OAcGD2. If a pipeline can accurately predict a non-binder, we can be much more confident in its ability to predict a selective binder, which can be used in antibody treatment of neuroblastoma.

DRONE PROJECT
Presenter(s): Ava Duncan, Nicholas Zuo
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Nevzat Bugdayci (College of Engineering)

Building and designing a functioning drone.

COMPARING DIFFERENT APPROACHES FOR PREDICTING POLICY RENEWAL TO INCREASE LONG-TERM STABILITY IN CAPITAL MANAGEMENT OF INSURANCE COMPANIES
Presenter(s): Vinny Tartaglia
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Gee Lee (College of Natural Science)

The Wisconsin Local Government Property Insurance Fund (LGPIF) data set contains information on insurance for different Wisconsin government properties between the years 2006 and 2010. Understanding policy renewal is important in actuarial contexts to assess the risk of a group of policies over time. Our goal is comparing different models that predict whether or not a policy will renew each year. We compared the ridge regression approach and the lasso approach with variables such as premium change, deductible change, coverage change, and variables that determine alarm credit and type of the policy. We have selected these approaches because some of the predictors had extremely large coefficients and regularization approaches apply a penalty to these predictors. Data for building the models came from the training years excluding the last year, and the models were tested on out-of-sample data from 2009. We believe that modeling the renewal rate of short-term insurance policies can allow us to use insights from long-term actuarial techniques, allowing improved stability in capital management. Because there are a limited number of non-renewals each year, this problem allows us to test statistical methods including regularization techniques. Our contribution is the comparison of various regularization techniques for the LGPIF dataset with limited lapse observations.

UTILIZATION OF UV LIGHT IN PEG-BASED HYDROGELS FOR TUNABLE STIFFNESS
Presenter(s): Grant VanWoert
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Caroline Szczepanski (College of Engineering), Surbhi Schillinger (College of Engineering)

Hydrogels are three-dimensional polymer networks that are soft in nature and swell in the presence of water. Given their flexible nature, hydrogels are a good platform for tunable, dynamic materials, which are desirable for multiple applications including drug delivery and anti-fouling where complex environments are encountered. The networks used in this research are comprised of poly(ethylene glycol) methyl ether acrylate (PEGMEA) as the backbone, with varying levels of two cross-linkers: (1) coumarin, a dynamic cross-linker, and (2) poly(ethylene glycol) diacrylate (PEGDA), a permanent cross-linker. The coumarin cross-links are responsive to light: cross-linking is induced when exposed to 365 nm irradiation, and these cross-links break with 254 nm light exposure. Coumarin bonds form at a slower rate than PEGDA cross-links, however these different rates have not yet been quantified. To address this gap, irradiation time and sample thickness was varied to establish that network stiffness varies with coumarin cross-linking. We show how Dynamic Mechanical Analysis (DMA) can quantify the dimerization of coumarin cross-linkers by examining the Young's Modulus of networks polymerized with varied irradiation periods. We quantify how the networks get stronger with increasing irradiation, and also identify the time when stiffness plateaus and coumarin is fully dimerized. Consistent over all formulations that were tested, it was found that the thinner, 0.5 mm, samples had higher Young's Moduli. This finding is consistent with the thinner samples receiving full penetration of UV light and dimerizing fully through the sample. This informs us that we can tune bulk network stiffness via UV irradiation.

COMPUTATIONAL ANALYSIS OF PLANT CELL-WALL DEFENSE PROTEINS USING MACHINE LEARNING
Presenter(s): Nicholas deCastro
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Daniel Woldring (College of Engineering)

Plant pathogens frequently secrete cell-wall-degrading enzymes such as xylanase and pectinase to facilitate host invasion. Plants can counter with a variety of protein inhibitors that target these enzymes and can limit the activity involved in cell wall degradation. In this work, we explore interactions between plant xylanase inhibitor proteins and fungal cell-wall-degrading enzymes using protein-structure prediction and machine learning. Together, this approach will demonstrate a large-scale computational exploration of inhibitor-enzyme interactions.

LARGE INTEGER MULTIPLICATION
Presenter(s): Andrew Slevin
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Dirk Colbry (College of Natural Science)

A comprehensive explanation of all the fastest ways computers multiply large numbers in a resource efficient manor. The poster will include examples of common processes used in computing where large integer multiplication is essential.

"BELONGING IS NOT BINARY": IMPOSTOR SYNDROME AND IDENTITY FORMATION IN DATA SCIENCE UNDERGRADUATE STUDENTS
Presenter(s): Ishita LNU
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Rachel Roca (College of Engineering)

Often, a sense of belonging in academic spaces is framed as binary- either you belong or you do not. Imposter syndrome, defined as persistent feelings of self doubt or inadequacy despite evidence of competence, complicates this idea by showing how students may move back and forth between confidence and uncertainty. This poster examines how imposter syndrome appears in undergraduate data science students' experiences, particularly in relation to identity, confidence, participation and help-seeking in coursework. This study draws on qualitative interview data collected in 2024 from seven undergraduate data science students, most of whom were juniors or seniors. Preliminary findings indicate that students often attribute imposter feelings to perceived gaps in foundational knowledge, comparison with peers, and the high stakes academic environment. These experiences matter because imposter syndrome can shape students' learning, sense of belonging, and persistence in data science. Understanding these experiences can help inform better teaching practices to support students struggling with imposter syndrome in data science courses.

GRIP FORCE DIFFERENCES BETWEEN HEALTHY AND FUNCTIONAL MOVEMENT DISORDER INDIVIDUALS
Presenter(s): Kyla Simpkins
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Garrett Weidig (College of Engineering), Tamara Bush (College of Engineering)

Irregular upper body movements such as tremors, jerks, and spasms are common symptoms of Functional Movement Disorder (FMD). Erratic movements can lead to greater grip forces during reach and grasp tasks, but have not been studied in FMD populations. Analyzing grip force in the FMD population is essential for comprehensively understanding rehabilitation progress. The goal of this study was to understand rehabilitation status affected grip force during an everyday task. Twenty healthy participants and twenty FMD participants were tested pre- and post- treatment. Participants were asked to complete a simulated drinking task using a 3D-printed cup. The force was collected via a single axis load cell embedded into the cup at the location of the thumb. Then the initial grasp force and transport

force was calculated using MATLAB. Then data analysis was conducted to calculate group averages (healthy, pre-, and post-treatment). Healthy participants exhibited an average transport force of 5.03 N and an average initial force of 7.39 N. FMD participant demonstrated significantly higher forces both pre-treatment (transport: 12.76 N; initial: 19.23 N) and post- treatment (transport: 11.37 N; initial: 16.61 N). Although post-treatment forces decreased, they remained higher compared to healthy participants. FMD participants produced elevated grip force during the activity. Sustained increased force could lead to other challenges like muscle fatigue and injury in the future. Since FMD participants did not return to healthy norms, in the future, force should be included in rehabilitation practices to fully understand the rehabilitation status of participants.

MULTI-MODAL WEARABLE SENSOR SYSTEM USING POINT-TO-POINT LORA COMMUNICATION
Presenter(s): Caleb Benninger, Ziwu Zheng
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

Rural Michigan communities continue to face persistent challenges related to limited broadband access and geographic isolation, particularly in regions where cellular coverage is unreliable or nonexistent. These constraints reduce the feasibility of technology-enabled health, safety, and coordination systems, disproportionately affecting older adults aging in place and individuals living alone. While remote health monitoring is often proposed as a solution, most existing models assume continuous Internet connectivity. These assumptions do not reflect the realities of many rural environments. This undergraduate research project evaluates the feasibility of a low-power, point-to-point wireless communication architecture designed to operate without reliance on cellular or Internet infrastructure. Rather than using network-managed wide-area platforms, the system emphasizes direct, long-range wireless links capable of transmitting low-data-rate physiological or status information under severe connectivity constraints. Prototype sensor and receiver nodes were developed and tested to examine link reliability, power consumption, and deployment practicality in rural settings. The project addresses a gap between theoretical connectivity models and real-world deployment conditions by prioritizing communication reliability under infrastructure-limited scenarios. By focusing on practical applications and deployment feasibility, this work seeks to inform future design decisions for rural health and safety monitoring systems where conventional connectivity assumptions fail.

DESIGN OF A HIGHLY CONSTRAINED PATCH ANTENNA WITH HIGH BANDWIDTH WHILE ACHIEVING A HOMOGENEOUS H-FIELD OVER THE SURFACE OF AN EMBEDDED DIAMOND
Presenter(s): Kenneth Seybold
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Jonas Becker (College of Natural Science), Shannon Nicley (College of Engineering)

This project is part of a larger effort within the Quantum Optical Devices (QuOD) Laboratory at MSU, where we are investigating the coherent control and readout of the electron spin states of electrons on liquid Helium by using Nitrogen Vacancy (NV) centers in diamond. This project explores optimizations for

a microwave patch antenna for the coherent driving of the electronic spin ground state of the NV centers. The application requires the antenna to have a high bandwidth, resonance at 2.87 GHz, and a uniform magnetic field on the surface of an embedded diamond in the middle of the antenna. Resonance at 2.87 GHz is important as it is the electronic spin ground state splitting that needs to be driven in the NV centers. The difficulty of increasing bandwidth is a result of stringent requirements imposed by the application, where the antenna cannot exceed 0.5mm in height, which prevents the application of conventional strategies of increasing bandwidth. Furthermore, the antenna must be a complete plane that circles the diamond to trap the electrons on the helium layer on the surface of the diamond. These limitations make designing an antenna with high bandwidth challenging. The QuOD Laboratory already has an antenna that is being used for initial testing. It is a standard circular patch antenna and as such has poorer bandwidth. This proposed design builds off the current design in order to improve the bandwidth while maintaining a homogeneous H-field over an embedded diamond.

TITLE: AN ENGINEERED APPROACH TO CHARACTERIZE MECHANISMS OF MUCILAGE ADHESION
Presenter(s): Shubhan Nagarkar
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Caroline Szczepanski (College of Engineering), Sabrina Curley (College of Engineering)

Upon hydration, seeds of many plant species release a polysaccharide hydrogel (mucilage) which displays remarkable bioadhesion to various substrates via hydrogen bonding. Examining this surface adhesion through an engineering lens can better inform mucilage evolutionary advantages, including lower mortality rates and exploitation, as well as future material design. In this work, extraction of mucilage from four species: Plantago ovata, Linum grandiflorum, Salvia hispanica, and Lepidium sativum was optimized to improve yield at a meso-scale (5g of seed) using complete seed hydration, physical and chemical separations, and lyophilization to produce dehydrated, pure mucilage. Each mucilage species was rehydrated uniformly, and its adhesive properties were characterized against an Elmer's glue control (polyvinyl acetate - PVA). Novel lap-shear and loop-tack testing protocols utilizing plasma-treated polyethylene terephthalate (PET) substrates and mechanical tensile testing were devised to simulate common mechanisms of seed dispersal and measure stress at failure. Furthermore, experiments mimicking varied environmental conditions were conducted by placing samples in dry, ambient, and saturated humidities. L. grandiflorum displayed stronger shear and loop-tack adhesion at higher humidity conditions in contrast to the PVA control, which could address the common reduction in performance in humid conditions of traditional synthetic adhesives. Furthermore, preliminary optical microscopy of the mucilage-substrate interface reveals species-dependent structural differences of fibrils contributing to adhesion. Mucilage in both dry and ambient environments demonstrated slightly higher shear adhesion than in saturated humidity conditions, showing a tenuous correlation with the habitats of these species. Overall, these results highlight the benefits of incorporating standardized engineering analysis, which complements evolutionary investigations into seed mucilage.

AUTOMATING LEGAL DOCUMENT CODING
Presenter(s): Arita Zaman
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Dirk Colbry (College of Natural Science)

Legal document management in large litigation databases requires extensive manual effort to identify, label, and organize key case information. This project explores the development of an automated document coding system to support the Clearinghouse Civil Rights Litigation by extracting and structuring important metadata from legal documents. Using natural language processing and large language models, the system can identify and auto-populate fields such as case name, document title, filing date, parties involved, and Electronic Case Filing (ECF) numbers. Instead of replacing human expertise, this project uses a human-in-the-loop approach, where after auto-populated codes are then presented to human reviewers who can verify these entries for accuracy. The aim of this project is to reduce the repetitive manual data entries while still preserving accuracy, which will help speed up the process of organizing legal documents within large civil rights litigation archives. This class is being done as a Vertically Integrated Project (VIP).

ALGORITHMIC COMPUTER VISION FOR BLOB DETECTION ON CIRCULAR HANDSHEETS
Presenter(s): Mihir Naik
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Dirk Colbry (College of Natural Science), Farid Gahramanov (College of Engineering)

In this study we present a Python workflow that utilizes the OpenCV library for the automated processing and enumeration of circular handsheet images for blob detection. We use contrast limited adaptive histogram equalization (CLAHE) to equalize lighting, the Hough Transform (HT) to ensure the image is centered, and thresholding to create the masked images. The workflow is highly scalable and is usable by both academics and industry alike. Future considerations include integrating the workflow into a web app to increase scalability and usability.

LEVERAGING PHOTOACTIVE CROSS-LINKING TO ALTER FAILURE MODE DURING HYDROGEL SWELLING
Presenter(s): Reed Blocksome
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Caroline Szczepanski (College of Engineering)

Hydrogels are three-dimensional, cross-linked polymer networks with the ability to absorb a compatible solvent (typically, water). Hydrogels are used for drug delivery and many other biomedical applications; however, their properties are typically fixed after polymerization, which is an obstacle for more specific treatments and dynamic environments. This work investigates poly(ethylene glycol) hydrogels modified with a coumarin functionality that allows for on-demand manipulation of cross-linking within the hydrogel network using UV irradiation (PEGCoumAc gels). Specifically, coumarin molecules dimerize when irradiated with 365nm light, which creates cross-links between polymer chains, and thus increases

the overall constraints within the network. Conversely, irradiation with 254nm light cleaves the coumarin bonds, reducing cross-linking and decreasing network constraints. We have found that some PEGCoumAc formulations have significant internal stresses during swelling, manifesting as catastrophic rupture during the swelling process. Thus, this work explores the question - can rupture behavior be controlled by manipulating internal constraints using coumarin? To address this question, we quantify rupture events and demonstrate how in-situ coumarin dimerization during swelling can alter failure mode and accelerate rupture. Specifically, we show that time to first rupture event is decreased with an increasing intensity of 365nm UV irradiation. This finding suggests that commonly unpredictable and random gel rupture can be controlled via the intensity of UV light and suggests a framework by which gels can be designed to rupture autonomously using external stimuli. This work establishes a path forward for tunable smart materials for targeted drug delivery, soft robotics, and many other applications.

ACCURATE SHAPE MONITORING WITH A GAPLESS FLEXIBLE INDUCTIVE SENSOR ARRAY AND BILSTM RECONSTRUCTION

Presenter(s): Zhibo Zhang
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Yiming Deng (College of Engineering)

Accurate and robust shape reconstruction is important for applications such as soft robotics, structural health monitoring, and aerospace systems, but many sensing approaches suffer from limited measurement range or blind regions along the sensor length. This project presents a flexible, gapless differential inductive sensor array combined with a learning based reconstruction method for continuous shape monitoring. The sensor adopts a gapless configuration to eliminate spatial blind spots and uses a fully tied square coil design to improve signal reception at large bending radii, increasing signal to noise ratio and expanding the usable sensing range. 3D finite element simulations show that the proposed design increases the maximum output range by 77.6% and improves output range by 268.4% for small shifts below 1 mm compared with a conventional coil layout. For shape reconstruction, we develop a bidirectional LSTM (BiLSTM) sequence to sequence regression model that maps a one dimensional sequence of 16 channel sensor readings to a corresponding sequence of segment wise curvature (or radius) values along the structure. By leveraging both local information and long range dependencies across the array, the BiLSTM improves reconstruction accuracy. Experimental results demonstrate precise curvature estimation with low reconstruction error (maximum position error about 1.08%) and performance gains over baseline models including GRU, vanilla RNN, and 1D CNN. Overall, the proposed sensing hardware and BiLSTM reconstruction provide an effective solution for high precision shape monitoring.

NONLINEAR CRACK DYNAMICS OF HIGHLY-ENTANGLEMENT POLYMER NETWORK
Presenter(s): Ruihao Lu
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Shaoting Lin (College of Engineering)

Background: In standard crosslinked polymers, crack velocity (v) scales linearly with the energy release rate (G). The impact of chain entanglement on this kinetic relationship remains largely unexplored. Methods & Results: We investigated fracture propagation in highly entangled networks. Unlike conventional polymers, these materials exhibit a distinct bi-linear transition in the v-G relationship. Key Finding: This bi-linear behavior marks a mechanistic shift: Stage I: Dominated by the initial entangled network response. Stage II: Transitions to the fracture of the primary covalent network. Significance: Our work identifies entanglement density as a critical regulator of crack kinetics, providing a new framework for designing toughened elastomers.

USING A SEM TO FIND DIFFERENCES IN GOLF BALLS
Presenter(s): Nate Romito
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Golf balls are one of the most recognizable items in the sports world. Many golfers will swear by one brand or another, with cost and looks greatly wavering. But what are the actual differences between cheap balls and expensive balls? Is there a difference in composition, microscopic structure, or something entirely different? I will use the SEM to image the inside of balls, EDS to determine the elemental composition, macroscopic observation to see the major distances, as well as perform a distance test using a simulator to see if there are any balls who travel significantly further after being hit. The results of these tests will be compared with respect to manufacturer data, previous studies, and will provide a cost-performance analysis of which balls are the best.

ENGINEERING & DESIGN OF A COMPACT MULTI REFLECTION-TIME OF FLIGHT MASS SEPARATOR FOR NUCLEAR STRUCTURE STUDIES AT FRIB
Presenter(s): Austin Sjaarda
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Antonio Camargo Villari (Facility for Rare Isotope Beams), Franziska Maria Maier (Facility for Rare Isotope Beams)

The Facility for Rare Isotope Beams (FRIB) produces rare isotopes to support cutting-edge research in nuclear science. Many experiments require specific ion species, necessitating precise and selective mass separation techniques. Multi-reflection time-of-flight (MR-ToF) devices have emerged as powerful tools for high-precision mass spectrometry and highly selective mass separation. They can deliver high-intensity purified ion beams, beneficial for experiments in nuclear structure and nuclear astrophysics. In these devices, ions are confined in a closed loop between two electrostatic mirrors and separate in time-of-flight according to their mass-to-charge ratio. This enables the separation of ions with very small mass

differences. The implementation of MR-ToF mass separators within existing radioactive ion beam facilities places strict constraints on device size, performance, and beamline compatibility. This work explores the engineering and design process used to achieve a high mass resolving power in a compact geometry compatible with FRIB infrastructure. The poster details engineering challenges related to material selection, mechanical and electrostatic design decisions, and manufacturing processes that guide the development of FRIB's first MR-ToF device.

FACE MORPHING: ONE FACE WITH TWO IDENTITIES
Presenter(s): Krish Wadhwani
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Arun Ross (College of Engineering)

A face morph is generated by blending two face images corresponding to distinct identities, producing a composite that matches both constituent identities. Morph Attack Detection (MAD) aims to detect such morphs, while demorphing attempts to reverse the morphing process using the composite image. Recently, neural network-based demorphing methods have been introduced. These approaches do not make any assumptions about the morphing process, making them general-purpose solutions. Although MAD and demorphing appear to be closely related problems, this connection has not been systematically explored. In this work, we ask the central question: "Can demorphing models be appropriated for morph attack detection?". To answer this, we (i) develop a representation extraction framework, and (ii) introduce a general procedure to convert generative demorphing models into discriminative MAD models. Our experiments demonstrate that demorphing models not only capture highly discriminative information but are slightly better than several MAD approaches as well as several general-purpose visual encoders, including CLIP and its variants. Our study also presents a method to perform MAD in a training-free manner.

MICROSTRUCTURE-RESOLVED GRAIN SEGMENTATION FOR IMPROVED BATTERY ELECTRODE MODELING
Presenter(s): Tung Nguyen
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Dirk Colbry (College of Natural Science), Robert Termuhlen (College of Natural Science)

Lithium-ion battery simulations often treat electrodes as homogeneous bulk materials to reduce computational cost. While this simplifies analysis, it neglects the complex particle-level geometry of real electrodes, where individual grains, electrolyte pathways, and particle-particle interactions influence transport and reaction behavior. Growing evidence suggests that these microstructural features can significantly affect battery efficiency, charge distribution, and overall performance. This project develops an image-based computational pipeline to segment battery electrode microstructures into individual particles using 2D and 3D microscopy data. The method combines connected-component analysis, watershed-based grain separation, and graph-based adjacency detection to identify and label distinct particles within reconstructed electrode structures. A minimal graph-coloring algorithm ensures

neighboring particles are uniquely and efficiently labeled, supporting particle-resolved simulations that account for particle connectivity and boundary interactions. Integrating this segmentation workflow into electrochemical simulation pipelines allows us to investigate how particle connectivity, boundary interactions, and local microstructure influence lithiation dynamics within the electrode. Because particle-particle interactions can alter charge distribution and reaction pathways, accounting for microstructural architecture may reveal design trade-offs that are invisible in bulk models. Ultimately, this work provides a framework for connecting real electrode geometry to battery performance, helping guide more physically accurate simulations and more efficient electrode design.

LOW-COST INKJET PRINTING OF NANODIAMOND SUSPENSIONS IN ISOPROPANOL-BASED SOLUTIONS FOR PATTERNED CVD GROWTH OF DIAMOND CRYSTAL

Presenter(s): James Verrico
Category: Engineering, Computer Science, and Mathematics
Mentor(s): James Siegenthaler (Facility for Rare Isotope Beams), Liam Falkenstroem (Fraunhofer-Gesellschaft)

Diamond is a chemically inert, hard, and strong material that can be lab grown. When, grown, it is a wide bandgap semiconductor with tunable properties that can be fabricated into devices including diodes, transistors, and chemical sensors that can withstand harsh conditions. The semiconductor processing steps, however, are costly and time consuming. By selectively seeding silicon wafers, diamond can be selectively grown into unique patterns and shapes and mitigate a processing step. Here, we show how a diamond can be selectively grown using a low cost developed inkjet printer. We modified a HP C6602A inkjet cartridge to be mounted on a Creality 3D printer. By removing the Z-axis, and controlling the X and Y axis with an Arduino Mega, we developed software that can inkjet custom uploaded images. Parameters for printing such as nozzle firing time and distance between adjacent droplets were optimized to accomplish desired continuous dot-line prints. We further developed our own nanodiamond seed suspension for selective diamond growth by tunning different ratios of deionized water, isopropyl alcohol, and the diamond weight percentage using both in-house nanodiamond powder and commercial aqueous nanodiamond solutions. Further we explored the addition of ethylene glycol to tune viscosity and surfactants for homogonous printing of the suspension. Optimal ratios were determined by their agglomeration of diamond powder which causes clogging and the residues left over on the silicon substrate before undergoing crystal growth. These findings demonstrate a new approach for low-cost patterned diamond growth, saving time and money compared to other microfabrication processes.

EXAMINATION OF SHOE GRIP STRENGTH THROUGH ELECTRON MICROSCOPY
Presenter(s): Charlie Haskell
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

While there is no one definitive shoe standard for the National Basketball Association (NBA), one brand comes to mind - Nike. While not the required brand, they are often the shoe of choice for most players, but do different brands of shoes really offer better performance? This project will explore different shoe brands and types, by looking at both samples of the soles under a Scanning Electron Microscope (SEM) and by testing the maximum angle at which the donor shoe, which the corresponding sole sample came from, can stay in place without slipping (henceforth referred to as the "slipping angle"). The results were analyzed with x-ray spectroscopy to potentially determine a chemical difference, and were also visually analyzed to potentially determine any manufacturing strategies that may provide a competitive edge in grip strength.

LLM-DRIVEN ADAPTIVE GENETIC ALGORITHMS FOR HYPERPARAMETER TUNING DURING EVOLUTION
Presenter(s): Adhvik Kolar, Shreyas Sajith
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Iliya Miralavy (College of Engineering)

Genetic Algorithms are widely used for solving complex optimization problems, but their performance depends heavily on carefully chosen hyperparameters such as mutation rate, crossover probability, and population size. These hyperparameters are often fixed before evolution begins, even though optimal values can change as the search progresses. This project explores an adaptive framework that integrates Large Language Models to dynamically tune Genetic Algorithm hyperparameters during evolution. The proposed approach uses periodic feedback from the evolutionary process, including fitness trends, population diversity, and convergence behavior, to prompt a Large Language Model to recommend hyperparameter adjustments in real time. Instead of replacing evolutionary search, the language model acts as a high level controller that guides exploration and exploitation by modifying algorithm settings based on observed performance. This creates a hybrid system that combines the interpretability and flexibility of language models with the robustness of evolutionary optimization. Experiments are conducted on benchmark optimization problems to evaluate convergence speed, solution quality, and stability compared to traditional static and heuristic based adaptive methods. Results demonstrate that LLM guided adaptation can improve convergence efficiency and reduce sensitivity to initial hyperparameter choices. This work highlights the potential of combining language models with evolutionary computation to create more autonomous and self adjusting optimization algorithms, with implications for automated machine learning, large scale optimization, and future adaptive AI systems.

INSIDE THE LOOFAH: EXAMINING MICROSTRUCTURE OF NATURAL AND SYNTHETIC CLEANSING TOOLS
Presenter(s): Lauren Cooper
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Loofahs are widely used personal hygiene tools among many, yet their tendency to retain moisture, trap materials, and support bacterial growth has raised concerns about their safety and practicality for everyday use. Despite broad variation in material composition, design, and cost, it remains unclear whether these differences truly influence bacterial accumulation or have long-term hygiene risks.This project examines natural loofahs and synthetic loofahs. Each of these cleaning tools will be used to determine how material properties and structural features correlate with bacterial growth and material degradation. The composition and microstructure of each of the cleaning tools were examined with Scanning Electron Microscopy (SEM) along with EnergyDispersive Spectroscopy (EDS). In addition to investigating bacterial growth over time, this study evaluated each tool's durability after repeated use, investigating material fraying and surface deterioration. The results of these examinations are evaluated with respect to previous literature findings on porous materials, moisture retention, and bacterial growth in hygiene-related environments. By integrating structural and micro-bacterial analyses, this research provides a detailed comparison of cleansing tool performance and susceptibility to bacterial buildup. The findings offer evidence-based insight into which products may pose greater hygiene risks, and present practical recommendations for selecting and maintaining safer personal hygiene tools. Further investigations can explore types of environments that harbor greater bacterial growth in order to prevent health risks.

WHAT'S THE DISTRIBUTION? THE NEED FOR BARIATRIC MEASUREMENTS
Presenter(s): Rylie DuBois
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Aaron Dawson (College of Engineering), Ryan Harth (Honors College), Tamara Bush (College of Engineering)

Bariatric patients are predisposed to numerous diseases and conditions that cause higher mortality rates and decrease their quality of life. Many types of medical equipment, such as attire, chairs, mobility devices, and beds, are not made to properly accommodate these patients' needs in support and pressure distribution. Currently, there is a lack of critical data to understand body sizes and measurements associated with this population. The goal of this study was to compare various anthropometric measurements of a population of 250-350-pound individuals to a database of average-sized individuals. 16 male and 15 female participants participated in anthropometric measurements. These measurements were collected using a rigid rule, flexible tape measure, and anthropometer. A one-tailed Student's t-distribution was calculated in Excel to compare the differences in measurements between the two populations. All bariatric measurements in female populations were statistically significant, except for popliteal height and seated shoulder height. All bariatric measurements in male populations were statistically significant, except for seated shoulder height. The identification of significant and insignificant differences in measurements indicates the need for more data to be

collected and for a better understanding of this population to make sure devices are developed that meet the needs of the bariatric population.

ALIGNING TASK ALLOCATION WITH HUMAN PREFERENCES
Presenter(s): Dhruv Kekin Toprani
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Vaibhav Srivastava (College of Engineering)

Human robot interaction : collected data: real outputs: 3 strategies : draft abstract:

MACHINE LEARNING-GUIDED ENGINEERING OF OATP DRUG TRANSPORTERS VIA COMPUTATIONAL PROTEIN-LIGAND BINDING PREDICTION
Presenter(s): Ailin Patimar
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Daniel Woldring (College of Engineering), Logan Garland (College of Engineering)

Organic Anion Transporting Polypeptides (OATPs) are membrane transporters that play a critical role in the uptake of drugs and endogenous compounds across biological barriers, including the blood-brain barrier. Engineering OATPs with enhanced affinity for therapeutic compounds while reducing transport of biowaste molecules could enable improved delivery of diagnostic agents and treatments for neurodegenerative diseases. However, experimental screening of transporter variants is costly and time intensive, motivating the use of computational approaches to guide protein engineering. This project develops a computational workflow for predicting OATP-ligand binding affinities and generating improved transporter variants. Structural models of OATP1B1, OATP1B3, OATP2B1 are obtained using state-of-the-art protein structure prediction methods, including AlphaFold3, Boltz-2 and Protenix. Multiple ligand docking poses are generated for each protein-ligand pair, and binding affinities are predicted using machine learning-based scoring models such as OnionNet2 and related protein-ligand interaction networks. Model performance is evaluated against experimentally derived binding data from the Karlgren dataset to identify the most accurate prediction pipeline. Using the optimized workflow, ancestral OATP sequences are analyzed to establish performance benchmarks for transporter activity. Generative machine learning models trained on ancestral transporter sequences are then used to design novel OATP variants predicted to exhibit stronger interactions with therapeutic ligands (e.g., PET/MRI contrast agents and Alzheimer's drugs) while minimizing affinity for endogenous waste molecules such as bilirubin and bile acids. This work demonstrates how integrating protein structure prediction, ligand docking, and generative machine learning models can accelerate the engineering of drug transport proteins and enable data-driven design of improved therapeutic delivery systems.

TESTING FABRICATION METHODS TO REDUCE PHASE BARRIER FAILURE IN CNC MACHINED MICROFLUIDIC MICROPLATES
Presenter(s): Elliot Snyder
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Brian Johnson (College of Veterinary Medicine)

Microfluidic microplates are microplates modified through CNC milling to be used in drug testing, allowing research to be shifted away from animal testing to more ethical methods. A type of microfluidic microplate is a y-device plate, which incorporates a y-type microfluidic device into the bottom of the plate, changing how the plate wells function. A phase barrier is a space between two channels of the y-device, whose function is for cells to communicate while also keeping media in its own channels. However, media sometimes crosses over between channels through the phase barrier. This project attempts to prevent crossover through methods such as heat, laser technology, and phase barrier changes. These modifications aim to prevent the y-device from leaking media and therefore improve the reliability of the microplates.

ENHANCING THE SENSITIVITY AND STABILITY OF BORON-DOPED DIAMOND AND CARBON FIBER MICROELECTRODES FOR NEUROCHEMICAL SENSING USING PEDOT/MWCNT-SDS COMPOSITE COATINGS
Presenter(s): Ariel Block
Category: Engineering, Computer Science, and Mathematics
Mentor(s): James Siegenthaler (College of Engineering)

The measurement of neurotransmitters in the brain is crucial for the early detection of neurodegenerative diseases such as Parkinson's or Alzheimer's disease but poses a significant challenge due to neurotransmitters' rapid oxidation and reduction rates tied with the requirement of subcellular electrodes for in vivo/vitro measurements. Boron-Doped Diamond Microelectrodes (BDDMEs) offer exceptional electrochemical stability, biocompatibility, and a wide potential window but often suffer from reduced sensitivity due to their low density of SP2 electroactive surface states. On the other hand, Carbon Fiber Microelectrodes offer excellent sensitivity electrochemically but degrade incredibly fast due to their surface full of loosely folded SP2 carbon molecules. In this work, conductive polymer nanocomposite coatings were developed for the electrochemical enhancement of BDDMEs and CFMEs to increase stability and sensitivity through adsorption modification for neurotransmitters such as Dopamine and Serotonin. Poly(3,4-ethylenedioxythiophene) (PEDOT) and Carboxyl functionalized Multi-walled Carbon nanotubes (COOH-MWCNT) were electrochemically deposited to form a higher-surface-area, redox-active interface designed to improve charge transfer and analyte interaction at the electrode's surface. Carbon fiber microelectrodes (CFMEs) were initially used as a disposable model system to optimize deposition parameters, film thickness, and stability prior to application on BDDMEs. Electrochemical characterization using cyclic voltammetry, electrochemical impedance spectroscopy (EIS) and fast-scan cyclic voltammetry (FSCV) demonstrated increased background current, altered redox behavior, and enhanced analyte-evoked responses following coating, consistent with increased electroactive surface area and improved electron transport. This work aims to bridge the gap between

the robustness of diamond-based electrodes and the sensitivity required for high-performance neurochemical sensing.

MICROSTRUCTURAL AND ELEMENTAL COMPARISON OF CHEAP VS. EXPENSIVE LIGHTNING CONNECTOR PROBES
Presenter(s): Shahir Ahmed
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

USB Lightning connectors are widely used accessories for Apple devices, available from both Apple and numerous third-party manufacturers at significantly different price points. This study investigates whether meaningful differences exist between a cheap third-party and an authentic Apple Lightning connector by examining the probe contacts, which serve as the primary electrical interface between the cable and device. Both connectors were examined at their 8 probe contacts. Surface microstructure was examined using scanning electron microscopy (SEM) at 1500x magnification with a secondary electron detector. Elemental composition was characterized using energy-dispersive X-ray spectroscopy (EDS). SEM imaging revealed no notable differences in surface morphology between the two connectors at the microscopic level. However, EDS analysis uncovered significant compositional differences. The cheap connector probes contained carbon, oxygen, nickel, and copper, suggesting a nickel alloy substrate with copper plating and possible surface oxidation. The Apple connector probes contained carbon, nickel, and platinum, indicating a platinum coating over a nickel layer. Platinum is highly resistant to corrosion and maintains excellent electrical conductivity over extended use. These findings demonstrate that while both connectors exhibit comparable surface microstructure, they differ substantially in elemental composition. The presence of a platinum coating on the Apple connector probes suggests a distinct manufacturing approach prioritizing corrosion resistance and long-term contact reliability.

ENGINEERING OF OATP1B1 FOR SELECTIVE BILIRUBIN TRANSPORT
Presenter(s): Reese Cordahl
Category: Engineering, Computer Science, and Mathematics
Mentor(s): Daniel Woldring (College of Engineering)

Human Organic Anion Transporting Polypeptide 1B1 (OATP1B1) plays a critical role in hepatic uptake of endogenous compounds and drugs, including bilirubin and estrone-3-sulfate (E3S). Engineering OATP1B1 to selectively modulate bilirubin transport without compromising E3S uptake has potential applications in understanding transport protein specificity future uses of the protein. A structure-guided approach to identify key residues within OATP1B1's major binding pocket that influence substrate specificity is applied. Using high-resolution cryo-EM structures of bilirubin-bound and E3S-bound OATP1B1 as templates, we selected residues T357 and F360 for targeted mutagenesis based on their roles in ligand orientation and hydrophobic stabilization. A full saturation mutagenesis set of 20 amino acids was designed for these positions, totaling to 800 structures. Models of each mutant were generated and computationally docked with bilirubin and E3S. Predicted transport selectivity was evaluated using the

machine learning model Boltz-2, and allowed for rapid assessment of mutations that enhance bilirubin binding while preserving E3S interaction. This workflow demonstrates the integration of structural analysis, mutagenesis design, and computational affinity prediction to rationally engineer transporter selectivity. Results from this study will inform experimental validation and provide a framework for designing selective OATP1B1 variants, offering insights into substrate recognition, and guiding future transporter engineering efforts.

Environmental Science & Natural Resources

HIGH-THROUGHPUT CULTIVATION OF MINERAL-ASSOCIATED MICROBES TO ENHANCE DNA RECOVERY FOR BIOMINING APPLICATIONS
Presenter(s): Jack Marean
Category: Environmental Science and Natural Resources
Mentor(s): Matthew Schrenk (College of Natural Science), Sarah Gonzalez Henao (College of Natural Science)

This project is derived from the Microbe-Mineral Atlas Project (MMA), which is exploring novel methods to bioengineer microbes to "biomine" important metals that are in high demand like rare-earth elements. Microbes naturally break down metal-bearing rocks to obtain nutrients necessary for survival. When this occurs, the metals are more easily and efficiently extracted. While the MMA strives to discover new mineral-interacting organisms that can perform biomining functions, this is difficult. The more practical approach is extracting DNA fragments from rock samples collected in mineral mines across the United States where these microbes may exist, and genetically modify better-understood microbes like Gluconobacter oxydans or Vibrio natriegens. Recovering DNA fragments from rock samples is difficult due to the low amount of available biomass and organic matter within the rock. This project aims to culture microbes from the rock samples. Microbes cultured from these rock samples may possess a greater ability to break down and extract minerals, making their genetic material more valuable for this project. One hypothesis is that further DNA extraction from the cultured samples will result in a greater number of higher quality DNA fragments versus extracting directly from the rock. The samples are being cultured in two different media with varying pH in 96-well plates. After periodic intervals of at least 24 hours, the optical density of the media is measured. If the optical density is greater, growth of organisms has likely occurred. If growth is suspected, the media is observed under a microscope to confirm microbial growth.

MODELING THE HIDDEN COSTS OF FAST FASHION: ENVIRONMENTAL AND SOCIAL TRADEOFFS IN GLOBAL SUPPLY CHAINS
Presenter(s): Badri Aiman Khan Badrul Zeman Khan
Category: Environmental Science and Natural Resources
Mentor(s): Saroopa Taylor (College of Natural Science)

The global fast fashion industry has transformed clothing production and consumption through rapid manufacturing cycles and low cost garments, but these efficiencies often mask significant environmental and social consequences. This project presents a data driven analysis of fast fashion's environmental footprint and labor impacts by integrating publicly available datasets on carbon emissions, water consumption, textile waste, and labor conditions across major garment producing regions. Using exploratory data analysis and statistical visualization techniques, this research examines patterns linking production intensity with environmental degradation and socioeconomic disparities within global supply chains. The analysis highlights how accelerated production cycles contribute to increased resource consumption and waste generation, while also disproportionately affecting regions with limited regulatory protections for workers and environmental standards. By synthesizing environmental indicators with labor related metrics, this study aims to move beyond isolated sustainability discussions and instead frame fast fashion as a complex system involving interconnected economic, environmental, and social tradeoffs. Visual and comparative analyses reveal trends not immediately visible through individual datasets alone, emphasizing the importance of interdisciplinary approaches in evaluating sustainability challenges. This work contributes to ongoing discussions on sustainable development by demonstrating how data science methods can be applied to evaluate industry-level impacts and inform policy oriented conversations surrounding responsible production and consumption. The findings aim to support broader awareness of the hidden costs embedded within fast fashion systems and encourage data-informed approaches to sustainability research and decision making.

THE CAUSAL IMPACT OF AIR POLLUTION ON STUDENT ACADEMIC PERFORMANCE
Presenter(s): Prachurjo Das
Category: Environmental Science and Natural Resources
Mentor(s): Jeffrey Wooldridge (College of Social Science)

Air pollution is a growing environmental concern with potential implications for human health, productivity, and cognitive function. Emerging research suggests that exposure to pollutants such as fine particulate matter (PM2.5), nitrogen dioxide (NO2), and ozone (O3) may negatively impact academic performance, particularly among children whose cognitive development and learning capabilities are still evolving. This study examines the causal relationship between air pollution and student test scores by leveraging a panel dataset that combines air quality data from the Environmental Protection Agency (EPA) with standardized test scores from the National Assessment of Educational Progress (NAEP). To identify the effect of air pollution on academic performance, I will employ panel data regression techniques with fixed effects, controlling for time-invariant characteristics at the school or district level. This approach allows for the isolation of pollution's impact by accounting for unobserved heterogeneity across locations. Additionally, I will explore potential sources of exogenous variation in pollution levels,

such as wind patterns or regulatory changes, to strengthen causal inference. This research contributes to the growing body of literature on the intersection of environmental economics and education policy. By quantifying the impact of pollution on student achievement, this study provides valuable insights for policymakers, educators, and public health officials seeking to mitigate the adverse effects of environmental factors on educational outcomes. The findings may have significant implications for zoning regulations, school infrastructure decisions, and broader discussions on environmental justice, particularly for low-income communities disproportionately affected by air pollution.

BIRD DIVERSITY ACROSS VACANT LOTS AND URBAN PARKS IN FLINT AND DETROIT, MICHIGAN
Presenter(s): India Taylor
Category: Environmental Science and Natural Resources
Mentor(s): Kevin McGraw (College of Natural Science), Trey Ursillo (College of Natural Science)

Urban green spaces such as parks and vacant lots play a critical role in conservation by supporting diverse wildlife communities, especially for birds. However, comparative studies on avian diversity in such green spaces and across multiple cities remain limited. This study aims to compare urban bird communities across vacant lots and parks in Flint and Detroit, Michigan. At a total of 32 sites (16 per city, 8 parks and 8 vacant lots per city), we deployed one Song Meter Micro 2 device. Between February 21 to March 15, the devices recorded from 1 hour before sunrise to 2 hours after, as well as the first five minutes of each hour. We processed audio data using BirdNET on MSU's HPCC and generated species lists for each site using a BirdNET confidence threshold of 0.95. Using a generalized linear model, we quantified the interactive effect of site type (vacant lot or park) and city (Flint or Detroit) on species richness and described differences in taxonomic diversity and diet between vacant lots and parks. These preliminary results are part of a larger study that will continue sampling throughout 2026 during migratory and breeding seasons to better understand avian utilization of these urban green spaces over time.

GEOCHEMICAL SIGNALS AND TECTONIC AFFINITIES OF ANGOLAN GRANITOIDS
Presenter(s): Danielle KIllingback
Category: Environmental Science and Natural Resources
Mentor(s): Tyrone Rooney (College of Natural Science)

Granitoid rocks provide crucial information regarding the processes of tectonic evolution as the dominant rock type in Earth's lithosphere. Without geochemical analysis, it is difficult to interpret their environment of formation. Despite their significance, there is limited knowledge about how these Angolan granitoids relate to one another and how they fit into the broader tectonic framework of Gondwana's evolution. This research focuses on samples which we found to be a part of the Coastal Terrane in the Kaoko Belt, the northern continuation of the Kaoko-Dom Feliciano Belt. This was the major orogenic system that once connected Southwest Africa to southern Brazil and Uruguay prior to Gondwana's breakup. Through XRF analysis, we also found that these granitoids are the roots of volcanic arcs, formed due to the lithosphere being subducted under another plate. Although we do not know the

exact age of these samples, we estimate the relative age to be around 550-630 MA. Through further research, we aim to refine this number to a more precise range. Building on my initial geochemical characterization, we are now analyzing our dataset and comparing it to published granitoid data from the papers by Janusek (2023), dos Santos (2019), and Hueck (2024). I aim to examine whether my samples align with, diverge from, or bridge patterns observed in these papers. Through this we seek to interpretations of magma sources and crustal processes within this connected system.

COLD SPOTS, WARM FEELINGS: CASE DESCRIPTIONS OF WINTER RECREATION IN A CHANGING CLIMATE ACROSS THE NORTHERN FOREST
Presenter(s): Ryan Petrosky, Sydney Perttunen
Category: Environmental Science and Natural Resources
Mentor(s): Elizabeth Perry (College of Agriculture & Natural Resources)

BACKGROUND: Understanding winter recreation across the Northern Forest (the forested landscapes from Maine to Minnesota and across southeastern Canada) requires more than documenting changing snowfall patterns. It requires attention to the evolving relationships between people, activities, and the places that give winter its meaning. This poster presents early-stage work from the Frostbound Fellows, two undergraduate scholars at Michigan State University collaborating on a mixed-methods project about climate change, winter recreation, and place attachment. The Fellows' charge in the first project year is to compile richly detailed case descriptions of winter recreation localities and activity contexts across the Northeast and Upper Midwest. These case descriptions will guide the development of subsequent surveys and qualitative methods, while also serving as an intellectual training ground in integrating geographic perspectives into recreation research. This poster will share the structure of the case description framework, examples of emerging cases across New England and the Upper Midwest, and reflections on the Fellows' learning and collaborative process. By centering winter recreationists' connections to northern forest landscapes, the Frostbound Fellows' work lays the groundwork for developing a generalizable theory of place attachment amid climate change. CONTEXT: The construction of case descriptions is grounded in geographic theories of place and place attachment, which conceptualize place as an ongoing interaction between physical settings, social meanings, and lived experience. Because winter recreation is highly sensitive to climatic variability, Nordic skiers' and snowmobilers' experiences offer important opportunities to examine how externally driven changes (e.g., declining snow reliability) shape existing and emerging forms of place attachment. Yet, as prior scholarship has noted, research on place attachment often lacks explicit grounding in geographic frameworks. By approaching case development through these frameworks, the Frostbound Fellows aim to strengthen conceptual linkages between recreation behavior, environmental change, and the production of place. METHODS: The Fellows' case-building process involves synthesizing diverse information sources, including community histories, land-use patterns, recreation infrastructure, climate and snowfall trends, and the cultural identities surrounding winter activities. Particular attention is paid to how these factors interact to support three dimensions of attachment: 1) existing place attachments, or the long-standing emotional and functional connections recreationists hold; 2) potential place attachments, reflecting new or shifting opportunities for connection as activity patterns evolve; and 3)

changed place attachments, encompassing the disruptions, losses, or transformations brought on by climate impacts and adaptation strategies. IMPLICATIONS: Through this process, the Fellows are learning to translate complex human-environment relationships into actionable case materials that will inform the project's broader theoretical aims. Their work highlights the value of student-driven case development as a methodological foundation and a pedagogical tool. This can encourage emerging scholars to navigate disciplinary tensions, integrate social and biophysical data, and situate recreation behaviors within broader processes of environmental change. Keywords: place attachment, activity use levels, case study

ISOLATION OF INTRACELLULAR AND EXTRACELLULAR DNA FROM LAKE SUPERIOR SEDIMENTS
Presenter(s): Julie Salerno
Category: Environmental Science and Natural Resources
Mentor(s): Matthew Schrenk (College of Natural Science)

This project focused on isolating intracellular (iDNA) and extracellular DNA (eDNA) from sediment samples collected at Western Mooring, Lake Superior. Sediments were subsampled and processed with extraction methods designed to separate DNA inside intact cells from DNA bound to sediment particles. DNA samples were first quantified using a Qubit fluorometer and then further analyzed for quality and fragment size using a genomic tape station. This work helped evaluate DNA preservation and improve methods for studying sedimentary DNA in freshwater systems.

EVALUATING LARGEMOUTH BASS GROWTH ON A CRAYFISH-DOMINATED DIET USING BIOENERGETICS
Presenter(s): Adam Stearns
Category: Environmental Science and Natural Resources
Mentor(s): Aaron Sullivan (College of Agriculture & Natural Resources), Brian Roth (College of Agriculture & Natural Resources), Mackenzie Thompson (College of Agriculture & Natural Resources), William Ota (College of Agriculture & Natural Resources)

The red swamp crayfish (Procambarus clarkii) is an invasive species that disrupts biodiversity in freshwater ecosystems and alters food webs, which poses challenges for management in invaded ponds. One proposed management strategy is to use native predators, such as largemouth bass (Micropterus nigricans), as a form of biological control. However, the energetic feasibility of bass persisting on a majority red swamp crayfish diet remains unclear. We used bioenergetics modeling, which quantifies how consumption and environmental conditions influence individual growth, to determine how largemouth bass growth is affected by consumption of red swamp crayfish. Stomach content data from multiple invaded sites were combined with temperature data, crayfish energetic density, and diet proportions to predict growth rates across observed and simulated diet scenarios. This approach assesses how largemouth bass can meet their energetic requirements in crayfish-dominated systems and informs stocking strategies for predatory fishes in invaded ponds.

ESTIMATING RELATIVE ABUNDANCE AT THE LOCAL LEVEL UTILIZING CAMERA TRAPS ON AN UNMARKED WHITE-TAILED DEER POPULATION
Presenter(s): Samuel Kneibel
Category: Environmental Science and Natural Resources
Mentor(s): Sonja Christensen (College of Agriculture & Natural Resources)

Population estimation is a fundamental component of wildlife management. Camera traps have proliferated in use over the past decade, and can provide passive observation and count data of target species. Using camera trap data collected during acute population monitoring from February through April of 2025 in the Dansville State Game Area, Michigan, USA, we utilized an N-mixture model designed for population estimation in unmarked populations to determine relative abundance of white-tailed deer (Odocoileus virginianus) within the study area. Our results provided a baseline estimate of deer abundance at the local level with acceptable levels of uncertainty. These results provide rigorous foundation for management decisions, and provide a "snapshot in time" of the local population that could be re-evaluated in the event of local disturbance, such as disease outbreak or significant management activities.

THE EFFECTS OF CIRCADIAN RHYTHM ON ODOR ASSOCIATION WITH ZEBRAFISH (DANIO RERIO)
Presenter(s): Vivian Gunn
Category: Environmental Science and Natural Resources
Mentor(s): Anne Scott (College of Agriculture & Natural Resources), Lili Hagg (College of Agriculture & Natural Resources)

Zebrafish (Danio rerio) have a specific preferred window of time for mating activity, often corresponding to times in the early morning. The goal of this experiment is to determine whether or not there is a relationship between time of day and strength of odor association. During mating trials that are run only during the ideal morning mating window, an odor is introduced, which will then be re-introduced in a y-maze trial. This experiment will test for the number of times that a fish enters a side with an odor they are familiar with from a mating trial. This number will then be compared to the time of day the trial was run, to determine if there is a correlation between y-maze arm entries and time of day. It is hypothesized that the fish will enter an odorized arm more frequently if it is earlier in the day, during their ideal mating time.

UNDERSTANDING BLACKLEGGED TICK BURDENS ON WHITE-TAILED DEER AS INFLUENCED BY FAWN SPACE USE IN MERIDIAN TOWNSHIP, MI.
Presenter(s): Abigail Cattermole
Category: Environmental Science and Natural Resources
Mentor(s): Henry Campa (GRADUATE SCHOOL DEAN), Jean Tsao (College of Agriculture & Natural Resources), Matthew Buchholz (College of Agriculture & Natural Resources)

White-tailed deer (Odocoileus virginianus) act as a primary host for adult blacklegged ticks (Ixodes scapularis) providing blood meals for reproduction and dispersing individuals to new locations.

Understanding how patterns of land cover and use within areas white-tailed deer inhabit affect tick burdens is crucial for guiding deer-targeted tick control measures. To assess these patterns, we initially analyzed the size and composition of home ranges of two groups of deer: (a) legally harvested deer and (b) radio-collared fawns. We fitted VHF radiocollars on fawns (n=10) during spring 2025 and collected movement data and visual locations to quantify their movements throughout Meridian Township, MI. We then collected ticks on hunter-harvested fawns (n=20) from Oct-Dec 2025 and from fawns culled by law enforcement personnel (n=34) during Jan 2026. Using the known harvest/cull locations and average home range size from the collared fawns, we quantified the land cover composition and structure of each fawn's estimated home range and evaluated tick burdens. Mean annual home range size of radio-collared fawns was 22.2 ha (11.7-29.8 ha). Seasonal fawn home ranges averaged 11.6 ha and 18.1 ha for summer and fall, respectfully. Tick burden of harvested deer ranged from 0-17 ticks per deer (mean=2). Analyses comparing tick burden to patterns of land cover and use and how those patterns relate to deer habitat requirements are ongoing. Our findings may guide land managers in understanding white-tailed deer and blacklegged tick interactions and dynamics in a suburban environment.

ADVANCING SOIL INFILTRATION MEASUREMENT THROUGH IOT-ENABLED DOUBLE RING INFILTROMETER AUTOMATION

Presenter(s): Summer Luick
Category: Environmental Science and Natural Resources
Mentor(s): Younsuk Dong (College of Agriculture & Natural Resources)

Accurate soil infiltration measurements are essential to understanding soil health and creating reliable hydrologic models. Oftentimes the true infiltration rate is much different than the assumed infiltration rate. This may be due to numerous factors including but not limited to land management practices, soil structure, vegetation and spatial variability throughout the field. It is vital to have a reliable and accurate way to measure infiltration rates. The current ASTM method of measuring infiltration rates is labor-intensive, time consuming, and prone to error. This project aims to use IoT-based automation for continuous and accurate monitoring of infiltration rates in agricultural fields. IoT technology has been combined with the falling head method of measurement in the past. However, this study will use the constant head method for measurement in hopes to improve the accuracy of the measurements. The system uses eTape sensors to measure fluid height, peristaltic pumps to maintain the water level, marriotte tubes to add water to the system, and Adafruit ultimate GPS featherwing technology to track GPS locations of each test. IoT technology will be implemented to upload the information to the cloud. The use of sensors in combination with IoT technology and application of the constant head method minimizes the labor and time associated with manual infiltration testing. Proper implementation of this project will improve the accuracy of the test, increase the number of samples collected in a day and decrease the labor involved in obtaining the measurements.

INFLUENCE OF VALUES, BELIEFS, AND NORMS ON MICHIGAN HOMEOWNERS' ECO-FRIENDLY FOOD AND FOOD WASTE BEHAVIORS

Presenter(s): Armando Laho, Bailey McFadden, Lea Saputo, Olivia Bisson, Rachel Miller, Victoria Bucher, Violet Greborunis

Category: Environmental Science and Natural Resources

Mentor(s): Aaron McCright (College of Social Science), John Waller (College of Social Science), Katherine Alaimo (College of Agriculture & Natural Resources)

Introduction: Earth Is My Home is an MSU and community-based initiative aimed at educating and inspiring individuals to integrate sustainable practices into daily life. The initiative integrates key behavior change strategies including social norms, relational organizing, social support, education, and principles of persuasion. As part of the study, we conducted a survey of Michigan homeowners to investigate eco-friendly food and food waste behaviors and guide the development and evaluation of the eco-behavior intervention. Methods: The survey was administered by Qualtrics in Nov-Dec 2025 to ~2,000 Michigan adults. Survey questions measured respondents' pro-environmental values, beliefs, norms, and behaviors. We created composite scales to measure key constructs from Value-Belief-Norm Theory, and we used SPSS to investigate relationships between these variables and scales measuring eco-intensive food consumption, plant-based diet, and food waste behaviors. Results: We will display the percentages of respondents who self-reported each of the 4 eco-intensive food consumption behaviors and those who reported to mostly consume plant-based diets and reduce food waste. We then will present the performance of theoretical relevant values, beliefs, and norms variables on the two resulting behavior scales. Specifically, we will explore the extent to which the same predictors perform similarly across our two models. Conclusion: By analyzing this data, this project can better measure community levels of environmental consciousness and eco-friendly behaviors. This will be used to aid in an intervention that employs meaningful, persuasive conversations and team-based learning to increase environmental awareness and encourage individuals to adopt new sustainable behaviors.

OVERCOMING NUTRIENT MANAGEMENT CHALLENGES FOR ORGANIC VEGETABLE PRODUCTION

Presenter(s): Abigail Golembiewski, Teagan Bush

Category: Environmental Science and Natural Resources

Mentor(s): Daniel Brainard (College of Agriculture & Natural Resources), Stephen Stresow (College of Agriculture & Natural Resources), Zachary Hayden (College of Agriculture & Natural Resources)

Organic vegetable growers in Michigan face persistent nutrient management challenges, particularly for nitrogen (N), which is essential for crop growth and yield but difficult to manage in organic systems. Unlike synthetic fertilizers, organic nutrient sources must decompose before N becomes plant-available, making it harder to synchronize nutrient release with crop demand. This timing challenge can lead to early-season N limitation, reduced yields, and, if growers compensate through higher application rates, increased risk of phosphorus (P) over-application and associated water quality impacts. To address these issues, a field experiment was conducted at the Michigan State University Horticulture Teaching and Research Farm evaluating organic broccoli nutrient management strategies under Michigan growing conditions. Treatments tested different N rates, application timing, and combinations of organic

amendments, with the goal of improving synchronization between nutrient availability and broccoli uptake. Fertility strategies were evaluated using soil inorganic N (KCl extraction), plant tissue nutrient content, soil health indicators, and drone-based imagery to assess crop vigor throughout the season. Across treatments, combinations of high-N feather meal and poultry manure improved broccoli yield without reducing profitability compared to standard organic fertility approaches. Results also indicate that early-season N availability is critical for maintaining yield through the full production period. These findings support nutrient management strategies aligned with Michigan GAAMPs by improving N-use efficiency, reducing the likelihood of excess P application, and providing Michigan organic vegetable farmers with practical, field-tested guidance for optimizing fertility while protecting soil and water resources.

COREY MARSH AQUATIC PLANTS: WITHIN-YEAR PATTERNS AND ABUNDANCE
Presenter(s): Isabella Leksche Rosales
Category: Environmental Science and Natural Resources
Mentor(s): Jeremy Hartsock (College of Agriculture & Natural Resources)

Aquatic plants are a critical component of aquatic ecosystems and provide many ecosystem services. These include things such as oxygenating the water column, improving water quality by absorbing nutrients, stabilizing sediment, and providing habitat and food for fish, birds, and invertebrates. In this study, we sampled the Corey Marsh Ecological Research Center, a wetland property of Michigan State University, approximately 9 miles away from campus. Our aim was to document the abundance of individual species of aquatic plants over the length of the summer. We also conducted this study to identify the abundance of an invasive aquatic plant, Curly-leaf pondweed, over time. We designed a sample frame using modified point-intercept surveying, using 24 equidistant sampling points over the parts of the marsh that are underwater. We sampled three times in total: once in June, July, and August of 2025. For each point, we recorded the water depth and threw a double-sided rake twice to collect plant samples. We then identified the relative dominance of each plant species on the rake based on visual approximation, as well as the total abundance of plant matter found on the rake. In total, we found 9 aquatic plant species occurring, including the non-native Curly-leaf pondweed. We assessed the change in species abundance over the summer and found that Curly-leaf pondweed had a higher abundance in the spring than in late summer. However, Coontail, Leafy pondweed, and Muskgrass were the most abundant species throughout the entire growing season, accounting for 70% of the total vegetation. These findings inform us that it is important to sample aquatic vegetation at multiple times throughout the season to get an accurate estimate of species population density and distribution. We also recommend using relative dominance to record abundance in samples, so that more accurate comparisons can be made.

INFLUENCE OF VALUES, BELIEFS, AND NORMS ON MICHIGAN HOMEOWNERS' PRO-ENVIRONMENTAL AND NATURE APPRECIATION BEHAVIORS

Presenter(s): Armando Laho, Bailey McFadden, Lea Saputo, Olivia Bisson, Rachel Miller, Victoria Bucher, Violet Greborunis
Category: Environmental Science and Natural Resources
Mentor(s): Aaron McCright (College of Social Science), John Waller (College of Social Science), Katherine Alaimo (College of Agriculture & Natural Resources)

Introduction: Earth Is My Home is an MSU and community-based initiative aimed at educating and inspiring individuals to integrate sustainable practices into daily life. The initiative integrates key behavior change strategies including social norms, relational organizing, social support, education, and principles of persuasion. As part of the study, we conducted a survey of Michigan homeowners to investigate eco-friendly behaviors and guide the development and evaluation of the eco-behavior intervention. Methods: The survey was administered by Qualtrics in Nov-Dec 2025 to ~2,000 Michigan adults. Survey questions measured respondents' pro-environmental values, beliefs, norms, and behaviors. We created composite scales to measure key constructs from Value-Belief-Norm Theory, and we used SPSS to investigate relationships between these variables and scales measuring pro-environmental and nature appreciative behaviors. Results: We will display the percentages of respondents who self-reported each of the 11 pro-environmental behaviors and each of the 6 nature appreciation behaviors. We then will present the performance of theoretical relevant values, beliefs, and norms variables on the two resulting behavior scales. Specifically, we will explore the extent to which the same predictors perform similarly across our two models. Conclusion: By analyzing this data, this project can better measure community levels of environmental consciousness and eco-friendly behaviors. This will be used to aid in an intervention that employs meaningful, persuasive conversations and team-based learning to increase environmental awareness and encourage individuals to adopt new sustainable behaviors.

ASSESSMENT OF SOIL WATER MOVEMENT IN ORCHARDS THROUGH ELECTRICAL RESISTIVITY TOMOGRAPHY

Presenter(s): Gianna Fiore
Category: Environmental Science and Natural Resources
Mentor(s): Nawab Ali (College of Agriculture & Natural Resources), Younsuk Dong (College of Agriculture & Natural Resources)

Weather variability has increased the vulnerability of Michigan's fruit industry by intensifying temperature fluctuations and erratic precipitation patterns, especially in sandy soil. The low water holding capacity creates rapid infiltration, uneven soil moisture distribution, and a high risk of nutrients leaching below the rootzone, affecting fruit production. These challenges complicate irrigation and fertigation management for optimum moisture and nutrient availability while minimizing losses. A key limitation is the lack of effective methods to evaluate water and nutrient transport in the soil profile. To address these challenges, Electrical Resistivity Tomography (ERT), a non-invasive geophysical technique, was used to assess soil structural variability, moisture distribution, particularly pre-vs post-irrigation events comparison. Soil variability and moisture distribution were compared to the resistivity values

collected from ERT. A correlation was observed between ERT-derived resistivity values, tomograph colors, and measured soil texture and moisture. Soil texture variability and bulk density assessment enable visualization of wetting depth, lateral movement of water, and areas with restricted infiltration. Salt and fertilizer application tomographs in soil provided insights for nutrient availability and transport in root zones. These outcomes reduce the risk of nitrate leaching, improve resource use efficiency, and demonstrate the effectiveness of ERT in detecting soil structural variability, monitoring moisture distribution, and tracking nutrient movement, thereby highlighting its potential as a tool for sustainable irrigation and fertigation management in orchards.

FRAMING THE DIVIDE: THE ROLE OF PARTISAN CUES IN CLIMATE POLICY SUPPORT
Presenter(s): Jaclyn Cool, Jenna Greene, Luca Ceccacci, Margaret Montpas
Category: Environmental Science and Natural Resources
Mentor(s): Douglas Bessette (College of Agriculture & Natural Resources)

Political polarization increasingly shapes how Americans interpret policy, particularly on climate and energy issues. Prior research shows that partisan cues, messenger identity, and framing can influence public support for climate policy, often more than the policy's technical content. This study investigates whether these dynamics extend to young voters by examining how partisan language affects college students' perceptions of an identical clean-energy executive order. Using a survey-based experiment distributed to Michigan State University students, participants were randomly assigned either a liberal-framed or conservative-framed version of the same policy. The survey measured support, perceived value alignment, confidence, and electability, alongside demographic variables such as political affiliation and gender. Responses were analyzed using two-way ANOVA to test the effects of partisan identity and framing. Results show that political identity was the strongest predictor of policy support: Democrats consistently rated the policy more favorably than Republicans across all measures. In contrast, partisan framing alone did not significantly influence support, alignment, confidence, or electability. Gender also showed no meaningful effect. These findings suggest that among college students, pre-existing political identity outweighs partisan language in shaping reactions to energy policy. While framing has been shown in other studies to shift attitudes, this experiment indicates that partisan cues may have limited influence within a politically engaged student population. The study contributes to broader research on climate communication by highlighting the durability of political identity and the challenges of depolarizing climate and energy policy discourse among young voters.

FIRST DETECTION OF LYCHNOTHAMNUS BARBATUS IN MICHIGAN
Presenter(s): Sam Brown
Category: Environmental Science and Natural Resources
Mentor(s): Jeremy Hartsock (College of Agriculture & Natural Resources)

Lychnothamnus barbatus is the only extant species of the macroalgae genus Lychnothamnus. Native to Europe and Austrasia, the only New World occurrences of L. barbatus are pre-Cretaceous fossils found in Argentina. In recent years, living populations have been found in inland lakes in Wisconsin and

Minnesota. During a point-intercept macrophyte survey of Sand Lake in Manistee County, our lab recorded the first occurrence of L. barbatus in Michigan. It is currently unclear whether these populations have been introduced from Europe or Austrasia, or if they have persisted in the Americas undetected until now. Further research is required to understand its origins in the New World, and continued macrophyte sampling will help to build the known distribution and community structure of L. barbatus.

MICROBE-MINERAL INTERACTION OF DEEP-SEA MINERALS AND MARIDESULFOVIBRIO HYDROTHERMALIS
Presenter(s): Elizabeth Wing
Category: Environmental Science and Natural Resources
Mentor(s): Ella Cardoza (College of Natural Science), Matthew Schrenk (College of Natural Science)

Making up 70 percent of Earth's surface, oceans remain largely underexplored, particularly the deep seafloor. The seafloor hosts a multitude of unique microenvironments, where microorganisms are able to sustain life under high pressures without oxygen. Some microorganisms do so by using "geo fuels," which are reduced inorganic compounds within minerals that provide them with the energy they need to sustain life. Microbes can oxidize these reduced compounds for energy gain through a process called chemolithoautotrophy. A newly emerging mining process for critical minerals, deep sea mining, could disturb these communities and disrupt critical nutrient cycling. The goal of this study was to directly observe how the presence of common seafloor minerals, gabbro and basalt, influence the microbial growth of the pressure-loving microbe, Maridesulfovibrio hydrothermalis. This was performed by growing M. hydrothermalis in seawater media at pressure with deep-sea minerals, including basalt, basaltic glass, and gabbro. Growth was monitored via cell enumeration with fluorescence microscopy, and Scanning Electron Microscopy (SEM) imaging is applied to image how the microorganisms are interacting with the minerals. It's hypothesized that M. hydrothermalis has a direct relationship with these seafloor minerals, where the microbes adhere and form biofilms on the basalt and gabbro to be in close enough contact to derive energy. These findings will improve our understanding of microbe-mineral interactions in the deep ocean and provide critical insight into how deep-sea mining may affect seafloor microbial ecosystems.

OPTIMIZING THE PROCEDURE FOR THE QUANTIFICATION OF MICRO/NANOPLASTICS(MNPS) IN TEA
Presenter(s): Balaji Venkatesh
Category: Environmental Science and Natural Resources
Mentor(s): Carl Boehlert (College of Engineering), Shiwang Cheng (College of Engineering)

The accumulation of micro/nanoplastics (MNPs) in ecosystems poses a risk to human health, especially when MNPs enter the body through non-traditional methods of detection. Tea made using teabags have found to leach MNPs in the drink. We hope to quantify the amount of MNPs present in tea using Metal Phenolic Networks (MPNs). MPNs are fluorescence-enabled method of organic networks constructed

from metal ions and phenolic ligands. It captures a variety of particles using metal ions and phenolic ligands. Utilizing MPNs, we detect the presence of MNPs in solution.

AGE-RESOLVED ASSESSMENT OF BLACK BEAR (URSUS AMERICANUS) DIET REVEALED THROUGH SPATIALLY RESOLVED STABLE ISOTOPE ANALYSIS OF TEETH ANNULI.
Presenter(s): Kalyn Watkins
Category: Environmental Science and Natural Resources
Mentor(s): James Moran (College of Natural Science), Katie Rock (College of Natural Science)

Understanding the diet of black bears throughout their lifetimes can provide valuable insights into their interactions with humans, natural feeding behaviors, and overall health. We are using laser ablation isotope ratio mass spectrometry (LA-IRMS) to measure isotopic carbon ($\delta^{13}C$) values of cementum in thin-sectioned bear teeth correlating to different years in the bear's life. Our methods use a line of 25µm laser ablation spot size, which enables stringent measurement of annual growth bands (i.e., annuli) in the teeth samples. This spatial precision positions us to reveal shifts in a bear's diet across life stages. We are seeing age-related variation in carbon sourcing. For example, preliminary data suggest an isotopic signal potentially linked to weaning between years one and two. The annual dietary record revealed by isotopic analysis of teeth can provide valuable insights into long-term dietary trends in bears not attainable with other types of analyses. Tools like LA-IRMS can help unlock dietary signals in teeth and other tissues (e.g., hair, feathers, scutes, etc.) and may be a valuable analytical method for exploring animal nutritional status, feeding patterns, and migration.

EFFECT OF SPIN TRANSITION ON THE ELASTIC PROPERTIES OF BRIDGMANITE
Presenter(s): Lily Velez Lewis
Category: Environmental Science and Natural Resources
Mentor(s): Susannah Dorfman (College of Natural Science)

Bridgmanite is the most abundant mineral in the Earth's lower mantle and naturally exists at extreme pressures and temperatures. This mineral undergoes a pressure-driven transition in electronic arrangement from high to low magnetic spin states, termed a spin transition, which may result in a noticeable change in bonding that can be observed under Raman spectroscopy. This change is expected to occur at 50 GPa pressure. This change is important because it will allow scientists to understand the behavior of bridgmanite in the lower mantle and how extreme pressures can affect the elastic bonds within the mineral enough to cause a chemical change that is visible via seismic wave speeds. However, no studies have clearly observed the effect of the spin transition on vibrational properties. In this experiment, two samples will be used; one that can undergo the spin transition due to its composition and a sample that cannot undergo the spin transition. After preparation, the bridgmanite samples are placed into diamond anvil cells where they will undergo pressurization up to 80 GPa, which is the average pressure for Earth's mantle. During pressurization, the samples will be analyzed using a Raman spectrometer. The Raman spectrometer will observe shifts in the vibrational peaks that will demonstrate

the difference in elastic properties between samples. The results will determine the effects pressure-induced spin transitions have on the elastic properties of bridgmanite.

UNDERSTANDING LOON MORTALITY TRENDS IN MICHIGAN
Presenter(s): Ann Joseph
Category: Environmental Science and Natural Resources
Mentor(s): Sonja Christensen (College of Agriculture & Natural Resources)

The Common Loon is an iconic and ecologically important native species in Michigan. Between 1987 and 2025, the Michigan Department of Natural Resources conducted diagnostic analysis on 512 common loons found dead or moribund in the state of Michigan. Since the early 1900s, populations of the common loon have followed steady decline in Michigan due to a diverse array of factors. Using this data, the main goals of this study were to classify causes of mortality and identify possible trends in emerging disease risk for the species within the state of Michigan. Across the time frame of the data, it was found that the top three causes of death were trauma, type E botulism, and lead toxicosis, respectively. In identifying these trends this study aims to help inform future disease response plans and identify options for mitigating negative health outcomes for loons Michigan.

FOREDUNE TRENDS ALONG LAKE MICHIGAN'S SHORELINE
Presenter(s): Riley Burns
Category: Environmental Science and Natural Resources
Mentor(s): Ethan Theuerkauf (College of Social Science)

Coastal hydrodynamics cause coastal areas to constantly change, driving transformation in foredune morphology. Along Lake Michigan's shoreline, fluctuating lake levels have significantly influenced the evolution of foredunes. Beginning in 2014, lake levels began to rise, narrowing the foredune width along the shoreline. High lake levels then peaked between 2019 and 2020, causing further narrowing. After 2020, lake levels have begun gradually declining. The goal of this study is to quantify foredune width loss associated with high lake levels and identify spatial patterns of heavy erosion and localized accretion. Shoreline paths representing foredune positions were digitized in Google Earth Pro for townships along Lake Michigan. Four shoreline dates were selected based on being before lake level rise, during peak lake level rise, immediate post lake level rise, and gradual lake level decline. These shoreline datasets were merged and imported into the Digital Shoreline Analysis System (DSAS), where they were analyzed using a baseline and transects previously developed in Professor Theuerkauf's lab for prior coastal research. DSAS was used to calculate shoreline change statistics for each township across the four time periods. The data calculated from DSAS were then imported into ArcGIS Pro to visualize spatial patterns of erosion and accretion along Lake Michigan. Findings suggest that most townships experienced foredune erosion, with limited localized areas showing accretion. Understanding how coastal hydrodynamics impact foredunes is crucial for coastal management, due to foredunes acting as a buffer against sedimentation transport and supporting communities with frequent tourism along the Lake Michigan beaches.

DISTRIBUTION AND GENETIC VARIATION OF INVASIVE WATERMILFOIL IN MICHIGAN INLAND LAKES
Presenter(s): Adam Grove
Category: Environmental Science and Natural Resources
Mentor(s): Jeremy Hartsock (College of Agriculture & Natural Resources)

Invasive watermilfoil - Eurasian watermilfoil and hybrid watermilfoil - are widespread and problematic aquatic plant species in Michigan's inland lakes. From aquatic plant surveys conducted across more than 130 lakes, we detected invasive watermilfoil species in several waterbodies. Here, we present the distribution of lakes where invasive watermilfoil was observed. In addition, to better understand genetic variation, we collected plant samples from a subset of lakes within the Huron-Manistee National Forest for genetic analysis. This effort was motivated by reports of herbicide-resistant strains occurring elsewhere in the state. Genetic testing revealed the presence of multiple strains among the sampled populations; however, none were determined to be herbicide resistant. Together, these findings highlight the broad distribution of invasive watermilfoil in Michigan inland lakes and provide insight into the current genetic composition of select populations. This information can help inform future monitoring and management efforts aimed at limiting the spread and impact of this species.

NATIVE PLANT ESTABLISHMENT FOLLOWING INVASIVE SPECIES REMOVAL AT THE BENGEL WILDLIFE CENTER
Presenter(s): Brixon Schmiesing
Category: Environmental Science and Natural Resources
Mentor(s): Cheyenne Kleiner (College of Education)

Invasive plant species pose a major challenge to forest restoration in Michigan. These non-native plants kill and outcompete native vegetation, reduce biodiversity, and generally harm an area's aesthetic and traversability. This is a problem evident at Bengel Wildlife Reserve in Bath Township, Michigan. Here, Oriental bittersweet (Celastrus orbiculatus) and bush honeysuckle (Lonicera spp.) have taken a stronghold and have heavily altered the parks forest environment. After manual removal of these invasives in a section of forest at the center, an assortment of native species were planted in their place. This study aims to see which native plant species establish most successfully and whether fencing newly planted areas improves native plant growth by reducing herbivory. Two 5 ft x 5 ft plots will be established within each different native species planting area: one fenced with a 4-ft-tall enclosure and one an unfenced control. Plant performance will be measured weekly over a four week period (March 20-April 10). Data collected will include total native percent cover, number of native plant stems, and the ratio of native to invasive plant cover. Based on previous restoration studies, it is expected that fenced plots will show greater native cover and stem density due to reduced animal grazing, while certain native species will demonstrate higher establishment success than others. These findings are important for guiding effective, low-cost restoration strategies in Midwestern forests and can inform land managers on species selection that improve long-term restoration outcomes.

WHOSE FISH ARE THESE? THE GENETIC ORIGIN OF BROWN TROUT HARVESTED FROM MICHIGAN WATERS OF LAKE SUPERIOR
Presenter(s): Braydon Sprik
Category: Environmental Science and Natural Resources
Mentor(s): Jared Homola (College of Agriculture & Natural Resources)

Brown Trout is a cold-water fish species that is a prized catch among Great Lakes anglers. This non-native species has been observed to seek areas with more suitable conditions. Stakeholder groups have recently requested an assessment of whether brown trout captured in Michigan waters of Lake Superior originated from stocking by the Michigan or Wisconsin Department of Natural Resources. After the Dingell-Johnson Act passed in 1950, a part of the revenue brought in through the purchase of fishing licenses is returned to the state to be used for fisheries management. Anglers often advocate for these funds to be spent by the state on increasing angling opportunities. There are four strains that have been stocked into Lake Superior over the past two decades: Seeforellen, Sturgeon River, Gilchrist Creek, and Wild Rose. Wisconsin DNR has stocked over 3 million Seeforellen Brown Trout since 2000. Michigan DNR has stocked mostly Wild Rose, Gilchrest Creek, and few Seeforellen. Samples were obtained from MiDNR after surveying three tributaries and 140 additional samples were angler captured fish. Samples were genotyped using restriction-site associated DNA sequencing at 42,291 single nucleotide polymorphism loci. After sequencing, a clustering analysis was used to determine seven distinct genetic lineages were present. The three additional strains are naturalized strains, including Chocolay River, Pilgrim River, and Whetstone Creek. Additionally, 41 of the 140 angler-caught samples were Seeforellen strain. Collectively, these results indicate that Brown Trout stocked in Wisconsin are often harvested in Michigan, highlighting the importance of interjurisdictional coordination.

A COMPARISON OF THE FAUNA OF INLAND LAKES
Presenter(s): Kaleigh Pullie
Category: Environmental Science and Natural Resources
Mentor(s): Louise Mead (College of Natural Science)

Inland Lakes Education and Research Center is a set of 4 man-made lakes on the Michigan State University campus. The lakes were initially constructed in the late 1960s to the early 1970s to study the ability of the aquatic plants to remove nitrogen and phosphorus from the effluent of a water treatment plant. To our knowledge, once the research was completed the area went mostly unused until recently. The goal of the current study is to characterize the flora and fauna around and in the lakes. Our initial investigation focuses on the local fauna and is working to characterize the water quality in each of the lakes. The data we collect will help answer a series of ecological questions about the site: How similar are each of the lakes? Is each lake its own ecosystem or do organisms (particularly vertebrates) move from lake to lake? Does wastewater have any residual impact on wildlife?

EXPLORING THE IMPORTANCE OF THE MISSISSIPPI RIVER SPILLWAY AS A LOESS SOURCE
Presenter(s): David Pruder
Category: Environmental Science and Natural Resources
Mentor(s): Randall Schaetzl (College of Social Science)

This presentation examines the origin of thick loess deposits in western/southwestern Wisconsin and evaluates whether these sediments were sourced primarily from the Mississippi River valley, the Iowan Erosion Surface, or a combination of both. Loess: wind-blown, silt-sized sediment is commonly derived from glacial grinding and meltwater transport. This sediment forms fertile soils that make up the major Midwestern agricultural regions, making its placement an important geomorphic and environmental question. Using geochemical analysis (X-ray fluorescence) of 70 source-area samples and 18 loess cores, along with statistical discrimination of elemental signatures, the study finds that most thick loess in western/southwestern Wisconsin was transported from western sources associated with the Des Moines Lobe rather than from the Mississippi River (which is what everyone thought historically). Although the Mississippi valley did contribute locally where the valley geometry aligned with dominant winds. These results update regional models of loess transport and highlight the previously unknown and dominant role of western sources in shaping Wisconsin's loess landscape.

PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) MIXTURE BIOACCUMULATION IN JUVENILE FATHEAD MINNOWS (PIMEPHALES PROMELAS) THROUGH DIETARY EXPOSURE
Presenter(s): Mariska Hamilton
Category: Environmental Science and Natural Resources
Mentor(s): Rachel Leads (College of Agriculture & Natural Resources)

Per- and polyfluoroalkyl substances (PFAS) are a large group of chemicals commonly used in industrial and commercial manufacturing. PFAS can enter the environment through many different ways, such as wastewater treatment plant effluent, biosolid application, and the use of firefighting foams. Due to these various sources, PFAS are present in the environment as complex mixtures of different compounds. These chemicals break down very slowly and are known to bioaccumulate through food webs. Early life stage (ELS) fish, in particular, can be sensitive to PFAS mixture exposure, impacting growth and survival. However, current knowledge is very limited in understanding how PFAS mixtures bioaccumulate and persist in ELS fish. Therefore, we completed a 56-day PFAS mixture bioaccumulation and depuration experiment with juvenile fathead minnows (Pimephales promelas). During the 28-day uptake phase, minnows were exposed to 5 concentrations of PFOS (0-0.20 mg/g) or a mixture of PFOS, PFHxS, PFOA, and PFOSA (0-0.25 mg/g) through their diet. Following the uptake phase, fish were then fed a clean diet for 28 days to measure PFAS depuration. Whole fish samples (n=3 per concentration) were collected during 10 sampling timepoints throughout the 56-day exposure. Tissue concentration increased with increasing exposure concentrations for all analytes, with whole-body PFAS concentrations reaching 142.8 µg/g. PFOS and PFOSA were most bioaccumulative, accumulating at higher concentrations than PFHxS or PFOA. Together, these results provide important information about how PFAS mixtures bioaccumulate in juvenile fish and can be used to inform future ecological risk assessments.

REE RECOVERY FROM COAL FLY ASH WITH SEQUENTIAL BIO-DESILICATION PRETREATMENT AND SPENT-MEDIUM BIOLEACHING
Presenter(s): Addison Swanson, James Richards
Category: Environmental Science and Natural Resources
Mentor(s): Maggie Williams (College of Engineering)

Coal fly ash (CFA) is a byproduct of coal combustion and is often stored in waste ponds that may leach contaminants, including critical metals to the environment. CFA contains economically viable concentrations of certain critical metals, which may be larger than in conventional ores, however typical methods to extract these elements - especially those with recalcitrant occurrence modes like the rare earth elements (REEs) - require excessive reagent and energy consumption. These aspects contribute to a heavy economic burden and environmental impact, and encourage the development of sustainable recovery methods. Bioleaching is a sustainable alternative and has been analyzed for recovering critical metals from CFA, however is generally ineffective without the necessary pretreatment step of decomposing the amorphous aluminosilicate structure that encapsulates REEs, demanding intensive physio-chemical pretreatments which negate the primary benefits of bioleaching. Instead, these structures can be targeted by the silicon-solubilizing bacteria Paenibacillus mucilaginosus in a process called bio-desilication, where the bacteria secrete organic acids that decompose silicate minerals. Bio-desilication therefore avoids the drawbacks of physio-chemical pretreatment while still achieving the decomposition of the crystal structure that traps the largest fraction of REEs. After this, the metals can be leached using biogenic carboxylic acids from Pseudomonas putida, which has been demonstrated to be more effective than with commercial acids. In summary, the recovery of REEs from CFA via the combination of bio-desilication pretreatment by P. mucilaginosus and spent-medium bioleaching by Ps. putida will be compared to results from physio-chemical leaching processes and assessed from environmental and economic perspectives.

FORGED IN THE NORTH: SEM INSIGHTS FROM IRON AND COPPER SLAG OF MICHIGAN'S UPPER PENINSULA
Presenter(s): Lucy DeGroot
Category: Environmental Science and Natural Resources
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Slag produced during historic iron and copper smelting in Michigan's Upper Peninsula preserves valuable textural and mineralogical evidence of regional mining and metallurgical practices. While the Upper Peninsula was a major center for both iron and copper production during the nineteenth and twentieth centuries, the micro textures of its smelting byproducts remain unstudied. Examining these features can provide insight into smelting efficiency, ore sources, and cooling conditions associated with different mining industries. This project investigates iron slag from Negaunee and comparative copper slag samples from the Upper Peninsula using scanning electron microscopy (SEM). High resolution imaging and energy dispersive spectroscopy (EDS) are used to document vesicles, metallic globules, and glassy matrices, as well as to identify compositional contrasts between iron and copper rich slags. Multiple SEM images will be incorporated into the final poster to highlight textural variability and metallurgical

differences. Although data collection is ongoing, SEM analysis is expected to reveal microstructural and compositional features that are not visible at the macroscopic level. These preliminary observations will support interpretations of slag formation conditions and smelting technologies, contributing to a broader understanding of mining and metallurgical practices in Michigan's Upper Peninsula.

RECREATIONAL ACTIVITY INFLUENCES ON CLIMATE CHANGE OBSERVATIONS AND IMPORTANCE OF ENVIRONMENTAL PROTECTION IN MICHIGAN'S HURON-CLINTON METROPARKS
Presenter(s): Allison Saunders
Category: Environmental Science and Natural Resources
Mentor(s): Elizabeth Perry (College of Agriculture & Natural Resources)

How people recreate on public land can affect their observations of climate change and how they view the benefits that come from the land being protected. While some recreational activities require wildlife to be present, others are dependent on snowfall, and some prefer extended periods of heat. One commonality affecting these conditions is climate change. Recreational activity choice can influence if climate change is present enough to impact someone's ability to recreate. Furthermore, if someone is not observing climate change while they recreate, then the effects do not impact them in an apparent way. This can lead to a decreased sense of need for environmental protection, further amplifying future climate impacts. However, if someone's ability to recreate is impacted by climate change, then they might be more inclined to advocate or agree with decisions that promote environmental protection. Data were collected from residents in the southwest region of Michigan during 2023 to create a climate action plan for the Huron-Clinton Metroparks. A survey was sent to the Metroparks' email list (2,385 responses) and complemented by an online panel of residents in the region (1,684 responses). The research team seeks to address whether recreation activity type influences climate change observations and environmental protection importance. On a broad scale, if we can understand the reasoning behind why environmental protection is a lower priority for various recreational activities, then we can implement educational opportunities to increase the knowledge of the importance of environmental protection.

SEDGE WREN NESTING VEGETATION AT COREY MARSH ECOLOGICAL RESEARCH CENTER
Presenter(s): Mikayla Datka, Page Greene
Category: Environmental Science and Natural Resources
Mentor(s): Jen Owen (College of Agriculture & Natural Resources), Olivia Smith (College of Agriculture & Natural Resources)

Sedge Wrens are a small, grassland-dependent songbird species that inhabit much of central North America. They are a nomadic species. Unlike most birds, they do not always return to the same habitat every year for breeding. However, Sedge Wrens return yearly to the wet prairie of Corey Marsh Ecological Research Center in high abundance for breeding season. Our team asked why Sedge Wrens choose this habitat annually and how the vegetation community composition at Corey Marsh, especially the invasive reed canary grass (Phalaris arundinacea), may be impacting their nesting success. It is critical

to understand the relationships between grassland birds and nesting vegetation because grassland bird species are rapidly declining due to climate change, habitat loss, and pesticide use, totaling a loss of over 700 million grassland birds since 1970 (Rosenburg et al., 2019). Our team investigated the correlation between nesting location and vegetation by conducting point count surveys and nest searches, as well as vegetation surveys in areas where we found nests. Vegetation composition varied by nest location and type. In these nesting areas there were 9 different vegetation species, which predominantly consisted of reed canary grass. This study will help future land managers understand which types of vegetation Sedge Wrens utilize in their nesting habitats, and how restoration efforts such as native species reintroduction may impact the nesting success of grassland birds at Corey Marsh.

N-FERTILIZATION MEDIATES SWITCHGRASS MYCORRHIZAL TRAITS AND COMMUNITY STRUCTURE
Presenter(s): Lana Wheatley
Category: Environmental Science and Natural Resources
Mentor(s): Gregory Bonito (College of Agriculture & Natural Resources), Sarah Evans (College of Natural Science)

Arbuscular mycorrhizal fungi (AMF) and other fungal endophytes, such as dark septate endophytes (DSEs) can provide their plant hosts with inorganic soil nitrogen (N), including nitrate and ammonium, in exchange for plant carbon (C). If this can be optimized, it may aid in reducing our reliance on synthetic fertilizer, reducing our impact on the environment. Previous experiments have identified negative effects of N-fertilizer on total AMF root colonization; however, these responses vary with plant host and soil nutrient content. In addition, the effects of synthetic N-fertilization on fungal root traits like vesicles, arbuscules, mycelium, or sclerotia are relatively unknown. Switchgrass (P. virgatum) is a potential bioenergy crop that hosts AMF/DSE and can grow on land unsuitable for food crops. This project uses switchgrass grown on a 16-year N-gradient plot to model the effects of increasing N-fertilization on fungal root traits and communities. We have seen thus far that increasing N does not affect the amount of fungal colonization in switchgrass roots, but that it may increase nutrient/energy transfer between AMF and the plant by increasing the ratio of arbuscules:vesicles (nutrient transfer traits:energy storage traits). However, it is unknown how AMF species and communities respond to a long-term N-gradient. To help answer this question, this semester I will be performing AMF community sequencing and analysis from spores that I have extracted from these field study plots. I hypothesize that as N-fertilization increases, AMF alpha diversity will increase and shift to include more arbuscule-forming mutualist species.

AQUATIC INVASIVE SPECIES MONITORING: ASIAN CARP
Presenter(s): Hope Dzik
Category: Environmental Science and Natural Resources
Mentor(s): Amy Workman (University of Wisconsin - Madison)

Invasive Asian carp have been a threat to the Great Lakes system and the Wisconsin River since the 1990s. With voracious appetites and opportunistic feeding behaviors, Invasive Carp have the potential to

disrupt food webs and degrade river ecology. These fish have been caught in the lower Wisconsin River, and the population may be spreading north. For example, in 2017, downstream of the Prairie Du Sac Dam, five Bighead Carp (Hypophthalmichthys nobilis) were reported. Even more alarming, in 2022 a Silver Carp (Hypophthalmichthys molitrix) were also caught in the same area. However, the upstream extent of distribution of these species remained unknown. Our primary research goal was to generate a complete protocol for the early detection of Silver and Bighead Carp using an environmental DNA (eDNA) approach. This was done by water filtration, DNA extraction, and use of real-time PCR. This approach allows for cost effective, non-laborious, and habitual testing for these species. This rapid and sensitive method enables a prompt response to management. This technique was incorporated into an educational program for a nature center located near the sampling sites, Upham Woods Outdoor Education Center Extension of UW-Madison. This aids in education of molecular techniques, outreach and education for invasive species, and promoting public ecological awareness of the threat of invasive carp. Current project outcomes indicate that youth self reported survey results reflect an increased understanding of invasive species effect on the environment, passion to pursue science as a career, and greater comprehension of the scientific method.

PRESCRIBED FIRE AND CANOPY THINNING REVERSE EFFECTS OF MESOPHICATION IN FIRE-SUPPRESSED OAK SAVANNAS

Presenter(s): Aidan Edwards
Category: Environmental Science and Natural Resources
Mentor(s): Lars Brudvig (College of Natural Science)

Fire suppression has significantly altered ecosystems, promoting fire-sensitive and shade-tolerant plant species over those that are fire-adapted and shade-intolerant. In Eastern North America, the resulting self-reinforcing process of 'mesophication' has led to shadier, less flammable conditions through increased canopy density, reduced ground-layer light levels, elevated moisture conditions, and changes in litter-layer fuel characteristics. Although these consequences of fire suppression are well described, we lack understanding of whether fire reintroduction can reverse mesophication or if additional interventions are needed. Through a large-scale experiment with oak savannas, we investigated how 15 years of repeated prescribed fires alone or in combination with thinning of fire-intolerant trees affected structural and microclimatic conditions associated with mesophication, relative to unmanaged units, across a growing season. Thinning and burning increased canopy openness, understory light, wind speeds, and leaf litter temperatures, and reduced air humidity, relative to unmanaged and/or burn-only treatments. Burning alone had smaller effects, with some evidence for increased understory light and leaf litter temperatures, and reduced air humidity, compared to the unmanaged treatment. Unmanaged units maintained deeper leaf litter. Effects of prescribed fire and thinning were the most pronounced mid-season. Oak litter percentage, leaf litter moisture, and soil moisture did not differ across treatments. Overall, combining thinning with prescribed burning was more effective than burning alone at counteracting the structural and microclimate effects of mesophication. These findings indicate that prescribed fire with tree thinning can restore the open, xeric, and flammable conditions that characterize oak savannas.

ASSESSING POTENTIAL BIOSIGNATURES OF MARS REGOLITH SIMULANT FOR FUTURE MARS LIFE EXPLORER MISSION.
Presenter(s): Elena Burtis, Peyton Squires, Shyam Nagarajan
Category: Environmental Science and Natural Resources
Mentor(s): Michael Velbel (College of Natural Science)

The Mars Life Explorer (MLE) mission concept is designed to investigate the potential for past or present microbial life in the Martian subsurface. Building on the legacy of the Viking missions and aligned with NASA's iMOST Objective 2.3A, MLE seeks organic molecules, isotopic signatures, and nonequilibrium gases associated with ice and regolith and evaluates their possible biological origins. Because the Martian surface is exposed to intense radiation that degrades organics, MLE will deploy a two meter drill to access protected subsurface materials where biosignatures are more likely preserved. This study assesses potential biosignatures using LAM Mars regolith analog to characterize grain morphology and mineral contexts that may enhance microbial preservation. Target materials include iron and manganese oxides, phyllosilicates, silica, sulfates, carbonates, salts, and rocks showing evidence of past groundwater flow. Molecular targets include pigments, lipids, amino acids, proteins, nucleic acid components, and diagnostic isotopic fractionations indicative of biological processing. The proposed payload integrates instruments capable of in situ chemical and isotopic analyses. Sample Analysis at Mars, the Mars Organic Molecule Analyzer, a linear ion trap mass spectrometer operating in laser desorption and gas chromatography modes, and the Alpha Particle X-ray Spectrometer will characterize volatile and refractory organics and determine elemental composition. Together with subsurface drilling, these tools will establish a comprehensive molecular inventory of Mars and strengthen the search for definitive biosignatures. These measurements will help distinguish abiotic organic chemistry from potential biological signatures and provide critical context for interpreting future sample return investigations on Mars.

A MACHINE LEARNING FRAMEWORK FOR YIELD ZONE PREDICTION: EVALUATING SPATIOTEMPORAL REFINEMENTS IN MICHIGAN AGRICULTURE
Presenter(s): Dev Jyoti Ghosh Arnab
Category: Environmental Science and Natural Resources
Mentor(s): Ryan Jayne (College of Natural Science)

Identifying consistent crop yield zones remains a central challenge in precision agriculture, particularly when integrating multi-source remote sensing and environmental data into predictive systems. This study presents a machine learning framework that explores the potential of satellite-based Synthetic Aperture Radar (SAR) observations of crop fields to predict yield zones across multi-season rotations of corn, soybean, and wheat in Michigan. The project evaluates how alternative modeling strategies and domain-specific feature engineering influence the predictive performance of yield accuracies from combine-harvester measured ground truth yield data from (2016-2023), spanning 328 farms. Within this framework, our modeling experiments benchmark multiple machine learning algorithms including

Random Forest, recurrent neural network, and histogram-based gradient boosting methods to assess their suitability irregularly sampled and high-dimensional spatiotemporal predictions. Histogram-based XGBoost emerged as the strongest baseline model and served as the candidate approach for iterative refinement. Further experiments focused on extending beyond raw SAR backscatter to integrate terrain features, soil attributes, and field-level spatial context variables. Spatial dependence was explored using a k-nearest-neighbor BallTree representation to capture local neighborhood influence on yield outcomes. An additional and noteworthy investigation to address the limited variability spatially and temporally from the SAR sensors by conducting time series ablation experiments that imposed perturbations by shifting the time series temporally and per observation. These explorations improved model robustness and generalization, increasing predictive performance from an initial R2 of 0.44 to 0.689 and yielding 63.5% classification accuracy across yield zones. Results highlight the importance of structured feature exploration within a well-defined data framework, demonstrating how spatial contextualization and robustness-oriented augmentation can substantially enhance yield zone predictability. This work provides insights into the methodological pathways for developing resilient SAR-driven agricultural monitoring systems.

DESIGNING FOR BLUE-GREEN SPACE EQUITY: SPATIAL ANALYSIS OF PUBLIC ACCESS AND SOCIOECONOMIC DISPARITIES IN MICHIGAN'S MIDSIZE INLAND LAKES
Presenter(s): Jakobi Johnson
Category: Environmental Science and Natural Resources
Mentor(s): Xiaowei Li (College of Agriculture & Natural Resources)

Blue spaces, which refer to outdoor environments featuring water bodies such as lakes, rivers, and waterfronts, and green spaces, such as parks, trails, and vegetated landscapes, are essential to community health, recreation, and overall well-being (Völker & Kistemann, 2011). However, access to these spaces is often shaped by socioeconomic factors, leaving many lower-income communities with limited opportunities to enjoy the benefits of nearby lakefront environments (Klompmaker et al., 2023). This research addresses a critical gap in landscape planning by examining access to public blue-green spaces on midsize inland lakes across Michigan. While abundant, these lakes often feature heavily privatized shorelines, creating significant access barriers for underserved communities (Wendel et al., 2011). This study investigates the relationship between socioeconomic factors, public lake access, and housing wealth across zip codes containing 221 midsize inland lakes in Michigan. Using a quantitative, secondary-data methodology, this analysis employs the zip code as the unit of analysis. The model assesses the relationship between the dependent variable-average housing price (2023)-and key independent variables, including population, income, age demographics, the number of public docks, and the acreage of lakefront parks. The findings indicate a clear pattern of inequity. Regression results indicate a significant inverse relationship between housing wealth and public access: zip codes with a higher number of public docks (β = -6,872, p = 0.0028) and greater acreage of lakefront parks (β = -22.57, p = 0.029) are associated with lower average house prices, after controlling population and income. This suggests that affluent communities are associated with more restricted public access to valuable blue-green amenities. This study highlights barriers embedded in zoning and land-use decisions, which

prioritize private, exclusive use of lakefronts in wealthier areas. In response, this research translates its findings into evidence-based design guidelines and planning modules to provide landscape architects and planners with a framework to advocate for policies and designs that promote more inclusive, equitable, and accessible blue and green spaces that support healthier and more inclusive communities.

EXTREME PYROXENE ENRICHMENT IN RIFT RELATED ROCKS: TRACING THE STABILITY OF PYROXENE UNDER DIFFERENT CRUSTAL CONDITIONS
Presenter(s): Mo Shuman
Category: Environmental Science and Natural Resources
Mentor(s): Tyrone Rooney (College of Natural Science)

Within continental rifts alkaline rocks constitute a significant volume of the erupted magmatic product. While this observation has been linked to small degree partial melting or heterogenous lithologies in the mantle source of these magmas, fractionation processes within the crust may also impact the alkalinity of erupted basalts. In particular, the fractionation of clinopyroxene at lower crustal depths can drive sub-alkaline magmas into the alkaline magma field. In the East African rift, the Kalakol basalts contain an abundance of clinopyroxene crystals, permitting an investigation of this process. We use major element data on clinopyroxene crystals in these rocks in combination with whole rock compositional data to explore potential high-pressure fractionation processes. Using the MELTS and Magemin thermodynamic models to predict the stability of clinopyroxene crystals, we compare the simulated clinopyroxene composition to the observed crystal data. We will interpret these data in the stratigraphically constrained section of Kalakol to assess the role of clinopyroxene in relation to the magma variability in this region.

IS OUR WATER SAFE? INVESTIGATING ONE COMMUNITY'S CONCERNS IN MUNICIPAL, SURFACE, AND PRIVATE RESIDENTIAL WELL WATER
Presenter(s): Delaney McIntyre
Category: Environmental Science and Natural Resources
Mentor(s): Jennifer Lee Johnson (College of Agriculture & Natural Resources), Karleigh Duffield (College of Agriculture & Natural Resources)

In response to concerns from residents of Otsego, Michigan regarding industrial pollution and local health concerns, our team conducted a rigorous community-led water sampling program at 24 sites throughout the community. We collected samples from city water, surface water, and private wells, which we then sent for professional chemical analysis to detect PFAS and other key analytes. Data returned from each laboratory indicate that while most samples remain within legal regulatory boundaries, they frequently exceed health-based safety guidelines.

ENVIRONMENT, ECONOMICS AND HEALTH IN RELATION TO THE COMPOSITION OF JEWELRY
Presenter(s): Ariella Beecham
Category: Environmental Science and Natural Resources
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

This research is being conducted to determine how the composition of gold jewelry--in this case a fourteen-karat gold and two gold-plated rings will be compared--affects of the wearer, the environment, and the economy. The scanning electron microscope will be used, secondary electron detectors for the topography of the surface of the slice of ring and backscatter electron detectors for detecting different atoms and phases present in the samples. X-ray analysis will also be used to show the exact percentage of gold in each sample and what other metals are present. The rings will be thoroughly cleaned, sliced into various pieces for different angles and edges to determine precision, and polished to ensure high quality SEM pictures. It's expected that fourteen-karat jewelry will have a higher gold content and a significantly lower erosion however the pictures from the scanning electron microscope will be hard evidence. Literature will also be used to provide additional information and evidence supporting environmental and economical effects. Samples will be acquired via eBay and friends. After the research is concluded, the fragments will be disposed of or donated.

Epidemiology & Public Health

LIVED EXPERIENCE WITH ALCOHOL PROBLEMS THAT EMERGE EARLY: THIN SLICES OF THE GLATT-JELLINEK CURVE
Presenter(s): Alexandra Beck
Category: Epidemiology and Public Health
Mentor(s): James (Jim) Anthony (College of Human Medicine)

My main aim is to estimate the early emergence of problem-experiences soon after the first full drink of an alcoholic beverage. Building from foundational studies of Glatt and Jellinek produced a timeline or curve as summarized for all drinkers, my approach is to produce estimates of potential diversity across population subgroups of newly incident drinkers who have described their 'lived experiences' during a 0-12 month interval after the first full drink. My USA study population is defined as the set of non-institutionalized and non-military civilian residents of all 50 States and DC age 12 years and older, sampled and assessed each year, 20xx-20yy (each year's n>60,000). After informed consent, assessment is via a computerized self-interview. Each year's analysis-weighted cumulative incidence proportions and standard error for each alcohol problem-experience are estimated with Taylor series linearization, with final Bayesian 95% credibility intervals for a display of subgroup variations. In my January progress report, I will show female-male variations and, if complete, a set of estimates that convey the degree to which problem-experiences co-occur (cluster within individuals).

ILLEGAL DRUG PURCHASE OPPORTUNITIES IN THE UNITED STATES SINCE 2002: A DOWNWARD DRIFT?
Presenter(s): Lowell Monis
Category: Epidemiology and Public Health
Mentor(s): James (Jim) Anthony (College of Human Medicine)

Casualties from illegal drug use, such as overdose deaths, represent a critical U.S. public health burden. Similar to the epidemiology of infectious diseases, these casualties require contact between a vulnerable "host" and a "drug" agent. While often occurring through peer sharing, contacts also manifest as "drug purchase opportunities" when a host is approached by a seller. This study aims to quantify year-specific estimates of these opportunities, with attention to variation across U.S. Census-specified race-ethnicity subgroups. Data are drawn from annual multi-stage probability sampling of the non-institutionalized, non-military civilian population aged 12 and older (n > 60,000 per year; > 65% participation level after informed consent). Annual assessments utilized computer-assisted self-interviews with standardized items on drug purchase opportunities and census characteristics since 2002. I estimated analysis-weighted prevalence proportions using the Taylor series for standard errors, followed by Bayesian sequential updating for successive 95% credibility intervals. Results suggest relatively stable drug purchase opportunities for some subgroups, while others exhibit a downward drift in year-specific estimates and Bayesian intervals. Discussion addresses potential drivers of these trends. One puzzling conclusion might be that there has been a downward drift in the occurrence of drug purchase opportunities in recent years, when the incidence (new users) and prevalence (new users plus continuing users) have been relatively stable. We are left with unanswered questions that will require more work in this line of research.

ASSOCIATIONS BETWEEN BASELINE FATTY ACIDS AND SCHOLASTIC OUTCOMES OVER 12 MONTHS IN UGANDAN CHILDREN
Presenter(s): Bushra Shah, Eshika Avidi
Category: Epidemiology and Public Health
Mentor(s): Vanessa Cardino (College of Agriculture & Natural Resources)

Fatty acids (FAs) play an important role in neurodevelopment and nervous system functioning. Their relationship with scholastic outcomes is not well understood, particularly among children affected by perinatal HIV exposure/infection, who may experience malnutrition/neuroinflammation. This study quantified associations between serum FA levels and scholastic outcomes in Ugandan children and evaluate modification by perinatal HIV status. Children with perinatal HIV infection (CPHIV, n=83), children with HIV exposed uninfected (CHEU, n=77), and children with HIV unexposed uninfected (CHUU, n=79) were enrolled. Self-report scholastic disadvantage, school aversion, and teacher challenge z-scores were assessed using adjusted linear mixed-effects models. Grade repetition, non-enrollment, and morbidity-related educational loss were measured using adjusted generalized estimating equations. Among all children, high v. low total monounsaturated fatty acid (MUFA) (MD [95% CI: -0.23 [-0.46, -0.01]), predicted lower scholastic disadvantage. High v. low total ω-6 polyunsaturated fatty acid (0.32 [0.05, 0.60]) and moderate v. low ω-6:ω-3 ratio (0.39 [0.07, 0.72]) predicted higher school aversion. High v. low arachidonic acid (OR [95% CI]: 2.38 [1.08, 5.24]), predicted higher odds of grade repetition. Among

CHEU, moderate total saturated fatty acid (-0.41 [-0.76, -0.06]) predicted decreased odds of scholastic disadvantage, whereas among CHUU, a high highly unsaturated fatty acid ratio (-0.35 [-0.68, -0.02]) predicted decreased odds of school aversion. These findings support the potential of MUFAs to improve scholastic outcomes in HIV-affected populations. However, higher ω-6, ω-6:ω-3 ratio, and arachidonic acid were associated with less favorable scholastic indicators, suggesting that fatty acid balance is important in school-related functioning with modification by HIV status.

THE RELATIONSHIP BETWEEN ANXIETY SYMPTOMS AND HAZARDOUS ALCOHOL INVOLVEMENT
Presenter(s): Stephanie Belkin
Category: Epidemiology and Public Health
Mentor(s): Kipling Bohnert (College of Human Medicine), Lindsey Esparza (College of Human Medicine)

This study examines the relationship between anxiety symptoms and alcohol involvement in a sample of individuals in alcohol treatment. Participants (n = 269) completed a study assessment consisting of self-reported measures. The two specific measures used for this study were the Generalized Anxiety Disorder-7 (GAD-7), which measures anxiety symptoms, and the Alcohol Involvement subscale of the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST), which measures level of hazardous or harmful alcohol use. We hypothesized that participants with higher GAD-7 scores would have higher ASSIST alcohol involvement scores. Mean scores and ranges were calculated for both tools, and a Pearson correlation was used to estimate the association between anxiety level and alcohol involvement. A scatterplot was also graphed to visually inspect the relationship between GAD-7 and ASSIST scores. The results showed a statistically significant positive relationship between higher anxiety symptoms and greater alcohol involvement risk ($r = 0.30$, $p < 0.001$). These findings show that anxiety may be an important factor to consider in alcohol treatment. Moreover, findings may be important to consider for prevention and treatment plans that address both anxiety and alcohol use in treatment settings.

DEAD BEFORE TRIAL: PATTERNS AND CAUSES OF MORTALITY IN U.S. JAILS, 2015-2019
Presenter(s): Gabrielle Chamberlin, Izabela Weglarz
Category: Epidemiology and Public Health
Mentor(s): Vivian Aranda-Hughes (College of Social Science)

Jails are designed for short-term custody, yet they remain high-risk environments where preventable deaths are common. This study analyzes national jail mortality data (2015-2019) and finds that 75% of individuals who died in custody were held pretrial, raising critical concerns about the safety of those not yet convicted. Illness is the leading overall cause of death, but the first 14 days of detention are especially lethal. During this period, substance overdoses dominate, suggesting failures in intake screening and withdrawal management. These early deaths highlight systemic vulnerabilities at the front end of the criminal justice process. This poster presents patterns by legal status, time in custody, cause of death, individual characteristics, and jurisdiction, offering new insight into how jail conditions contribute

to mortality. Findings support policy discussions around bail reform, medical oversight, and the ethical implications of pretrial incarceration.

**HANDGUN CARRYING LINKED WITH INTERPERSONAL VIOLENCE: EPIDEMIOLOGICAL ESTIMATES FOR U.S. ADOLESCENTS SINCE 2002 **
Presenter(s): Katherine Glovatsky
Category: Epidemiology and Public Health
Mentor(s): James (Jim) Anthony (College of Human Medicine)

Post-traumatic stress disorder (PTSD) poses a significant public health burden for individuals, families, and society in the United States (US), particularly in relation to firearm-related interpersonal violence and victimization (Wamser-Nanney et al., 2019). For this study, I estimated prevalence proportions of recent attacking behaviors associated with handgun carrying among US adolescents and examined subgroup differences to understand female-male variation in these associations. The analysis used weighted estimates from a nationally representative sample of non-institutionalized US residents aged 12-17 across all 50 states and Washington, DC, collected annually since 2002 (n > 5,000 per year; participation >65%). Behaviors were assessed via computerized self-administered interviews. For each year, I derived weighted prevalence proportions and standard errors using Taylor series linearization, with Bayesian 95% credibility intervals as summaries. Differences in attack prevalence across handgun-carrying subgroups were used to estimate the association between handgun carrying (HC) and attack behavior (AB). The Bayesian intervals suggest notable HC-AB associations; however, these findings are preliminary due to limitations, including unclear temporal sequencing and uncontrolled confounding factors (e.g., conduct disorder syndromes). This study highlights directions for future research to inform public health efforts aimed at reducing interpersonal violence, firearm morbidity and mortality, and PTSD risk.

PARTICIPANT ENGAGEMENT AND SKIN CAROTENOID CHANGES IN VULNERABLE PREGNANT WOMEN FOLLOWING A FOOD-BASED INTERVENTION
Presenter(s): Miriam Haddad
Category: Epidemiology and Public Health
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

Maintaining a healthy maternal diet plays a significant role in facilitating the growth and development of the infant during pregnancy and postpartum. Understanding the importance of a high-quality diet during pregnancy may provide insight into the health implications of increasing maternal carotenoid consumption during pregnancy. The research objective was to evaluate the correlation between participant engagement levels in a food-based intervention and changes in the skin carotenoid values among pregnant women experiencing food insecurity, obesity, or risk for substance use disorder. Pregnant women (n=26) in the Pregnancy EAting and POstpartum Diapers 2 study (PEAPOD 2) provided dietary intake information using structured food logs spanning 10 consecutive days. Participant engagement was quantified based on the adherence to the predefined criteria of the food intervention.

Individuals were categorized as non-engaged, engaged, or highly engaged. Pre- and post-intervention skin carotenoid values were considered to determine the efficacy of the food intervention relative to each participants' engagement. A one-way analysis of variance (ANOVA) test was conducted to compare changes in skin carotenoid values across engagement groups. There was no statistically significant difference in the change in skin carotenoid values among engagement categories. Substantial variability in carotenoid response across engagement groups was observed, indicating high individual variability. These findings suggest that engagement alone may not be sufficient to predict carotenoid response among pregnant women facing health vulnerabilities. Future work should further clarify the role of engagement, and other behavioral factors, in influencing carotenoid response.

HOW DO A WOMAN'S LIFE COURSE EXPERIENCES RELATE TO SOCIAL SUPPORT IN PREGNANCY: THE ROLE OF ADVERSE CHILDHOOD EXPERIENCES (ACES)
Presenter(s): Elizabeth George
Category: Epidemiology and Public Health
Mentor(s): Dawn Misra (College of Human Medicine)

Low social support is a risk factor for adverse perinatal outcomes and may contribute to higher rates of these outcomes for Black women. Factors that put women at risk for low social support have been understudied beyond sociodemographic factors, especially among Black women. This study aimed to examine the relationship between maternal adverse childhood experiences (ACEs) and the level of social support reported by mothers during pregnancy. Data were from 592 self-identified Black women aged 18-45 years in the Life-course Influences on Fetal Environments 2 (LIFE-2) study who delivered at one of two private hospitals in metro Detroit MI. Participants complete the 10-item (yes/no) CDC ACEs Questionnaire during postpartum. Social support was measured using the Medical Outcome Study (MOS) Social Support Survey (20 items, 5-point Likert responses). Linear regression was used to test the relationship between maternal ACEs and social support. The mothers' mean age was 26.95 years, and the average education level attained was high school diploma/GED. More than half of the mothers were unmarried or not living with their partners and had an annual family income of less than $30,000. About 19% of participants had a score of two or more ACEs. The mean social support score was 45.92. With each additional ACE experienced by the mother, the social support score decreased by 0.66 units (95% CI: -1.094, -0.232; p = .003). ACEs were strongly associated with social support during pregnancy. Screening women for ACEs may help providers and programs identify women in need of additional social support.

SCHOOL ADMINISTRATORS' PERSPECTIVES ON ENVIRONMENTAL SUPPORT ON CAMPUS WALKABILITY IN THE 50K4LIFE STUDY
Presenter(s): Michelle Gallegos
Category: Epidemiology and Public Health
Mentor(s): Susan Buchholz (College of Nursing)

Across the U.S.-Mexican border at El Paso, Texas, there is an increase in cardiometabolic diseases among the Mexican American population. The 50K4Life program is a study focused on reducing these health disparities by promoting moderate-to-vigorous physical activity (MVPA) with school employees. This sub-study stems from the main trial of 50K4Life and aims to evaluate environmental support for walking. The results will inform the interpretation of the main trial findings on how environmental factors impact physical activity. This study is guided by the adapted Social Ecological Model (Sallis et al., 2006), which emphasizes the influence of intrapersonal, interpersonal, and organizational factors on health behaviors. A mixed-method approach is being used to collect data for this sub-study, with >12 school administrators (one per school). Quantitative data is being gathered using the Environmental Assessment Tool (EAT) via REDCap email survey to capture each school's environmental inventory. Surveys will provide descriptive and correlational data. Qualitative data is being collected through key informant interviews using an interview guide via Zoom and analyzed using thematic analysis. The study team is in the process of gathering data. Together, these methods will facilitate an in-depth and strong evaluation of the school environment. This study will provide insight into the effectiveness of 50K4Life workplace walking challenge in promoting physical activity among this population. Additionally, the study emphasizes the significance of physical wellness in preventing chronic diseases and underscores the importance of healthcare providers examining environmental factors.

COMPARISON OF BLOOD MERCURY LEVELS AMONG USERS OF STORE-BOUGHT AND HOME-GROWN CANNABIS
Presenter(s): Katie Carothers
Category: Epidemiology and Public Health
Mentor(s): Masako Morishita (College of Human Medicine)

Cannabis is widely used throughout the United States for both recreational and medicinal purposes. Cannabis readily absorbs metals from soil and the surrounding growing environment, allowing toxic elements such as mercury to accumulate in plant tissues during cultivation. Cumulative mercury exposure is associated with adverse effects on the nervous system, cardiovascular system, and kidneys. As cannabis has become legalized for medical and recreational use in many states, more individuals are consuming regulated products, while others continue to use home-grown cannabis. Regulated cannabis sold in dispensaries is generally subject to heavy metal testing, whereas home-grown cannabis is not. As a result, differences in cultivation sources may influence cumulative metal exposure in consumers. This study aims to compare blood mercury levels between individuals who use commercially grown cannabis and those who use home-grown cannabis. Whole venous blood samples were collected from participants who reported using cannabis at least once per week (≥4 times per month). Participants smoked their cannabis five minutes prior to blood collection. Ten participants used cannabis from a

dispensary, and ten participants used home-grown cannabis. Blood mercury concentrations will be measured using a DMA-80 Mercury Analyzer. Sample analysis is currently in progress as calibration of the mercury analyzer is being finalized. A comparison of blood mercury levels between commercially grown cannabis users and home-grown cannabis users will be included on the poster.

BIRTH AND BARRIERS: EXAMINING PERINATAL MENTAL HEALTH AND OPIOID CRISIS AND TREATMENT AVAILABILITY
Presenter(s): Alexandra Beck
Category: Epidemiology and Public Health
Mentor(s): Claire Margerison (College of Human Medicine)

For this project, I have developed a methodology to create a database of perinatal mental health providers in California based on the information from the Perinatal Mental Health Provider Directory powered by Postpartum Support International. This database describes the providers' platform of practice (virtual, in-person, or both) by county. Additionally, I assisted in developing methodology for obtaining estimates from the Substance Abuse and Mental Health Services Administration (SAMHSA) looking at substance use treatment facilities a) providing medication for opioid use disorder and b) treating perinatal patients in California. Data on pregnancy-related emergency department visits relating to overdose and psychiatric issues were incorporated into the work as well. These estimates were standardized by either women of reproductive age by county or index births in 2021. Ultimately, multiple maps, with some examining the overlap and interaction between variables were produced. Generalized linear models were then used to create quantitative models of the data.

FACTORS INFLUENCING SUSTAINED MENSTRUAL CUP USE AMONG SCHOOLGIRLS IN HOHOE, GHANA
Presenter(s): Kathryn Horvath
Category: Epidemiology and Public Health
Mentor(s): Constance Currier (College of Human Medicine), Darline ElReda (College of Human Medicine)

During our education abroad program in Ghana through Michigan State University, we conducted research on menstrual hygiene among schoolgirls. Our presentation will highlight the strength and resilience of young women navigating cultural taboos, limited resources, and social stigma while striving for dignity and opportunity. By sharing their stories and experiences, we aim to emphasize the importance of access to education, health resources, and open dialogue. This research not only reflects the challenges faced but also celebrates the determination and courage of Ghanaian girls, offering insights into global health, gender equity, and the transformative power of resilience.

UNIQUE ASSOCIATIONS BETWEEN EATING DISORDER SYMPTOMS AND SUICIDAL IDEATION VERSUS ATTEMPTS IN A NATIONALLY REPRESENTATIVE SAMPLE OF YOUNG ADULTS IN THE U.S.
Presenter(s): Aiden Evans
Category: Epidemiology and Public Health
Mentor(s): Vivienne Hazzard (College of Human Medicine)

The objective of this study was to examine how distinct eating disorder symptoms correlate with suicidal ideation as compared to suicide attempts among young adults in the United States. The sample for the current study is a nationally representative sample of young adults in the U.S. from Wave 7 of the NEXT Generation Health Study (N=2,321). Participants self-reported eating disorder symptoms and lifetime suicidal ideation and attempts via survey. In a cross-sectional secondary data analysis, we conducted modified Poisson regression models adjusted for age, sex, race/ethnicity, highest parental education, sexual orientation, and depressive symptoms. The sample had an average age of 22.6 (range: 20-26) years at Wave 7 and was comprised of 58.5% females and 41.5% males. In the overall sample, the lifetime prevalences of suicidal ideation and attempts were 15.7% and 6.0%, respectively. There was a statistically significant association for actual-desired body mass index (BMI) discrepancy and lifetime suicidal ideation (prevalence ratio [PR] = 1.04; 95% confidence interval [CI]: 1.34, 5.04, p = .02). Among participants who reported suicidal ideation, actual-desired BMI discrepancy (PR=1.06; 95% CI: 1.02, 1.10; p=.004), laxative use to control weight (PR=1.97; 95% CI: 1.14, 3.42, p=.02), and diuretic use to control weight (PR=1.99; 95% CI: 1.05, 3.78, p=.04) were significantly associated with greater prevalence of lifetime suicide attempts. Results indicate that independent of depressive symptoms, specific compensatory eating disorder symptoms are uniquely associated with increased prevalence of suicide attempts but not ideation, suggesting a contribution to an increase in an individual's capability for suicide.

POPULATION HEALTH: SHAPING HEALTH OUTCOMES BEYOND THE INDIVIDUAL
Presenter(s): Sritha Neelam
Category: Epidemiology and Public Health
Mentor(s): Ankita Shashikant Bhosale (University of Pennsylvania)

While clinical care is vital, social determinants nearly drive 80% of health outcomes (Magnan, 2017). Income, education, housing, food security, and environmental conditions collectively account for prevention of majority of health issues, yet healthcare systems remain predominantly focused on individual diagnosis and treatment (Kindig & Stoddart, 2003; Magnan, 2017). This disconnect between where health is shaped and where resources are concentrated represents a critical gap in how societies address disease and inequity. Population health offers a framework for closing that gap. Drawing from epidemiology, public health, social science, and health policy, this approach targets upstream determinants of health at the community and systemic level, intervening before illness reaches the clinic (WHO, 2008). Strategies such as community-based preventative screenings, school nutrition programs, early childhood education investments, and improvements in housing and transportation infrastructure demonstrate that addressing root causes reduces both disease burden and long-term healthcare costs.

Communities with limited healthcare access often experience higher rates of preventable illness and chronic disease. Population-level interventions directly address these disparities, shifting the healthcare paradigm from reactive treatment toward proactive prevention and equity. Effective population health practice requires cross-sector collaboration across healthcare, government, education, and community organizations. When systemic drivers of health are addressed collectively, outcomes improve sustainably and equitably across populations (Kindig & Stoddart, 2003). Population health does not replace individual care; it ensures that the conditions surrounding individuals support, rather than undermine, their health.

KOREAN SOCIETY AND HEALTH: AN INVESTIGATION INTO THE CORRELATION BETWEEN SOCIOECONOMIC DEVELOPMENT IN SOUTH KOREA AND FEMALE MORTALITY RATE DUE TO BREAST CANCER BETWEEN 2005 AND 2019

Presenter(s): Matthew Kafarski
Category: Epidemiology and Public Health
Mentor(s): Diana El Reda (College of Human Medicine)

Breast cancer is the most prevalent cancer among South Korean women, with new diagnoses rising to 29,729 in 2019, while its mortality rate has reached 10.2 per?100,000 population in 2019. This study deduced the association between South Korean female breast cancer mortality rate and socioeconomic status (SES) indicators from 2005-2019. Annual female breast cancer mortality data (WHO, ICD-10 C50) was analyzed alongside SES indicators: Human Development Index (HDI), Female Life Expectancy at Birth (FLEB), Health Expenditure (% GDP), Gender Inequality Index (GII), Female Labor Force Participation (FLFP), and Breast Cancer Screening. Statistical methods included R2 correlation, Z-score normalization, multicollinearity assessment, and ordinary least squares (OLS) regression. A composite SES_Index combining FLEB, Health Expenditure, and GII was created to address collinearity. Two OLS models containing SES_Index or HDI, controlling for FLFP and Breast Cancer Screening rates, evaluated significance of indicators. Final OLS models explained 96-97% of mortality variance, with SES_Index (R2 = 0.977) and HDI (R2 = 0.958) demonstrating strong predictive value of female breast cancer mortality. Breast Cancer Screening Rate and FLFP Rate exhibited weak and non-significant associations with mortality. Rising female breast cancer mortality alongside SES and HDI reflect South Korea's epidemiological and demographic transition. However, the weak association between screening and mortality suggests inequities in post-screening follow-up, treatment access, and regional oncology care. South Korean public health strategies should strengthen referral pathways, reduce rural treatment disparities, and implement outreach and education programs for marginalized populations to ensure screening translates into timely and effective treatment, reducing mortality.

WASTEWATER MONITORING OF NOROVIRUS GI AND GII IN MICHIGAN
Presenter(s): Gessica Portice
Category: Epidemiology and Public Health
Mentor(s): Nishita D'Souza (College of Agriculture & Natural Resources)

The COVID-19 wastewater surveillance (WS) program in Michigan enabled the development of complementary public health approaches for monitoring viral infections at the community level. By leveraging existing infrastructure, this framework can be expanded to other pathogens of public health concern, particularly in regions with limited clinical surveillance capacity. The Centers for Disease Control estimate that Norovirus causes approximately 58% of foodborne illness and is associated with about 2,500 outbreaks annually in the United States alone. As clinical Norovirus data is limited, this study evaluates WS as a tool for monitoring Norovirus prevalence in Michigan communities. Composite 24-hour influent wastewater samples (n = 335) were collected from eleven wastewater treatment plants across Michigan between October 2023 and February 2026. Virus concentration was performed using PEG precipitation and centrifugation to recover viral pellets, followed by RNA extraction. Norovirus GI and GII targets were quantified using GT-ddPCR Wastewater Test Kits (GT Molecular). Droplet digital PCR was conducted with a one-step RT-ddPCR Advanced Kit on a QX200/600 system (Bio-Rad). Norovirus GI and GII positivity rates were 95.54% (321/336) and 100% (336/336). Mean concentrations were 6.30 x 104 gene copies (GC)/100 mL for GI and 3.21 x 105 GC/100 mL for GII. Norovirus GI concentrations peaked in January and Febrauary, while GII was most prevalent in March and April. These findings demonstrate that WS is a cost-effective and non-invasive tool for tracking Norovirus trends, identifying hotspots, and supporting public health interventions, providing data that enables timely and targeted mitigation when clinical surveillance is limited.

INJURY EPIDEMIOLOGY AMONG OLYMPIC AND PARALYMPIC ATHLETES: A COMPARATIVE ANALYSIS OF HEAD AND NECK INJURY PREVALENCE
Presenter(s): Trinity Woodard
Category: Epidemiology and Public Health
Mentor(s): William Adams (College of Education)

A comprehensive analysis of Teams USA's Olympic and Paralympic athlete's history of head, face, and neck injuries remains largely unknown. Objective: This study examined head, neck, and face injuries among Team USA Olympic and Paralympic athletes competing in the Tokyo 2020 and Beijing 2022 Olympic & Paralympic Games. Methods: Team USA athletes competing in the Tokyo 2020 and Beijing 2022 Olympic and Paralympic Games completed a health history questionnaire prior to competition where they self-reported all injuries they had sustained resulting in time loss from sport. Head, neck, and face injuries were quantified and descriptive statistics reported. Results: In total, 138 head(Olympic, n=87; Paralympic, n=52), 15 face (Olympic, n=10; Paralympic, n=5), and 24 neck (Olympic, n=19; Paralympic, n=5) injuries were documented. Female athletes sustained a majority of head (n=88, 65.1%), face (n=11, 73.3%) and neck (n=16, 66.7%) injuries. Olympic athletes sustained a greater proportion of head (n=87, 63.0%), face (n=10, 66.7%), and neck (n=19, 79.1%) injuries than Paralympic athletes. Conclusions: Female athletes and Olympic ahtletes sustained a greater proportion of head, face, and

neck injuries than their male and Paralympic counterparts. These data may assist practitioners in the development of strategies to minimize the risk of future injuries and/or long-term health consequences.

TIME-DEPENDENT ANALYSIS OF BEVERAGE-INDUCED ENAMEL EROSION USING SCANNING ELECTRON MICROSCOPY
Presenter(s): Sam Phillips
Category: Epidemiology and Public Health
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Tooth Enamel is the hard, outermost layer of the tooth that protects teeth from physical damage and shields the softer inner tissues from acids, bacteria, and temperature. Concerns have long existed regarding the potentially erosive effects of everyday beverages on enamel health and integrity. This research seeks to explore the microscopic damages that occur in enamel from prolonged exposure to common drinks, including coffee, Red Bull, Coca-Cola, orange juice, milk, and water as a control, using Scanning Electron Microscopy (SEM) imaging. Samples were exposed for three durations (24 hrs, 48 hrs, and 72 hrs) to analyze how erosion progresses over time. Because human enamel samples are not readily accessible, eggshell was selected as a structural analog due to its similar mineral composition and susceptibility to acid-induced surface dissolution. SEM characterization was carried out using backscatter electron imaging (BSE) to evaluate surface morphology and energy-dispersive X-ray spectroscopy (EDS) analysis to assess changes in mineral density. Background literature was reviewed to support methodological choices and strengthen the scientific rationale for material selection. This research is relevant both to public health and to my personal pre-medical interests, as understanding how everyday dietary choices affect enamel structure is essential for preventative dental care and long-term oral health.

Global & Area Studies

PEDIATRIC ANTHROPOMETRIC MEASUREMENTS OF ANDEAN PERUVIAN CHILDREN
Presenter(s): Jasmine Briggs, Lindsey Geiger, Makenzi Forgie, Myah Leuenberger
Category: Global and Area Studies
Mentor(s): Rene Hinojosa (College of Osteopathic Medicine)

World Health Organization (WHO) growth charts are used globally to evaluate children's development. These are based on a research project that included sites in six countries, but only one locality in Latin America. This limited representation raised questions regarding their accuracy, particularly considering biological, environmental, and cultural diversity in the region. As part of an Education Abroad program, we went to a rural underserved community, Colcabamba, Peru, with the objective of testing if WHO charts can accurately monitor the growth of children. Following WHO guidelines, we performed cross-sectional, non-invasive, measurements of 37 children. Data were used to calculate Z-values for weight, height, and body mass (BMI), and z-value deviations compared to WHO charts. Z-value plots showed

90.9% of children within normal weight parameters, 6.1% overweight and 3% severely underweight. Regarding height, only 81.3% were normal, 3.1% extremely tall, and 15.6% moderately stunted. Results for BMI showed 78.1% normal, 3.1% overweight, 12.5% at risk, and 6.3% severely wasted. Children had a tendency for being overweight and stunted rather than underweight and taller, with female children showing higher body mass than males. Bland Altman analysis, comparing differences between WHO expected values and actual measurements, show that overall children in this community are underweight and shorter than expected. While there is a noticeable bias, WHO charts are still useful for monitoring the health status of children in Colcabamba. Because of the limited sample size, further studies are needed to make definitive conclusions if replacing the WHO standards with country-specific charts is necessary.

COMPARISON OF PEDIATRIC ANTHROPOMETRIC MEASUREMENTS BETWEEN ANDEAN AND AMAZONIAN PERUVIAN CHILDREN

Presenter(s): Abigail Jager, Gabriel Gulbransen, Jagger Wraalstad, Liana Salazar
Category: Global and Area Studies
Mentor(s): Rene Hinojosa (College of Osteopathic Medicine)

The World Health Organization (WHO) growth charts are widely used to assess children's growth and nutritional status. These charts were based on data from around the world but only one locality selected from Latin America. Pediatric and public health professionals have questioned whether these global standards accurately represent children from diverse Peruvian communities. This pilot study aimed to evaluate whether WHO anthropometric standards accurately represent the growth of Peruvian children. As part of an Education Abroad program, anthropometric measurements were conducted on 33 children under the age of 10 in a rural Andean village, Ccolcabamba, Peru. With informed parental consent, patient-reported information included date of birth and gender, while physical measurements included weight, height or length, and BMI. Physical measurements were adjusted for age and Z-scores calculated using WHO standards. Measures of Andean children were compared to published data from Amazonian children. There were no significant differences in age-adjusted Z-scores for weight, height, or BMI between Andean and Amazonian groups. However, sample size simulation showed that results may become significant with samples of 500 for height and BMI. When individually comparing males and females in the Andean community to those in the Amazon, males demonstrated lower weight and BMI while females demonstrated higher weight and BMI, with smaller height differences. Although differences were not significant, it appears that there is gender-specific regional variation that the WHO charts may not show. These differences may be due to changes in altitude or feeding habits. Further information is needed for a definitive conclusion.

RESHAPING THE GLOBAL TROPICAL IDENTITY
Presenter(s): Michael Barry
Category: Global and Area Studies
Mentor(s): Ryan Shadbolt (College of Social Science)

Our planet is defined with the tropic lines of Cancer and Capricorn, which highly correlates with Koppen tropical climates. However, many places in flux with global and regional wind patterns are outliers to this general rule. For instance, cities such as Miami have a tropical climate despite being located north of the Tropic of Cancer. On the other hand, Hanoi, located well south of the Tropic of Cancer in a lowland Indochina landscape, is temperate. While we get a general sense with respect to the Gulf Stream and Siberian Highs that generally define the climate for these cities, we can also dig further. Using a 30 year data module, we can find temperature trends while emphasizing a skew towards cooler averages, to see if there's a way to determine tropical or temperate places. Through formulating an original equation, we revealed a certain number that was given in units of Climatic Temperature, or CT. The threshold in CT numbers was either 12 or 53.5 (depending on Celsius and Fahrenheit metrics) which through many samples consistently distinguished tropical from temperate cities. For the case of Miami and Hanoi, these cities were also separated by the CT threshold variable. We can also account for cities in reference to elevation and latitude. From this module, cities such as Bogota and Addis Ababa switch from temperate to tropical. Can we reshape or add to what we see as tropical? When accounting for latitudinal and altitude nuances, it's possible.

THE FORGOTTEN WAR CRIME: VIOLENCE AGAINST WOMEN DURING TIMES OF ARMED CONFLICT
Presenter(s): Brooke Winters
Category: Global and Area Studies
Mentor(s): Siddharth Chandra (International Studies & Programs)

"Conflict-related sexual violence" refers to any form of sexual violence directly or indirectly linked to a conflict. International law has been created to address sexual and gender-based violence, however, it often falls short of reaching individual and collective accountability. Sexual violence is not solely the action of rogue soldiers, but a strategic and calculated tactic of warfare used to humiliate, interrogate, and control in furtherance of genocide and ethnic cleansing. During the genocides of Indonesia in 1965 and Bangladesh in 1971, sexual violence was used to humiliate, interrogate, and control both women and men. In Indonesia, individual soldiers used sexual and gender based violence to control women who were associated with the Indonesian Communist Party (PKI) to advance interrogation efforts. In Bangladesh, sexual and gender based violence was used not only for humiliation and intimidation, but also to further the ethnic cleansing of the Bengali population. While sexual and gender based crimes in conflicts have general goals of control, intimidation, and humiliation, they can also be a part of a broader tactical goal. This paper will show that gender-based violence is a strategic tool used to terrorise, manipulate, control, and weaken targeted populations at the direction of political and military institutions. International law fails to address the practicality of accountability and justice in a way that creates deterrence.

THE IMPACT OF CULTURAL GLOBALIZATION ON SOCIAL CONFORMITY AND IDENTITY: INSIGHTS INTO GLOBAL YOUTH CULTURE
Presenter(s): Ella Wilson
Category: Global and Area Studies
Mentor(s): Michael Ristich (College of Arts & Letters)

In existing research concerning how globalization shapes social behavior worldwide, it has been found that individuals have been profoundly influenced by global dynamics that challenge their existing perspectives on social patterns and interactions. While these insights have been significant in understanding the effects of globalization on various demographic groups, including youth, in general most have tended to focus on specific regions as opposed to examining this research through a lens that highlights shared experiences among youth worldwide. Therefore, it may prove valuable to examine this body of research with the intent of searching for a broader trend amongst global youth as an aggregate. By analyzing evidence from diverse, global contexts, this work aims to reveal common themes and patterns that demonstrate how globalization, specifically cultural globalization, has shaped youth behavior, with a focus on youth conformity and identity formation on a global scale. Through this work, I intend to help form a clearer picture of how cultural globalization shapes youth social experiences, raising understanding on how we can support youth navigating cultural change worldwide.

SKIN UNDER SIEGE
Presenter(s): Ayat Alsoofi
Category: Global and Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

This project examines the dermatological health impacts among Syrian refugees, exploring how conflict-driven displacement has exacerbated health vulnerabilities. Syria was chosen as the focus due to its ongoing humanitarian crisis - one of the largest and most unresolved in the world - which has left millions displaced and facing severe hardships. Additionally, the portrayal of Middle Eastern communities through Orientalist narratives has often overlooked the region's complex realities, making it crucial to shed light on the human cost of this crisis. With a focus on skin, hair, and nails, this project investigates how prolonged food insecurity and poor living conditions impact dermatological health in refugee camps. Analyzing these conditions highlights dermatology's role in crisis healthcare, with data drawn from recent studies on Syrian refugee populations. The findings emphasize that dermatological health serves as both a visible indicator of refugee well-being and a critical component of comprehensive care, suggesting that healthcare interventions in conflict zones should incorporate dermatology to improve health outcomes and dignity. By addressing these overlooked aspects, this project advocates for more targeted health responses in humanitarian settings. Despite the ongoing challenges, the resilience of the Syrian people offers hope for recovery and a stronger future.

THE REFUGEE CRISIS'S IMPACT ON REPRODUCTIVE HEALTHCARE FOR SYRIAN REFUGEE WOMEN DISPLACED IN JORDAN
Presenter(s): Jordan Saylor
Category: Global and Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

The Syrian Civil War has created an immense humanitarian crisis, leaving millions displaced, healthcare systems disrupted, and women and girls facing disproportionate ramifications. This research explores how the conflict has exacerbated access to Syrian refugee women's reproductive healthcare in Jordan and its resulting consequences on the population. Through qualitative analysis of articles, surveys, and case studies, this project addresses the complex barriers to reproductive care, which include economic limitations, infrastructure burdens, legal constraints, and cultural stigma. The findings highlight the healthcare disparities faced by women who have been displaced as refugees. Underscoring the need to provide quality gender-sensitive care in Jordanian refugee camps and urban centers, preventing women's health from being undermined during and after conflict.

CHANGES IN INTERNATIONAL LAW: AFTERMATH OF THE ARAB SPRING
Presenter(s): Madi Schultz
Category: Global and Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

Beginning in 2011, conflict in the Middle East quickly escalated into an international issue, with involvement from many countries across the world but concentrated in the Middle East.Many know about the Arab Spring, but what of the international changes that were made because of these very same events? This presentation examines the differences in international law caused by the Arab Spring. it shows what international law has looked like previously, from general rules to actual practices within the international community. It then looks at the changes that were made in the direct aftermath and how the Arab Spring has continued to affect the way international law is handled and what policies are put in place specifically in regards to the Middle East. This presentation highlights actual policies and treaties put into place after the Arab Spring and directly compares them to how international powers, specifically the United Nations, continue to treat international issues. It also brings orientalism into play, or the viewing of the Middle East as "other," and how that has previously and continues to play into policies made regarding the region. The Arab Spring was a transformative event that brought the Middle East to the forefront of the international stage and greatly changed how the entire region was viewed from there forward.

AID TO SYRIA: WHO GIVES, WHAT'S MISSING, AND WHY IT MATTERS
Presenter(s): Breanna Bouyer
Category: Global and Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

The Syrian Civil War lasted from 2011 to 2024. Now a year later, Syria is left in devastating conditions. With millions forced to flee, major infrastructure destroyed, and the healthcare system left in ruin, Syria is a long way from restoration. This presentation is focused on the outcomes of the Syrian Civil War, and the steps taken to rebuild Syria, more specifically from a monetary lens. Starting with repercussions of the war, like the refugee crisis, I will set the scene for why the study of Syria is essential. The second half of this presentation will be focused on international aid to Syria. Both state and non-state actors have provided billions of dollars in total to Syria, and I will explain how useful this money is to Syria. Finally, the presentation will conclude with the current state of Syria and what needs to continue to happen to ensure Syria is rehabilitated. Syria has a population of nearly 25 million, and all these people deserve a quality standard of living in their own country. This presentation is supposed to raise awareness of the situation in Syria and motivate audiences to consider what an effective aid response would entail.

ANALYZING THE COMMUNICATIVE CAPABILITIES OF THE GRAPHIC NARRATIVE IN REINHARD KLEIST'S DER BOXER (THE BOXER)
Presenter(s): Caleb Miko
Category: Global and Area Studies
Mentor(s): Lynn Wolff (College of Arts & Letters)

In the context of Holocaust representation and storytelling, scholars have long debated how documentary versus aesthetic approaches differently communicate the seemingly incommunicable emotional "truths" of Holocaust experience. In combining text and image, graphic narratives, as a medium, offer ways to bridge these divides between the documentary and the aesthetic. Through the combination of text and image, graphic narratives portray traumatic experiences both accurately and viscerally and thus are able to powerfully communicate the "truth" of those experiences in a unique way. My project will explore these dynamics of the medium through an analysis of Reinhard Kleist's Der Boxer (The Boxer), an adaptation of the life story of Holocaust survivor Hertzko Haft. My project will examine the communicative capabilities of the graphic narrative through close reading, and through comparison of Kleist's work with a filmic representation of Haft's story, a biography about Haft, and Haft's post-war video testimony given on his Holocaust experience. My analysis will be grounded in the theoretical work of Roland Barthes, Cornelia Brink, Marianne Hirsch, and Susan Sontag, who all think about images in ways that will illuminate Kleist's work further. Through my work with Der Boxer, these other representations, and these theoretical approaches, my project will explore how Der Boxer communicates the "truth" of Haft's Holocaust experience, and by doing so, I hope to also shed light on the larger capabilities of the graphic narrative as a means for telling difficult stories.

SHELTER, STATUS, AND STRUGGLE: SYRIANS UNDER TURKISH POLICY
Presenter(s): Sage Jarmosco
Category: Global and Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

This presentation examines the relationship between international refugee law and its influence on the treatment of Syrian refugees in Türkiye following the Syrian Civil War. The war displaced millions, forcing Syrian refugees to migrate to neighboring countries. Although Türkiye is a signatory of the 1951 Refugee Convention, their practices continue to violate the conventions articles and harm the refugee populations-especially females. This project examines the legal obligations outlined in the 1951 Refugee convention and Türkiye's compliance with the articles. It also explores the systemic violence female Syrian refugees faced, focusing on barriers to living conditions, work opportunity, and migration. Ultimately, this presentation will shed light on the gaps between international refugee law and their implementation in Türkiye, revealing the continued legal violence Syrian refugees face.

HOW THE POLITICAL SYSTEM WAS BUILT IN SYRIA WW1-WW2
Presenter(s): Cameron Ingersoll
Category: Global and Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

I believe that Syria's history is greatly overlooked during WW1 and WW2. The purpose of my presentation is to bring light onto what happened in Syria during these times. This will include their different rulers, political landscape, and wars that might have taken place there. My goal is to show how much turmoil countries like Syria have gone through, and how they ultimately fought for and achieved independence from their rulers. This presentation will draw on historical information from credible academic sources such as Britannica to conduct a demonstration of Syria's shifting rulers during this period. By examining how each ruling power governed, what ideologies drove their decisions, and how Syrian society responded, this presentation will build a layered picture of a nation whose political identity was repeatedly shaped by outside forces. As a Political Theory and Constitutional Democracy major at MSU, I am trained to understand politics in both a literal and philosophical way. I want to investigate how other places handle their politics and the different ways their politics have shaped their society in order to better understand how other countries operate. During the world wars, society was massively changing in the political scene. While the major powers are usually shown during this, I wanted to highlight a lesser known story during this, which I chose to be Syria.

HOW ACCOUNTING SHAPES HUMANITARIAN AID IN SYRIA'S CRISIS
Presenter(s): Johnson Nguyen
Category: Global and Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

This project investigates how accounting systems and financial reporting influence the effectiveness of humanitarian aid in Syria. Rather than focusing on the scale of displacement or total aid contributions, the research examines the less visible mechanisms that determine how resources are recorded, monitored, and distributed.By looking at reports and audits from organizations such as UNHCR, UNICEF, and the WHO, the study identifies how accounting practices shape transparency, donor confidence, and the delivery of aid. Findings indicate that inconsistent documentation, donor-imposed spending restrictions, and limited oversight often lead to inefficiencies and unequal allocation of resources.By situating accounting within the context of humanitarian relief, this research highlights the profession's ethical responsibility to ensure accuracy, accountability, and fairness in crisis response efforts.

THE KINGDOM OF SILENCE: HOW INTERNET CENSORSHIP IN SYRIA IMPACTS CITIZENS PERCEPTION OF THEIR GOVERNMENT.
Presenter(s): Sarah Schneider
Category: Global and Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

After the death of his father in 2000, Bashar-al-Assad became the president of Syria, continuing the authoritarian system of his predecessor. Starting in 2011, Assad began to face significant challenges to his rule, which lead to the Syrian Civil War, and his demise as a president in 2024. During the Assad Regime from 2011-2024, Syrian citizens were subjected to untrustworthy media sources (social media) and censored information about the state of their country. This research explores how this conflict affected Syrian's perception of the government, specifically how their trust was altered throughout this time. Through qualitative analysis of surveys, articles, and academic journals, this project addresses the laws enforced to censor media, as well as the shift in consumption, and the continued barriers that are enforced on differing platforms. The findings suggest a negative perception of the government, as media continues to be censored, ultimately creating a community brought together through distrust and fear.

STATE OF AFFAIRS IN SYRIA
Presenter(s): Jennifer Choe
Category: Global and Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

In spite of major media coverage on the uprisings in the Middle East in 2011 with the Arab Spring, little is known about the historical precedents. Syria in particular has witnessed extreme transformation tracing back to the 1950s. The intention of this study is to investigate major catalysts of change in 1950s Syria and what Syrians today can learn from its history. It is structured into two parts: a historical analysis in

chronological succession and its applications. This study highlights the voices of two educators, combating orientalism as well as views that the Middle East is a foreign, politically charged bubble that is unlike the United States. A thorough analysis of Syria's republic demonstrates that the factors contributing to the political instability is their independence from World War II, military intervention, Arab-nationalism, and Cold War tensions. In the past century, Syria's government structure has been influenced by different political ideologies and external powers, breeding a proxy battleground of unrest. In an area where change is a constant, the failure to establish lasting unity invites further examination of the parallels between the past and the present. The 1950s were transformative, as previous structures crumbled to form new ones expeditiously, reflecting the modern Middle Eastern world.

Health Sciences

PARENT CHILD RELATIONSHIP, MINDFULNESS, AND FAMILY MENTAL WELL BEING IN LOW INCOME HEAD START FAMILIES
Presenter(s): Sophia Solak
Category: Health Sciences
Mentor(s): Jiying Ling (College of Nursing)

Previous research suggests that higher levels of parent mindfulness are associated with healthier parent-child relationships and better overall family mental health, whereas lower mindfulness is linked to poorer family functioning. This study examined the relationships among parent-child relationship quality, parent mindfulness, and family mental well-being in low-income parent-child dyads. Participants included 309 parents (M age=31.78 years) and 330 preschool-age children (M age= 46.65 months) recruited from multiple Head Start organizations in Michigan. Data were collected through online Qualtrics surveys. Among participating parents, 41.1% were single, 43.2% were unemployed, and 38.8% reported an annual family income <$20,000. Conflict parent-child relationship was positively correlated with parent stress (r=.49, p<.001), anxiety (r=.41, p<.001), depression (r=.33, p<.001), and child sadness (r=.50, p<.001); and negatively correlated with parent mindfulness (r=-.49, p<.001). In contrast, parent-child closeness was negatively associated with parent stress (r=-.17, p<.001) and child anger (r=-.14, p=.015), and positively associated with parent mindfulness (r=.21, p<.001). Parent mindfulness was negatively associated with parent stress (r=-.70, p<.001), anxiety (r=-.62, p<.001), depression (r=-.55, p<.001), child sadness (r=-.42, p<.001), and anger (r=-.44, p<.001); and positively correlated with child positive affect (r=.33, p<.001). These findings suggest that enhancing parent mindfulness may reduce stress reactivity and improve parent-child relationships. Given the links between conflict, parental distress, and child sadness, mindfulness-based interventions may help interrupt relational strain and promote healthier family emotional functioning.

COMPARING CLINICAL STRATEGIES USED AMONG AUTISTIC AND NON-AUTISTIC SPEECH LANGUAGE PATHOLOGISTS WORKING WITH AUTISTIC CHILDREN: A QUALITATIVE STUDY
Presenter(s): Autumn Cottrell
Category: Health Sciences
Mentor(s): Emily Jensen (College of Communication Arts Sciences)

This study evaluates the clinical strategies that Speech Language Pathologists (SLPs) use in their therapeutic practice with autistic children. The data presented here is a subsample (n = 20) from a greater qualitative interview study (n = 80) focused on speech language pathologists' understanding of various clinical strategies they use with autistic children on their caseload. Within the subsample, half (n = 10) are autistic SLPs and the other half are non-autistic SLPs. Data analysis focused on the different strategies that were used by autistic and non-autistic SLPs in their clinical practice. Strategies that were primarily used but not restricted to non-autistic SLPs were visual timers and schedules, token boards, sensory toys, and sensory-sensitive spaces. Strategies that non-autistic SLPs use are similar to autistic SLP strategies with a greater mention of using Augmentative and Alternative Communication (AAC). Autistic SLPs reported greater therapeutic intentions and career motivation to work with autistic clients, compared to non-autistic SLPs. Pediatric therapy strategies that are seen to be consistent between non-autistic and autistic SLPs are language modeling, play-based approaches, and child-led practice. This study seeks to further understand practices used with autistic children by incorporating autistic SLPs' perspectives, ensuring responsive clinical practices.

SKIN CAROTENOIDS AND CARDIOVASCULAR RISK INDICATORS IN PRESCHOOLER-PARENT DYADS
Presenter(s): Ella Eversole, Priscilla Johnson-Bashor
Category: Health Sciences
Mentor(s): Jiying Ling (College of Nursing)

A high-quality diet in early childhood is critical for long-term health and the development of lifelong healthy eating habits. Skin carotenoids provide a non-invasive biomarker of fruit and vegetable intake. While lower carotenoid levels in childhood have been linked to higher cardiovascular risks in adulthood, little is known about carotenoid concordance and health indicators within preschooler-caregiver dyads. This study examined the relationship between skin carotenoids and cardiovascular risk indicators, including BMI, blood pressure, and body fat percentages, among preschoolers and their caregivers. Participants, including 160 preschoolers and 146 caregivers, were recruited from various Head Start programs across Michigan. Skin Carotenoids were measured using the Veggie Meter, while anthropometric and cardiovascular measures were obtained following standard protocols. The majority of participants were White (70.6% preschoolers and 78.8% caregivers), and most reported an annual income below $30,000. Preschooler and caregiver skin carotenoid levels were moderately and positively correlated ($r=.44$, $p<.001$). In addition, higher caregiver carotenoid levels were associated with lower BMI ($B = -.03$, $p = .014$), systolic BP ($B= -.04$, $p = .028$), and diastolic BP (-.04, .011). Preschoolers and their caregivers with normal blood pressure had significantly higher skin carotenoid levels compared to caregivers with elevated blood pressure (preschooler: $M=245.90$ vs. 221.27, $t=2.04$, $p=.044$; caregiver: $M=248.55$ vs. 211.49, $t=2.79$, $p=.003$). These findings highlight the importance of family-based dietary

patterns and support interventions targeting early childhood nutrition to reduce long-term cardiovascular risk.

A SCOPING REVIEW: QUALITY APPRAISAL OF CAREGIVER WEARABLES AND SMART APPS
Presenter(s): Lauren Bottini
Category: Health Sciences
Mentor(s): Arienne Patano (College of Nursing), Gwen Wyatt (College of Nursing), Rebecca Lehto (College of Nursing)

Informal cancer caregivers (CCGs) experience poor psychosocial well-being and quality of life. Wearables and smart devices offer promising solutions to support caregivers' well-being. A scoping review was performed to evaluate the effectiveness of wearables and smart apps for improving the psychosocial well-being and quality of life of informal CCGs. The aim was to describe the use of the Critical Appraisal Skills Program (CASP) tool to critically appraise the studies included in the review. A comprehensive search of CINAHL, PubMed, Web of Science, and Embase identified studies published within the last ten years using the following search terms cancer caregivers, wearables, smart apps, psychosocial, wellbeing, and quality of life. Using Arksey and O'Malley framework and PRISMA guidelines, 237 records were retrieved, 158 screened, and 16 met inclusion criteria. Two research assistants independently reviewed all studies. A structured checklist was used to appraise the study design, sampling framework, interventions, validity and reliability of measures, relevance of findings, and applicability. CASP scores ranged from 7-11, with 69% (n = 11) of studies rated as moderate to high quality. Strengths included clear objectives, sound study designs, well-described interventions that included duration, and appropriate outcome measures. Limitations included small sample sizes, limited diversity, use of non-validated outcome measures, lack of adherence data, and details about ethical considerations. The CASP tool provided a structured and transparent approach to appraise the level of evidence, strengths, and reliability of studies in this scoping review.

INTEGRATED MENTAL HEALTH CARE FOR MEDICAID BENEFICIARIES IN SIX STATES REPRESENTING THREE LEVELS OF NURSE PRACTITIONER PRACTICE AUTHORITY
Presenter(s): Alexis Karpenko, Isabela Domingues Martins
Category: Health Sciences
Mentor(s): Ann Annis (College of Nursing)

Mental health (MH) conditions and substance use disorders (SUD) represent significant health and financial burdens to individuals and the nation's health system, particularly among the Medicaid population. Integrated physical and MH care delivery models emphasize provider-driven approaches to improving care. Within these models, nurse practitioners (NP) play a critical role in expanding the delivery of MH services. The purpose of this study is to describe MH care for Medicaid beneficiaries in six states with three levels of NP practice authority. This study is a retrospective cohort study of Medicaid beneficiaries and providers during 2022-2023 in six states that represented full, reduced, and restricted NP practice authority. We collected information about the state Medicaid MH programs, populations,

and providers, producing a profile for each state. Medicaid data was analyzed to determine state-level prevalence of MH/SUD. Among 6 million Medicaid beneficiaries in the six states, approximately one-third had a diagnosis of MH/SUD. All states provide inpatient and outpatient MH; state specific service coverage and integration incentives differ. The findings will provide critical information on the relationships between state NP practice authority regulations and mental health care. This study will inform state Medicaid programs and workforce policies, enhancing MH service integration. Medicaid programs aim to bridge the gap between physical and MH services improving patient care and the population's health. Less restrictive NP practice authority could improve access to MH/SUD services.

EVALUATION OF FELINE BEHAVIORAL VISION TESTING SYSTEM USING CRX+/+ AND CRX+/- CATS
Presenter(s): Sean Burk
Category: Health Sciences
Mentor(s): Paige Smith (College of Veterinary Medicine), Simon Petersen-Jones (College of Veterinary Medicine)

Inherited retinal diseases in felines can lead to partial or complete vision loss. As genetic therapies are developed to treat these conditions, reliable methods for assessing functional visual outcomes are needed. While electroretinography provides quantitative information on retinal function, standardized behavioral tests to evaluate functional vision rescue remain limited. This study evaluated the validity and repeatability of a behavioral laser-tracking assay as a functional vision outcome measure to complement existing diagnostic tools. Eight kittens approximately 1.5 months of age were tested, including four visually normal controls and four kittens with early-onset blindness treated bilaterally with the same gene therapy. During each trial, a moving laser stimulus was presented for one minute while behavior was video recorded. Testing was repeated three times to assess repeatability. Two masked observers independently quantified outcomes as the percentage of time each kitten tracked the laser and assigned a subjective visual behavior score using a standardized grading scale (0-5). Treated affected kittens demonstrated higher mean laser-tracking performance (68.7% ± 7.3 SEM) compared to controls (41.7% ±6.9 SEM), reaching statistical significance ($p = 0.018$). Subjective grading scores were slightly higher in controls (4.00 ± 0.28 SEM) than affected kittens (3.56 ± 0.22 SEM), but this difference was not statistically significant ($p = 0.24$). Tracking performance demonstrated moderate test repeatability, with some kittens showing consistent responses across trials while others exhibited substantial variability. The behavioral tracking assay provides functional insight into vision rescue but appears heavily influenced by behavior, with visually normal kittens more prone to distraction. Although repeatability was moderate overall, variability suggests further protocol refinement is needed. Future improvements, including environmental standardization, shorter or averaged trials, and monocular testing using opaque contact lenses, may enhance assay sensitivity and reliability.

FOOD INSECURITY ADVERSELY CORRELATES WITH FAMILY MENTAL WELL-BEING: THE MEDIATING ROLES OF PARENT-CHILD RELATIONSHIP AND MINDFULNESS

Presenter(s): Anna Wiltzer
Category: Health Sciences
Mentor(s): Hannah Lalonde (College of Nursing), Ivy Xie (College of Nursing), Jiying Ling (College of Nursing)

This study examined the mediating roles of parent-child relationship and mindfulness in the relationships between household food insecurity and family mental well-being. Parent-child relationships are an important factor in the functionality of a family unit. Food insecurity may increase parental stress and mental health challenges, thereby placing children at greater risk for adverse socioemotional outcomes. We analyzed data from 168 preschoolers and 154 caregivers enrolled in Michigan Head Start programs. Of the participants, 41.6% of parents were unemployed. With that 40.3% of participants from the parent group made less than $20,000 a year in income. Parents completed online Qualtrics surveys measuring socioeconomic demographics, household food insecurity, parent-child relationship, parent mindfulness, and mental health of parents and children. Correlational and mediation analyses were conducted. Household food insecurity was significantly correlated with higher levels of preschoolers' sadness ($r=0.32$, $p<.001$) and fear ($r=0.23$, $p=.003$). Greater caregiver mindfulness was associated with lower levels of preschoolers' sadness ($\beta=-0.19$, $p=.017$) and fear ($\beta=-0.18$, $p=.048$). Caregiver-child conflict greatly mediated the relationships of household food insecurity with preschoolers' sadness ($\beta=0.14$, $p=.002$) and fear ($\beta=0.12$, $p=.002$). Caregiver mindfulness also mediated the relationships of household food insecurity with caregivers' stress ($\beta=0.26$, $p<.001$) and anxiety/depression ($\beta=0.24$, $p<.001$). The study's results support the detrimental relationships between food insecurity and family mental well-being. Interventions targeting mindfulness and parent-child conflict resolution may help buffer the negative effects of food insecurity on both caregivers and young children.

CROSS-NATIONAL CONTENT VALIDATION OF A HOSPITAL READINESS TOOL FOR PEDIATRIC CANCER NURSING QUALITY MEASUREMENT

Presenter(s): Ana Ludwig, Brianna Johnson
Category: Health Sciences
Mentor(s): Courtney Sullivan (College of Nursing), Maura Philippone (College of Communication Arts Sciences)

Background/Purpose: Standardized nursing-sensitive quality indicators (NSIs) guide measurement and improvement of nursing care and patient outcomes. To address the need for pediatric cancer NSIs globally, our previous research established a core set of pediatric cancer NSIs and a standardized, adaptable toolkit for NSI data collection in resource-diverse settings and countries. This toolkit includes a readiness assessment of hospitals' existing NSI use and quality monitoring systems. To ensure the assessment tool is appropriate for use with future international pilot sites, the purpose of this study is to establish content validity of the NSI readiness assessment tool. Methods: A purposive sample of 12 pediatric oncology nurse leaders representing the 6 WHO Regions and both low- and middle-income and high-income countries were invited via email to complete a semi-structured content validity

questionnaire. Assessment tool items were rated for content relevance, item clarity, and item importance using a 4-point Likert scale (1 is low, 4 is high score). Participants were asked to provide recommended changes for any items they scored less than 4. Findings: For each item, an Item-Content Validity Index (I-CVI) score of ≥ 0.78 will indicate strong content validity. Conclusions: A valid NSI readiness assessment tool will inform strengths and opportunities for enhancing quality monitoring systems at future pilot sites. Next steps include establishing process and face validity of the readiness assessment tool. Future directions include Spanish translation and cross-cultural validation of the tool for use in Chile.

PAIN ASSESSMENT TOOLS AMONG CHILDREN WITH INTELLECTUAL AND DEVELOPMENTAL DISABILITIES: A SYSTEMATIC REVIEW
Presenter(s): Isabela Domingues Martins
Category: Health Sciences
Mentor(s): Marci Mechtel (College of Nursing), Patricia West (College of Nursing)

Children with intellectual and developmental disabilities (IDD), including autism spectrum disorder (ASD), frequently experience pain but often have difficulty communicating it verbally. In addition, their presentation of pain may differ from neurotypical children, leading to under-recognition and undertreatment. This systematic review evaluates the validity, reliability, and clinical usefulness of pain assessment tools designed or adapted for children ages four to twenty one years with IDD. Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines, four databases (PubMed, CINAHL, PsycINFO, Family and Society Studies) were searched using predefined keywords assisted by an expert librarian. The search yielded 1653 titles, duplicates removed, screened and were assessed using Covidence. Eleven studies met inclusion criteria and examined behavioral, proxy-report, and self-report tools used in hospitalized settings, including acute and postoperative units. We are currently reviewing full text articles independently for data extraction. We will synthesize findings to further analyze the evidence for responsive clinical practice application and future research implications.

PREVALENCE OF MENTAL HEALTH CONDITIONS AND SUBSTANCE USE DISORDERS AMONG ADULT MICHIGAN MEDICAID BENEFICIARIES, 2022-2023
Presenter(s): Keely Cross
Category: Health Sciences
Mentor(s): Ann Annis (College of Nursing)

Mental health (MH) conditions and substance use disorders (SUD) are important health issues, especially for disadvantaged populations. Medicaid provides health care for over 2.5 million Michigan residents. Medicaid beneficiaries have increased risk of MH/SUD and may encounter difficulties accessing care, particularly in areas with few mental health resources. Medicaid beneficiaries with mental health conditions also have an increased risk of other chronic conditions, such as heart disease, cancer, and diabetes. We aimed to determine the prevalence of MH/SUD among adult Michigan Medicaid beneficiaries and describe characteristics of this population. Our study sample included Michigan

Medicaid beneficiaries 18-64 years with comprehensive benefits and billed services in 2022-2023. Using diagnosis codes, we identified cohorts of beneficiaries who had MH and/or SUD conditions. We examined demographic and geographic characteristics and chronic condition comorbidities. Among 1.5 million Medicaid beneficiaries eligible for our study, 504,541 (33%) had a MH and/or SUD (17% with MH, 7.6% with SUD, and 8.1% with both). More women (21%) than men (12%) had a MH and/or SUD. Anxiety (49%) and depression (36%) were the most frequent MH conditions, while tobacco (31%), alcohol (10%) and opioids (9%) were the most frequent SUDs. Identifying individuals with mental health conditions is important because it directly affects how health care is delivered. Ensuring that all individuals have access to care when needed allows health care providers to better address mental health needs and improve the quality and effectiveness of care for this population.

THE EFFECT OF MORNING VERSUS EVENING EXERCISE TRAINING ON AORTIC STIFFNESS IN POSTMENOPAUSAL WOMEN WITH HYPERTENSION

Presenter(s): Lydia Elbert
Category: Health Sciences
Mentor(s): Katharine Currie (College of Education)

Aortic stiffness, assessed using carotid-femoral pulse wave velocity (cfPWV), increases with age and menopause, and is associated with an increased risk of future cardiovascular events. While exercise training decreases aortic stiffness (i.e., cfPWV) in some populations, it is unclear whether the time of day when exercise training is performed affects the degree of change. This study examined whether there was a difference in the amount of change in cfPWV following 6-weeks of exercise training performed in the morning (AM) and evening (PM) in a clinical population. Twenty-five sedentary, postmenopausal females with hypertension (65±7 years, body mass index: 33.3±5.9 kg/m2, 76% on blood pressure medications) participated in two, 6-week blocks of training (treadmill and isometric handgrip exercises 4 days/week) in the AM (0800-1100h) and PM (1700-2000h) with a ~3-week wash-out period in between blocks. cfPWV and blood pressure were measured pre- and post-training blocks using applanation tonometry and an automated oscillometric device, respectively. The change (post-pre) in cfPWV and systolic and diastolic BP were calculated and compared (AM vs. PM) using paired parametric and non-parametric tests depending on normality. Data are reported for AM vs. PM as mean±SD or median (interquartile range) for normal and non-normal data, respectively. There were no differences in the change in cfPWV (-0.3±1.5 vs. 0.5±1.7 m/s; P=0.080), systolic (2±4 vs. 2±13 mmHg; P=0.748) or diastolic BP [2(9) vs. -1(7) mmHg; P=0.369) after each training block. Data collection is ongoing and data from the larger sample may detect differences due to time of training.

TRIANGULATION FOR SPATIALLY TAGGED PALS IN HYPOXIA STUDIES
Presenter(s): Yu Zhou
Category: Health Sciences
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

Positron annihilation lifetime spectroscopy (PALS) probes nanoscale free volume and local chemistry through the formation and decay of positronium. In biological tissue, the ortho-positronium (o-Ps) lifetime and the three-gamma (3γ) annihilation fraction are sensitive to oxygen, making PALS a promising complementary signal for tumor hypoxia. Here we present an analysis workflow that adds spatial information to PALS by triangulating 3γ annihilation events. In a segmented scintillator detector, each annihilation photon may undergo multiple Compton interactions. We use measured interaction positions and deposited energies to constrain photon directions, and we estimate the common 3γ origin with a constrained least-squares vertex fit. Event-level quality controls (geometry consistency, energy balance, and fit residuals) are applied to reject poorly constrained events and mitigate scattering ambiguities. The approach is evaluated with a forward Monte-Carlo generator and synthetic phantoms to quantify reconstruction stability and to study how detector granularity, energy resolution, and timing affect localization accuracy and usable 3γ yield. This framework enables "3D-tagged PALS": extracting microstructural information (o-Ps lifetime) together with oxygen-related contrast while reporting coarse localization of the signal. Ongoing work focuses on calibration with benchtop measurements and extension to heterogeneous tissue models and clinically relevant detector geometries.

HEALTH SUPPORTS LEARNING: ACADEMIC OUTCOMES IMPROVED BY THE SCHOOL-BASED ASTHMA THERAPY PROGRAM
Presenter(s): Phoebe Marx
Category: Health Sciences
Mentor(s): Kimberly Arcoleo (College of Nursing)

Background: School nurses play a crucial role in facilitating optimal childhood asthma management. School nurses collaborate with teachers, administrators, caregivers, and healthcare providers to ensure the holistic health and wellness of students and there is a growing body of evidence demonstrating improved clinical outcomes for children participating in school-based asthma therapy, but little is known about the impact on academic outcomes. Methods: Retrospective academic record review from 2013-2019 for 633 children enrolled in a large urban school district. Unexcused absences, behavioral incidents, and grades for 4 academic quarters prior to SBAT enrollment and 4 quarters after enrollment were abstracted. Analyses were conducted separately for elementary and middle/high school children. Results: There was a 14% reduction in number of unexcused hours for elementary children (25.42 to 21.98) and 17% reduction for middle/high school students (39.06 to 31.39) from pre- to post-SBAT enrollment. Elementary children also had an 29% decrease in behavioral incidents (0.49 to 0.35) and middle/high school students demonstrated an 50% reduction from 0.26 to 0.13. There were no statistically significant changes in English, Math, Science or Social Studies grades for middle/high school students. Conclusions: This is the first study to report objective measures of academic outcomes for children enrolled in school-based asthma therapy. These striking findings demonstrate how

administering children's controller medications in school and thereby improving attendance can not only result in better health outcomes, but also improve decrease behavioral incidents, and reduce lost revenue due to absenteeism. Keywords: academic outcomes, asthma therapy

NOT ONE CLOCK FITS ALL: SEGMENT-SPECIFIC CIRCADIAN TIMING IN THE EPIDIDYMIS
Presenter(s): Kierra Jursch
Category: Health Sciences
Mentor(s): Alexandra Yaw (College of Agriculture & Natural Resources), Hanne Hoffmann (College of Agriculture & Natural Resources)

Infertility affects one in seven couples, and male infertility is a contributor in 50% of cases. Dysfunction of the epididymis, an organ responsible for sperm maturation, motility, and storage, commonly contributes to male infertility. The epididymis is divided into three distinct regions, the caput, corpus, and cauda, which differ in gene expression and physiological roles. Although regional specialization in the epididymis is well established, circadian properties within individual segments remain largely unexplored. Normal circadian rhythms, biological processes that follow a roughly 24-hour clock, are necessary for epididymal function and disruptions to these rhythms, such as those caused by sleep deprivation, can reduce sperm count and motility. To determine if circadian rhythms differ across epididymal regions, male Per2::Luciferase reporter mice, which emit bioluminescence as Per2 clock gene expression oscillates, were used to measure rhythms ex vivo. Epididymides were collected either intact or following sub-dissection into caput, corpus, and cauda explants, and circadian parameters from bioluminescent recordings were compared among preparation methods and regions. Sub-dissection of epididymides revealed differences in circadian rhythms not apparent in whole-tissue preparations. The corpus exhibited a significantly longer circadian period than both the caput and cauda (two-way ANOVA, $p < 0.0001$), demonstrating that individual segments exhibit distinct circadian dynamics. These findings indicate that epididymal sub-dissection can reveal meaningful circadian differences among regions. Defining region-specific epididymal circadian profiles will improve experimental design and establish a foundation for drug screening and chronobiological approaches to support epididymal circadian function and sperm maturation, with potential implications for assisted reproductive technologies.

LITERATURE REVIEW QA: NATURE VIRTUAL REALITY RESEARCH WITH CANCER PATIENTS AND CAREGIVERS
Presenter(s): Myah Leuenberger
Category: Health Sciences
Mentor(s): Rebecca Lehto (College of Nursing)

High-quality literature reviews are an important component in the advancement of nursing research. When evaluating the rigor and credibility of evidence, quality appraisal (QA) contributes to comprehensive research evaluation. However, selecting a QA tool may be challenging. For this review, the Joanna Briggs Institute (JBI) checklists were selected due to their versatility and reliability. The purpose was to conduct a QA of articles included in a relatively new area of research: virtual reality (VR)

use to support emotional health among caregivers and patients. The JBI toolkit consists of 15 questionnaires, each developed for different research methodologies. For this review, two of the JBI checklists were applied: randomized clinical trials (RCT) and quasi-experimental. Each study was thoroughly evaluated for rigor and credibility across multiple domains, including randomization, blinding, outcome measurement, and follow-up. Of the 34 studies appraised, 20 were RCTs, none of which met all appraisal criteria. Considering the VR equipment, it was not possible to keep group assignments concealed from the participants. The remaining 14 were quasi-experimental with 4 meeting all conditions. The rest frequently lacked detail in reporting administration and consistency. These results demonstrate the need for rigorous research in the emerging area of nature-based VR for cancer patients and caregivers. While the JBI measures were successfully used for this literature review, understanding each instrument's attributes can guide authors on appropriate selection. Effective appraisal supports the development of high-quality research that informs interdisciplinary practice, promotes methodological transparency, and enhances the translation of findings into optimal patient care outcomes.

ILLUMINATING LIGHT ON FERTILITY: REPRODUCTIVE CONSEQUENCES OF ALTERED LIGHT INTENSITY
Presenter(s): Ainsley Gibbs
Category: Health Sciences
Mentor(s): Alexandra Yaw (College of Agriculture & Natural Resources), Hanne Hoffmann (College of Agriculture & Natural Resources)

Reproductive physiology is highly sensitive to environmental cues, with light cycles being one of the most influential regulators of the body's circadian rhythms. Light modulates reproductive axis, by which the brain integrates light cues to promote hormone production and release that drives ovarian function, impacting reproduction and fertility. Seasonal changes in light quality, where summer months have increased light intensity compared to winter months have be linked to fertility in humans. In humans, lower in-vitro fertilization success rates have been observed in the winter months that correlate to reduced light hours. To investigate how light intensity influences fertility, we collected data from estrous smears and quantified ovarian follicles in female mice. To collect these samples, female mice were housed under standard light conditions (300 lux) before transitioning to bright (1000lux) or dim light (50 lux) under a 12:12 light-dark cycle. Estrous cyclicity was monitored via daily vaginal cytology and ovaries were collected, sectioned, and stained with H+E before quantifying the number and type of follicles. By examining how light intensity shapes reproductive hormone regulation and cycle stability, this study seeks to clarify the broader relationship between environmental lighting and reproductive health.

WHO BENEFITS THE MOST FROM SLEEP HYGIENE EDUCATION: FINDINGS FROM THE SLEEP EDUCATION FOR EVERYONE PROGRAM (SLEEP)
Presenter(s): Reagan Pennycuff, Roxanne Anderson
Category: Health Sciences
Mentor(s): Robin Tucker (College of Agriculture & Natural Resources)

Introduction: Poor sleep is prevalent among older adults.1 Sleep issues can lead to reduced quality of life and increased risk of developing chronic conditions.2,3 Behavioral interventions have been shown to improve sleep quality and duration. This study explored predictors of improved sleep after completingthe SLeep Education for Everyone Program (SLEEP). Methods: 104 adults participated. The Sleep Hygiene Index (SHI) measured undesirable sleep behaviors; the Pittsburgh Sleep Quality Index (PSQI) assessed sleep quality and duration. Self-reported sleep duration was extracted from the PSQI. Median income data based on zip code were obtained from the 2022 American Community Survey 5-Year estimates. BMI was calculated from self-reported height and weight and categorized into lean, overweight, and obese. Race included Black or white. A multiple regression model identified predictors. Results: Participants were 66.7±12.3 years with an average BMI of 29.9±8.1 kg/m2. Older age, fewer chronic diseases, and more favorable initial scores predicted a lower SHI score post-program (adjusted $R2=0.35$, $df=83$, $F=15.72$, $p<0.001$). Better sleep quality scores at baseline and fewer chronic diseases predicted better sleep quality scores post-program (adjusted $R2=0.28$, $df=82$, $F=16.54$, $p<0.001$). Greater sleep duration at baseline predicted greater sleep duration post-program (adjusted $R2=0.36$, $df=83$, $F=47.94$, $p<0.001$). Race, education level, employment, BMI status, and income range did not predict post-intervention outcomes. Conclusion: Favorable initial scores predicted better outcomes post-SLEEP in all three sleep measures. Fewer chronic conditions predicted favorable post-PSQI and SHI scores. Older age also predicted better SHI scores.

HUMAN MILK OLIGOSACCHARIDE METABOLIZING GENE EXPRESSION IN THE GUT MICROBIOTAS OF 6-MONTH-OLD INFANTS
Presenter(s): Alexander Boville
Category: Health Sciences
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

Human milk contains many nutrients essential for human growth and development. Human Milk Oligosaccharides (HMOs) act as substrates for specific microbes, shaping the overall composition of the infant's gastrointestinal microbiome. We can compare the gut microbiota between infants with different diet compositions by analyzing the abundance of genes from bacteria in the gut that metabolize such HMOs. Quantitative Real-Time Polymerase Chain Reaction was performed on infant gDNA from 121 participants, using four primers sets to calculate the relative abundance of their targeted genes and associated bacteria. We are currently working on cleaning up our data and removing outliers from our standard curve calculations. We seek to analyze the gut microbiota composition differences between infants that consume only human milk, no human milk, and a mix of human and formula, as well as observe trends in our data between diet composition and relative abundance

IDENTIFYING MICHIGAN-BASED WELL-BEING RESOURCES FOR PEOPLE WITH PARKINSON'S DISEASE AND THEIR CAREGIVERS
Presenter(s): Ava Kardynal, Olivia Jackson
Category: Health Sciences
Mentor(s): Helen Mach (Communication Arts Sciences), Maura Philippone (College of Communication Arts Sciences), Sai Aishwarya Ramani (College of Communication Arts Sciences), Thea Knowles (College of Communication Arts Sciences)

Parkinson's disease (PD) is a neurodegenerative disease whose symptoms (e.g., tremor) can diminish well-being for people with PD and their caregivers. Non-clinical well-being resources (e.g., exercise groups, support groups) can contribute to enhanced well-being in these populations. As PD incidence continues to rise in North America alone, more people will require PD-specific supports to navigate the widespread effects of this disease on well-being. This study therefore aims to identify PD-focused well-being resources through primary (i.e., electronic survey) and secondary (i.e., structured online search) research approaches, with a focus on Michigan-based resources to maximize impact in the mid-Michigan area. A structured online search, which will inform the development of a subsequent electronic survey (Qualtrics) of people with PD and caregivers of people with PD, will be conducted to gather information about Michigan-based well-being resources for people with PD and their caregivers. Findings will provide focused insight into localized support systems for people with PD and their caregivers, ranging from non-clinical exercise groups to social support groups. Resources will be categorized by location, cost, and activity type to identify current patterns in resource accessibility and pinpoint potential gaps. Findings will identify preferred and impactful well-being resources available in Michigan, and will inform clinical guidance within this population. By synthesizing and disseminating primary and secondary research findings, the researchers aim to improve access to non-clinical activities (i.e., beyond healthcare services) that promote enhanced well-being for people with PD and their caregivers.

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EXAMINING THE PACE OF IMPLEMENTATION: FACTORS INFLUENCING PROGRESSION THROUGH THE ACT SMART TOOLKIT IN A COMMUNITY SUD TREATMENT ORGANIZATION
Presenter(s): Andrew Prindle
Category: Health Sciences
Mentor(s): Amy Drahota (College of Social Science)

Despite availability of evidence-based substance use disorder treatment programs (SUD-EBPs), implementation by community-based organizations is variable. Implementation processes assist organizational leaders and providers to effectively implement SUD-EBPs. However, little research has examined the pace of implementation efforts. This convergent mixed-methods study is currently examining factors that influence the pace of progressing through the ACT SMART Toolkit being used to support implementation of a SUD-EBP within a Michigan-based multi-site SUD treatment organization. ACT SMART is an evidence-informed, comprehensive implementation strategy involving facilitation, organization-based implementation teams, and structured activities to promote EBP adoption, implementation and sustained use in community settings. The implementation team consisted of six SUD organization employees (5 supervisors, 1 direct provider) and the ACT SMART Facilitator. Quantitative data included the ACT SMART Milestones checklist that documented time to complete toolkit activities. Qualitative data included transcribed implementation team meetings and meeting minutes. Ongoing qualitative analysis followed a coding, consensus, and comparison method rooted in grounded theory. Two researchers independently coded transcriptions to identify emergent themes related to factors influencing the pace of completing ACT SMART's Exploration activities. Preliminary findings suggest multiple factors slowing implementation pace: organizational readiness, leader engagement, staff capacity, and competing priorities. Finalized analysis and integration of quantitative and qualitative data is expected by early April. These preliminary findings highlight the importance of organizational and contextual factors on the pace of implementation efforts. Examining influences of implementation pace may allow implementation researchers to adapt processes and strategies for greater efficiency, ultimately supporting more timely use of SUD-EBPs.

COMPARING THE EXPERIENCE OF SURGERY AMONG PLEURAL AND PERITONEAL MESOTHELIOMA PATIENTS PARTICIPATING IN A COMMUNITY-ENGAGED RESEARCH PROJECT
Presenter(s): Lilli Fields
Category: Health Sciences
Mentor(s): Amanda Woodward (College of Social Science), Jen Hirsch (College of Social Science), Linda Zhang (College of Social Science)

Mesothelioma is a rare and aggressive cancer that is contracted from exposure to asbestos and affects the lining of the lungs (pleural) or abdomen (peritoneal) (and sometimes both). Treatment options for mesothelioma are limited. Surgery has been one of those options, but controversy has arisen based on two studies which found limited effectiveness and increased negative side effects for both pleural and peritoneal mesothelioma. While some experts agree with these results, others have concerns about how they were conducted. With this context in mind, this study uses data from the Mesothelioma Caregiver Study, a 4-year federally funded community engaged project to develop and test an online support intervention for caregivers. Semi-structured interviews were conducted with 27 patients, caregivers, and bereaved. This study analyzed transcripts from 11 participants (3 patients, 3 caregivers, and 5 bereaved) where the patient had surgery either alone (n=2) or in combination with other treatments (n=9). Six of these had pleural and 5 had peritoneal mesothelioma. Patients, caregivers, and bereaved described the different types of surgeries performed, side effects, their experiences of care during and after surgery, including interactions with health professionals. These findings highlight aspects of patient and caregiver experiences that may get lost in large clinical trials.

PHYSIOLOGICAL INTERACTIONS BETWEEN DIETARY OXALATES, GUT BARRIER INTEGRITY, AND THYROID FUNCTION
Presenter(s): Sohniaa Mahalingam
Category: Health Sciences
Mentor(s): Marty Spranger (College of Natural Science)

Dietary oxalates are naturally occurring compounds found in many plant-based foods, such as leafy greens, nuts, and legumes. Recently, public influencers have claimed that dietary oxalates from spinach and kale damage the intestinal barrier and impair thyroid function in healthy individuals. This literature-based analysis evaluates the physiological effects of oxalates on gut barrier integrity and thyroid physiology to evaluate the validity of these claims. Under normal physiological conditions, the majority of dietary oxalates remain in the gastrointestinal tract, where they bind to calcium to form insoluble calcium oxalate, which is excreted in feces. Endogenously produced oxalates, generated through vitamin C metabolism, are filtered and excreted by the renal system. Problems occur primarily in individuals with hyperoxaluria, fat malabsorption, or inflammatory gastrointestinal diseases, where reduced calcium binding and weakened epithelial barrier allow greater oxalate uptake and crystal formation. Oxalate interaction with the gut epithelium is regulated by the gut microbiota, including oxalate-degrading bacteria such as Oxalobacter formigenes, which limits epithelial exposure in healthy individuals. In comparison, a compromised gut barrier increases susceptibility to oxalate permeability and uptake. Regarding thyroid physiology, calcium oxalate crystals are commonly observed in normal thyroid tissue

and increase with age. Evidence shows that crystal accumulation is associated with low-activity thyroid cells rather than pathological processes, suggesting that they are not a consequence of impaired thyroid function but instead due to reduced follicular activity. Overall, current evidence does not support claims that dietary oxalates harm gut or thyroid function in healthy individuals, but rather due to pathological issues.

NANOMEDICINE AND SMALL MOLECULE MODULATION OF PLASMA FOR DEEP PROTEOMICS IN CARDIOVASCULAR DISEASE PATIENTS
Presenter(s): Zhina Zabihian
Category: Health Sciences
Mentor(s): Morteza Mahmoudi (College of Human Medicine)

Cardiovascular disease (CVD) remains the leading cause of mortality worldwide. Early detection is essential for timely interventions that can minimize heart tissue damage and improve patient outcomes. However, current blood-based biomarkers lack the sensitivity and specificity needed for early-stage detection,primarily due to the complexity of plasma proteins, where concentration differences span over ten orders of magnitude. This makes it difficult to identify low-abundance proteins. Our study has two primary objectives: first, to significantly enhance plasma proteome coverage by integrating small-molecule and nanomedicine technologies that leverage the protein corona property. Second, to utilize machine learning and causal inference techniques for biomarker discovery through in-depth plasma proteome analysis with our innovative approach.These strategies aim to improve early CVD detection and enable more accurate, reliable diagnostic tools. How effective is nanomedicine-based detection of low-abundance proteins in CVD, and what novel biomarkers canthis method identify to improve diagnostics in patient care?

ESTABLISH LIGHT'S EFFECTS ON COGNITION IN MICHIGAN STATE UNIVERSITY STUDENTS
Presenter(s): Morgan Rouse
Category: Health Sciences
Mentor(s): Hanne Hoffmann (College of Agriculture & Natural Resources)

Bright, full-spectrum light during the day has a positive impact on many physiological functions in humans, including improved cognition, reduced fatigue, and enhanced mood regulation. Oftentimes, students spend a significant amount of time indoors and do not see natural sunlight before early-morning classes in the winter. This reduction in bright natural light in the morning might negatively affect certain students' ability to learn in class. Our goal is to determine how the quality of morning and early-afternoon light influences Michigan State University students' cognition. Therapeutic light therapy mimics noon-sunlight and is much brighter than standard indoor lighting. Previous studies have shown that light therapy in students can increase attention, performance, and accuracy. Based on this, we hypothesize that twenty minutes of high-quality morning light exposure will increase cognitive function and reduce fatigue in college students. To test this hypothesis, participating Michigan State University students completed a series of questionnaires on Qualtrics and were tested weekly for three weeks on a

simple cognitive task (Trail Making Test) to measure their cognitive function before and after wearing either no glasses, placebo glasses, or experimental glasses. This study was approved under IRB# STUDY00008572. Our preliminary data showed that the experimental glasses reduced students' performance on a cognitive task, and there was no significant difference in performance across the individual group conditions. Our findings suggest that other factors, such as how eyes adjust to the room's light after wearing the experimental glasses, may influence cognitive performance in the experimental setting and warrant further investigation.

ELECTROCARDIOGRAM CATEGORIZATION THROUGH TIME SERIES ANALYSIS
Presenter(s): Owen Sylvester
Category: Health Sciences
Mentor(s): George Mias (College of Natural Science)

Cardiovascular diseases are the leading cause of mortality worldwide. Patient health is typically assessed through various molecular and physiological measurements, including electrocardiograms (ECGs). ECG analysis is an important tool because it is used in cardiac rehabilitation programs (medically supervising patients that have experienced heart issues) to monitor heart signals, as well as detect abnormalities. An ECG offers a rather non-invasive diagnostic tool, which when supported by machine learning, can be used for the early diagnosis of cardiovascular disorders. In this investigation we used publicly available ECG data to characterize patient signals for various heart disorders, as well as healthy signals, using an array of statistical and graph-based methods. We obtained data using PhysioNet from the PTB database. The analysis included spectral characterization of the heart signals using periodograms and Fourier analyses, along with noise filtering and baseline correction. We also use autocorrelation-based methods and automated XQRS detections to characterize heartbeat structure, and apply graph-based methods including visibility graphs. The characterization of the datasets provides feature sets that we use to classify the different signals into heart disease classes. In summary, our ECG signal analysis coupled with machine learning provides new methodology toward the early non-invasive detection of cardiovascular conditions.

EXAMING EFFECTS OF RECENCY OF CONCUSSION IMPACTS BASELINE TEST PERFORMANCE IN COLLEGIATE ATHLETES
Presenter(s): Benjamin Zhang
Category: Health Sciences
Mentor(s): Ashton Owen (College of Education), Lili Klein (College of Education)

Title: Examing Effects of Recency of Concussion impacts Baseline Test Performance in Collegiate Athletes

Purpose: The purpose of this study was to evaluate whether time since most recent concussion influences Sport Concussion Assessment Tool 6 SCAT6 performance in collegiate athletes with a history of concussion. Methods: A cross-sectional study of Division I collegiate athletes was conducted prior to the start of the 2026 academic year. Participants completed the SCAT6 as a part of their pre-season

concussion assessment requirement. Date of most recent concussion was self-reported via the SCAT6 and dichotomized using a two-year cutoff (≤2 years vs. >2 years post-injury). A binomial logistic regression (LR) analysis was conducted to examine whether SCAT6 cognitive and symptom measures predicted concussion recency. Results: 46 athletes ((≤2 years, N=14 . >2 years N=32 were included in the study. The model demonstrated modest fit (McFadden's R^2=0.17; AIC=61.11). None of the predictors significantly contributed to the model, including concentration (B=0.34, SE=0.52, p=.510), orientation (B=1.02, SE=0.76, p=.179), immediate memory (B=0.40, SE=0.43, p=.348), delayed recall (B=−0.40, SE = 0.43, p = .348), total symptoms (B=0.13, SE=0.34, p=.691), symptom severity (B=−0.14, SE=0.19, p=.454), and SCAT-6 total score (B=−0.41, SE=0.31, p=.191). Discussion: SCAT6 cognitive and symptom measures did not significantly predict concussion recency in collegiate athletes with concussion history. These findings suggest that concussion recency from a prior season may not significantly impact an athlete's performance on subsequent baseline assessments. Therefore, clinicians may not need to adjust their interpretation of an athlete's baseline based on a concussion from a prior season. Future studies should examine the effects of multiple prior concussions on baseline performance.

HARD CONTACT LENS COMPOSITION AND COMFORT: A SEM-BASED MATERIAL COMPARISON
Presenter(s): Gillian Dobb
Category: Health Sciences
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Hard contact lenses are vital not only for patients' vision but also for their overall comfort. Understanding compositional variations between different areas of the lens may help identify which materials better support eye comfort and long-term wearability. To explore this, images were captured of multiple hard lens sections with different anatomies using Scanning Electron Microscopy (SEM). After the use of SEM and SEM X-ray technology, compositional features and makeup were compared with existing literature. Observations pointed towards past literature, which highlighted material properties that could influence lens comfort, durability, and physiological compatibility in patients.

SELF-CARE AND ITS EFFECTS ON STRESS AND SLEEP AMONG TRADITIONAL NURSING STUDENTS
Presenter(s): Sephora Miller
Category: Health Sciences
Mentor(s): ChengChing Liu (College of Nursing)

Background: Nursing students experience higher stress than peers in other health disciplines, increasing their risk of burnout and mental health issues. Integrating self-care into nursing education may help mitigate these risks. This study examined the impact of self-care practices on stress and sleep among traditional nursing students. Methods: A 12-week cross-sectional study was conducted with students enrolled in a Health Promotion course. Interventions included a student-developed self-care calendar, self-care practice, and an integrative retreat. Data were collected in Weeks 3 and 14 using the Insomnia Severity Index, Brief Mindful Self-Care Scale, and Brief Resilient Coping Scale. Paired t-tests and regression analyses were performed using SPSS v28. Results: Among 45 students (Mage = 20.54 ± 2.55;

76% female), stress levels increased significantly over the semester (p = .019), while sleep duration declined slightly. Although insomnia severity and resilient coping improved nonsignificantly, overall mindful self-care scores rose (p = .092), with significant gains in Physical Care (p = .012) and Mindful Relaxation (p = .007), and a decrease in Self-Compassion (p = .042). Regression analysis showed that Physical Care was significantly associated with lower stress levels (p = .041). Conclusion: Findings highlight the potential of structured self-care to improve nursing students' stress. However, the overall increase in stress suggests that current self-care interventions may not be sufficient on their own. Future efforts should focus on enhancing the effectiveness and consistency of self-care strategies to better support stress management in nursing education.

BRILLOUIN BASED QUANTATIVE IMAGING OF OVARIAN TISSUE MECHANICS
Presenter(s): Mankirat Singh
Category: Health Sciences
Mentor(s): Ping Wang (College of Human Medicine)

Mechanics are important when it comes to any tissue but specifically Ovarian tissue. Ovarian function is dependent on mechanical properties. Structurally ECM provides the ovary with a dynamic microenvironment. As they age, ovarian follicles follow a very ordered stage, from primordial to primary to secondary to tertiary and preovulatory. It is important to characterize this heterogeneity using a quantative method. Brillouin microscopy is a non-contact, non-invasive imaging technique that utlizes light to evaluate tissue rigidity. This can give insight to mechanical properties. This can also be clinically important given the prevalence of Polycystic Ovarian Syndrome. As a prelimary study, an ovariectomy is performed and imaged to get basic understanding of ovarian mechanics.

PARTICIPANT TRACKING: NATURE-BASED MEDITATION FOR GRIEF MANAGEMENT
Presenter(s): Christina Gao
Category: Health Sciences
Mentor(s): Rebecca Lehto (College of Nursing)

Bereaved caregivers of individuals with cancer often face prolonged emotional distress and have limited access to supportive interventions. While nature exposure and meditation have independently shown benefits for emotional well-being, their combined effect remains unexamined in bereaved caregivers. The NCI funded mixed methods pilot study aims to evaluate the feasibility and acceptability of a newly developed nature-meditation program while rigorously tracking participants' engagement and study progression. The purpose is the describe the tracking system that is designed to monitor milestone completion, retention, attrition and study completion across this 12-week study, with 6 weeks of meditation and 3 data collection points. This mixed-methods pilot study will enroll 70 participants. The Excel tracker generates real-time graphical summaries of enrollment and study progression relative to demographic targets, including race/ethnicity, age, educational attainment, area of residence, income, employment status, caregiver relationship type, and future intervention recipients. The tracker indicates that 64 caregivers enrolled; however, a subset has been deemed ineligible, some have not yet initiated

the intervention, and others have required extended time frames. Demographic data are available for n=35 (89% female; 93% White). Preliminary demographic patterns indicate that current recruitment has primarily engaged caregivers who are older, retired, and highly educated, suggesting potential under representation of working-age, male, and racially diverse caregivers. The study will continue to monitor recruitment and assess feasibility and adaptability of the nature-meditation intervention for bereaved caregivers. This approach demonstrates a practical framework that can be adapted to other nursing-led supportive-care projects that require structured follow-up and consistent operational documentation.

History, Political Science, & Economics

POLICY IMPACT OF DEMOGRAPHIC DIVERSITY IN UNITED STATES LEGISLATURES
Presenter(s): Lowell Monis
Category: History, Political Science, and Economics
Mentor(s): Matthew Grossmann (College of Social Science)

This analysis investigates the multifaceted dimensions of diversity-including racial, ethnic, and gender factors-within the U.S. Congress and state legislatures to determine if American representative democracy is truly representative. Utilizing datasets from the Klarner Chamber-Level State Legislator Racial Data (1971-2021) and the Center for American Women and Politics (2000-2023), the study employs R-based linear modeling to trace the interplay between identity, legislative productivity, and tenure. Key findings indicate that legislative productivity is positively correlated with gender diversity; specifically, an increase in female legislators is linked to a higher volume of enacted legislation. Furthermore, the study finds that Congress follows rather than leads state legislatures in minority representation patterns. Analysis of tenures suggests that minority inclusion correlates with longer legislative tenures, though benefits diminish in highly populous states with larger seat counts due to increased competition. While the project initially analyzed gender and race as distinct variables, it is expanding to address the intersectionality of identity. The research also integrates findings on partisan control, examining how Democratic majorities in state houses influence the translation of descriptive diversity into substantive economic outcomes, such as reductions in the gender wage gap. Future work will analyze intersectionality and the leadership gap regarding committee chairs in these legislatures.

VISUALIZING POLITICAL DIVISION FROM 1789 TO TODAY
Presenter(s): Robert Chambers
Category: History, Political Science, and Economics
Mentor(s): John Waller (College of Social Science)

In 2022, Pew Research found that Americans' perceptions of those on the other side of the political spectrum were at an all time low with more than half of both parties describing the other as closed-minded, dishonest, and immoral. I use congressional roll call data from the House of Representatives and Senate to visualize and quantify the growth and change of political division within the legislature from

1789 to today. Using primary component analysis (PCA), clustering approaches, and dimensionality-reduction techniques, I produce a variety of visuals to help understand the history of partisan division along with a variety of quantitative measures that show how 'divided' each session was. Through this combination of visuals and metrics, I show that division within congress has increased dramatically from early sessions. I also show that party discipline has increased, manifesting as distinct clusters that can be identified through unsupervised learning methods along with reduced variance in voting habits within parties. Finally, I examine votes that saw particularly strong or weak party discipline to find topics where bipartisanship has broken down or is still possible.

UNPACKING MODERN KOREAN HISTORY TEXTBOOKS: THEIR ORIGINS, STRUCTURE, AND DEVELOPMENT
Presenter(s): Kara Hwang
Category: History, Political Science, and Economics
Mentor(s): Ethan Segal (College of Social Science)

Compulsory education in Korea follows a nationalized curriculum that governs the kind of education students receive in their classrooms. Although individual teachers may deliver the material differently based on their style and understanding, the overall curriculum and approved remain uniform. This nationalized education system is a product of a long historical legacy, dating all the way back to, and contingent on, the creation of what is now understood as "modern" Korea. When did Korea become "modern"? Conventional wisdom suggests that modernity was brought in during the years of Japanese colonial occupation (1910 to 1945). The Japanese Government-General in Korea made education a national project and, through four Choson Education Ordinances, formed the basis of Korea's centralized and bureaucratic system of education. During the transition period (1945 to 1948), when the state was under trusteeship of the US Army Military Government in Korea (USAMGIK), the system was codified into the constitution in preparation for the creation of the Republic of Korea. Throughout these processes, a variety of individuals, including American missionary and army officers, Koreans who received their education in the United States, Korea, or Japan, historians and politicians, and others with contrasting perspectives, pushed forward their agendas. At the center of many of their disagreements, one of the most contentious subjects was guksa, translated as "Korean" or "national/state" history. This project traces the various figures who argued over guksa and calls for a reassessment of the role it has played as a concept in modern Korean education.

RESTORING HISTORIES: DIGITIZATION OF 19TH CENTURY NEW YORK ENSLAVEMENT RECORDS
Presenter(s): Mason Hambley
Category: History, Political Science, and Economics
Mentor(s): Kristina Poznan (College of Social Science)

Only a small fraction of people subjugated by the transatlantic slave trade and the slave system of North America have been cataloged into searchable databases. Yet, scattered across hundreds of archives and libraries, are many obscure records of the names and other details related to this appalling episode of US

history. The failure to bring these records to light hinders the ability of historians and family members to track familial histories before the end of the Civil War in 1865. It also perpetuates the depersonalization at the heart of enslavement. In an effort to remedy this situation, Enslaved.org has created a linked open data site in which millions of named individuals have been linked across events, places, and times. This research project focused on remediating and enhancing a typeset dataset from the mid-20th century containing records of manumission for enslaved individuals who lived in New York during the 18th century. These will be entered into Enslaved.org's larger database. This information is contained in two record collections held by the Manumission Society of New York City and the Office of the Register in New York City. We undertook a lengthy process of transcription into a machine-readable spreadsheet involving the use of LLM's. LLM output was then crosschecked with the original source. Post-transcription enhancement involved linking enslaved individuals to their family members and enslavers via unique identifiers in order to properly model relationships in the larger dataset. Lastly, we recorded place, source, and event, adding additional information for future analyses.

SURVIVING SENATE SCRUTINY: CONFIRMATION POLITICS FOR HIGH-LEVEL NOMINEES
Presenter(s): Tina Chiou
Category: History, Political Science, and Economics
Mentor(s): Ian Ostrander (College of Social Science), Iliya Liampert (College of Social Science)

This project examines diversity in high-level presidential appointments and the Senate's role in confirming those nominees from 1981 through 2026. While substantial scholarship evaluates descriptive representation in Congress and the judiciary, comparatively less attention has been paid to executive branch appointments, despite their central role in shaping policy implementation within the modern administrative state. Because "personnel is policy," understanding who is nominated and who is successfully confirmed has significant implications for democratic representation and institutional legitimacy. We construct an original dataset that records individual senator roll call votes on high-level executive nominations to bureaucratic and independent agency positions from the H.W. Bush administration through the Biden administration, enabling analysis of partisan support, opposition, and patterns of delay. We evaluate patterns in senators' votes on confirming executive nominees. By centering the ethical and practical dimensions of representation, this project contributes to broader debates about diversity, democratic accountability, and executive power. The findings will inform scholarly work on identity in political institutions and provide new empirical evidence on who gets to govern in the contemporary United States.

THE EVICTION CRISIS OF MICHIGAN HOUSING
Presenter(s): Emma Pinson
Category: History, Political Science, and Economics
Mentor(s): Heather McCauley (College of Social Science)

Addressing the eviction crisis is essential because housing stability is the foundation for an individual's well-being, health, and long-term economic security. Failure to address this issue allows cycles of

displacement, inequality, and homelessness to persist across generations and permanently impair the quality of life for entire communities. Eviction completely alters a family's stability and sense of safety, disrupting education and employment, creating inaccess to healthcare and social service programs, and has deep cultural impacts by reinforcing racial and economic inequalities created by decades of historical discriminatory housing practices. Comprehensive eviction diversion programs offer a proven, humane, and cost-effective solution by prioritizing prevention through legal representation, financial assistance, case management, tenant education, and landlord engagement. These extensive programs ensure that housing crises are resolved before tenants are evicted and experience homelessness. These coordinated approaches benefit not only tenants, but also landlords, courts, and local governments by reducing conflict, minimizing vacancy and legal costs, and promoting stronger, more stable communities. Quick yet appropriate action is critical, as each delayed policy decision results in another household facing instability. Policymakers, courts, and community leaders must act now to expand and strengthen eviction prevention systems, and in doing so, protect vulnerable residents, promote community equality, and ensure lasting housing stability for communities across Michigan and nationwide.

RUSSIA-WEST CONFRONTATION IN THE POST-COLD WAR
Presenter(s): Benjamin Stewart
Category: History, Political Science, and Economics
Mentor(s): Kirstin Hasler Brathwaite (James Madision College)

On December 26, 1991, the 45-year period of intense geopolitical relations between the world's two superpowers had come to an end. The Soviet Union dissolved, signaling the defeat of global communism while the United States emerged as the unipolar hegemon and claimed victory for global democracy. Scholars and the public alike foresaw a euphoric geopolitical landscape that would be shaped by respect between the former rivals who would cooperate on security matters in post-Cold War Europe. However, disagreements over the post-Cold War status quo created a rift in Russia-West relations and continues to plague the relationship today. This project will apply a case study analysis, using four case studies to explain why Russia-West relations deteriorated after the end of the Cold War. These case studies will demonstrate that Western encroachments on Russia's interests were at the expense of Moscow's ontological security, which is shaped by its perceptions of itself as a great-power and a multi-civilizational state. This view will challenge the realist theory in international relations, which frames the discord in relations by increases and decreases in material security, altering the balance of power. The case studies this project examines are the Kosovo War (1999), the Ukrainian Orange Revolution (2004), the Bucharest Summit (2008), and Russia's annexation of Crimea (2014).

EAST LANSING STUDENT HOUSING DISCUSSION
Presenter(s): Divya Thirukumaran
Category: History, Political Science, and Economics
Mentor(s): Noah Durst (College of Agriculture & Natural Resources)

This research examines newspaper articles on student housing in East Lansing from 1950 to 2020. Student housing has consistently been a major point of debate, influenced by fluctuations in Michigan State University enrollment, campus housing policies, and decisions by the East Lansing City Council. Preliminary findings indicate that in the late 20th century, much of the discussion focused on rising student enrollment combined with stagnant campus housing, which led to an overflow into the local housing market. This resulted in the conversion of single-family homes into rooming houses, prompting complaints from long-term residents about noise and differing lifestyles. In response, the City Council implemented restrictions on the number of students allowed per household, parking regulations, and zoning changes to manage the impact of student housing. In contrast, during the 1950s, the primary concern centered on the shortage of housing for married students.

HEDGES: PERMEABLE OR IMPERVIOUS?
Presenter(s): Eli Piper
Category: History, Political Science, and Economics
Mentor(s): Emily Tabuteau (College of Social Science)

I have focused my research on the relations of peasant neighbors in 14th-century Tottenham, England. It covers the Tottenham Manorial Rolls from 1318-1399 CE, and focuses on the type of interactions and relations between the peasants of the village. It is roughly 2700 words and includes many direct examples from the records translated from Latin into English. The paper is argumentatively informative and is formally written. I stuck to my own interpretation of the two volumes of these court rolls which are primary sources. I consulted with and utilized feedback from my professor and academic advisor Dr. Emily Tabuteau. I plan on presenting orally with a poster as a visual, in person or online is fine with me.

GOING BANANAS? A DIVE INTO THE EFFECTS OF TARIFFS ON BANANA IMPORTS
Presenter(s): Gavin Boom
Category: History, Political Science, and Economics
Mentor(s): David Ortega (College of Agriculture & Natural Resources)

With recent executive decisions regarding international trade, public discourse around the United States trade policies has increasingly focused on tariffs, price fluctuations, and their effects on retail and wholesale markets. In particular, debates have emerged over the impact of the Liberation Day tariffs on primarily imported products like bananas. While many argue that tariffs directly drive wholesale and retail price increases, some elected officials have argued that the costs will primarily be absorbed by exporters. This study examines the relationship between the Liberation Day tariffs placed on bananas and the subsequent price changes, with attention given primarily to retail markets. Using a regression-

based quantitative approach, this research analyzes weekly price data (pre- and post-tariff liberation day tariffs) along with distinguishing between conventional and organic bananas. Regression analysis suggests that following the tariff, retail conventional banana prices increased by 7 cents (with a p-value < 0.001). Furthermore, organic bananas were on average 32 cents more expensive than regular bananas(p-value <0.001). However, the premium on organic bananas decreased by 4 cents upon the implementation of the tariffs(p-value <0.106). This is consistent with a change in relative demand as consumers shifted to the cheaper conventional product as prices rose. These results highlight how tariffs interact with market factors and how they can immediately impact consumer prices. By integrating economic data with contextual market factors, this research provides insight into how trade policies affect food prices

STATE STRUCTURE, ECONOMIC MANAGEMENT, AND AUTHORITARIAN-LED DEMOCRATIZATION: COMPARING MEXICO'S PRI AND SOUTH KOREA
Presenter(s): Ben Gunther
Category: History, Political Science, and Economics
Mentor(s): Myunghee Lee (James Madision College)

How does state structure shape whether dominant authoritarian parties pursue proactive or reactive democratic concessions? I argue that the structure of the state apparatus determines whether strong authoritarian parties engage in proactive or reactive concessions. Under a patrimonial state, strong parties struggle to manage the economy effectively, weakening both their stability and victory confidence and leading them to make reactive democratic reforms. By contrast, Weberian states allow for more effective economic management, strengthening party elite confidence that enables proactive democratization. I test this theory through a small-N comparative study of South Korea's democratic opening in the late 1980s and Mexico's democratization under the PRI, tracing how state structure and economic management condition parties' assessments of the risks of democratic reform. This study contributes to the literature on authoritarian-led democratization and dominant-party regimes by linking party strength to bureaucratic structure and by specifying when such strength can allow for proactive democratization.

A WAR OF WORDS: AN ANALYSIS OF PRESIDENTIAL RHETORIC, THE WAR IN AFGHANISTAN, AND PUBLIC OPINION
Presenter(s): Joyce Peterlin
Category: History, Political Science, and Economics
Mentor(s): Daniel Bergan (College of Communication Arts Sciences)

Among academics, there is an understanding that the United States presidency exists in two dimensions: domestic and foreign policy decision-making. A president faces challenges in both capacities, but the modern presidency has encountered far less on the foreign front and executive power within that dimension has only grown. This makes foreign policy the most powerful weapon in the president's rhetorical arsenal. The primary question is whether or not the president can influence public support for

foreign military action with public remarks. For the sake of this paper, I examine the War in Afghanistan across the different presidential administrations. Throughout this study, I do a close reading analysis of major speeches regarding the deployment of troops to Afghanistan, the sustainment of deployed troops, and the withdrawal from the war. From there, I cross reference the speeches with public opinion polling regarding the War in Afghanistan before and after the remarks were made to ascertain the influence they did or did not have. This study draws from both the quantitative differentials of the polling data available, but also the contents of the speeches to inspect the communication strategy employed by the White House and how it aligns with the American national identity.

IMPORTING CUSTOMARY INTERNATIONAL ENVIRONMENTAL LAW THROUGH DOMESTIC INSTITUTIONS: THE PRECAUTIONARY PRINCIPLE IN INDIA
Presenter(s): Kate Kling
Category: History, Political Science, and Economics
Mentor(s): Mark Axelrod (James Madision College)

This paper examines how the Precautionary Principle has been incorporated into Indian environmental law and policy through Customary International Law (CIL). Originally developed to regulate interactions between states, CIL functions as an alternative mechanism for committing governments to international environmental principles when treaty consensus is unattainable. Because CIL does not require executive or legislative consent, it allows courts to bypass unwilling political actors and mandate environmental protections, after which states may internalize these norms through domestic legal channels. The Precautionary Principle holds that scientific uncertainty cannot justify delaying environmental regulation, obligating the state to anticipate, prevent, and address environmental harm, while requiring industrial actors to demonstrate that proposed activities are ecologically benign. India's Supreme Court recognized the principle as binding through CIL in the landmark Vellore Citizens Welfare Forum v. Union of India (1996), interpreting its articulation in the 1987 United Nations Brundtland Report as evidence of customary status. Through an analysis of all 70 subsequent Indian Supreme Court cases that reference the Precautionary Principle, as well as its codification in the National Green Tribunal Act (2010), this research traces the principle's evolution from a CIL-based justification to a domestically entrenched constitutional norm within India's broader environmental law system. The findings show that while early judicial decisions relied heavily on CIL to justify precautionary measures, later cases predominantly cite Vellore or statutory mandates under the NGT Act. This trajectory illustrates how CIL can catalyze domestic legal development and gradually embed itself in locally generated legislation.

PREDICTING MLB ARBITRATION SALARIES THROUGH MULTIPLE REGRESSION
Presenter(s): Tyler Webb
Category: History, Political Science, and Economics
Mentor(s): Hanzhe Zhang (College of Social Science)

What's an arbitration eligible player actually worth? Can a statistical model tell us before a hearing does? This presentation builds a multiple regression model to predict MLB arbitration-eligible salaries, drawing

on performance data including previous WAR, previous salary, and YOS. Using historical arbitration cases as training data, the model identifies which variables most strongly drive salary and uses them to calculate a predicted salary range that the players agent should fight for in court.

SPARTAN COEDS: THE EXPERIENCES OF WOMEN STUDENTS AT MSU IN THE 1970S
Presenter(s): Delaney Cram
Category: History, Political Science, and Economics
Mentor(s): Lisa Fine (College of Social Science)

In the early 1970s, traditionalist gender roles and expectations and the building women's liberation movement collided for women students, staff, and faculty at Michigan State University. Though the societal narrative continued to assert that women had "made it" in the university, many women at MSU continued to experience misogynistic degradation, unwanted sexualization and sexual harassment, and unequal academic, extracurricular, and professional opportunities compared to their male counterparts. This led to the formation of some feminist organizations and events during the 1970s at MSU to demand equal opportunities for women, particularly in the university. One of the things that came out of this movement was the formation of women's studies courses, and eventually a women's studies program, at MSU. The advent of women's studies courses was met with both skepticism and elation from MSU students and faculty alike. While the development of a women's studies program here at Michigan State was the culmination of a multitude of factors and influenced by faculty, administration, community activists, and the example of other universities across the country, the experiences, perspectives, and activism among MSU students during this time may have had an impact on the program that should not be ignored.

THE DISPLACEMENT OF CHILDREN IN INDONESIA: THE ROLE OF THE 1965 POLITICIDE, STATE, AND INTERNATIONAL INTERVENTION.
Presenter(s): Grace Fitzgerald
Category: History, Political Science, and Economics
Mentor(s): Siddharth Chandra (International Studies & Programs)

Displacement of accused Parai Komunis Indonesia (PKI) members' children during the 1965 Politicide in Indonesia is often overlooked (Wardaya, 2021). Throughout the 1965 Politicide, accused PKI members were frequently killed or jailed by the military, leaving their children orphaned, forcing them to live with extended family, strangers, or to be completely abandoned (Sukanta, Lindsay, 2020). As a result of the events in 1965, the Indonesian government established its first documented foster care system. The political and economic aspects of the state of Indonesia during the mid-late twentieth century will be analyzed through three documents in this report. The 1971 Report on the Implementation of the Foster Care Survey on Children who have Lost Both Parents and Were Victims of the GS30S / PKI in the Should Blitar Area, and the Prospective Families in the Bagor District, Ngandjuk Regency, and in Blitar City; the 1990 United Nations (UN) Convention on the Rights of the Child; and the Republic of Indonesia Law No. 23 of 2002. Through a comparative analysis of the above-mentioned documents, this report aims to

discover the motivations of the Indonesian government to implement the foster care system in 1971, and the influence the 1990 UN Convention had on the system. The analysis provides a new perspective on corruption and negative influences on the social welfare system for children who lost both parents during or as a result of the 1965 Politicide in Indonesia, and the importance of international and domestic law in protecting children.

VARIATION IN PHYSICIAN ASSISTANT SCOPE-OF-PRACTICE LAWS: WORKFORCE AND POLITICAL CORRELATES ACROSS U.S. STATES
Presenter(s): Maia Keena
Category: History, Political Science, and Economics
Mentor(s): Matthew Grossmann (College of Social Science)

Scope-of-practice (SOP) laws determine the level of autonomy granted to physician assistants (PAs) in delivering healthcare services and vary widely across U.S. states. Over the past several decades, many states have expanded PA authority, reducing physician supervision requirements. This study examines factors associated with variation and change in PA SOP laws across states between 1998 and 2020. State-level SOP classifications were analyzed alongside state measures of PA workforce supply, physician supply, health spending, political dynamics, interest group activity, and public opinion. Cross-sectional and change analyses were used to explore which variables were associated with more permissive SOP regulatory frameworks. Results show a national trend toward liberalization, with many states moving from restrictive to more permissive SOP regimes and no states becoming more restrictive during the study period. In earlier years, higher levels of organized health interest group activity were associated with more restrictive SOP laws. Over time, this relationship weakened as liberalization spread across states. Workforce factors were more consistently associated with policy variation, as states with larger PA workforces and greater physician supply were more likely to adopt permissive SOP frameworks. Findings suggest that workforce composition, political dynamics, and broader national trends toward healthcare workforce flexibility are correlated with variation in PA SOP laws.

THE LOGISTICS OF GENOCIDE: A SUPPLY CHAIN APPROACH
Presenter(s): Anthony Zaleski
Category: History, Political Science, and Economics
Mentor(s): Siddharth Chandra (International Studies & Programs)

This presentation will attempt to illustrate the history of genocidal "supply chains", and evaluate how disrupting these supply chains can be an effective form of midstream mass atrocity prevention. This presentation will evaluate three cases: The Holocaust of World War II, the mass murder of Bengalis during the war of Bangladeshi Independence in 1971, and the purge of the Partai Komunis Indonesia (PKI) in Indonesia in 1965-1966. These mass atrocities all possessed a significant logistical element. The Holocaust relied heavily on rail transportation, the Indonesian atrocity relied on critical road infrastructure, and the Bangladeshi genocide required significant intermodal transportation, with elements of sea, air, road and rail transportation. This presentation will analyze the methods with which

resistance groups, with varying degrees of success, worked to disrupt the logistics networks of the genocidal regimes, and will use the lessons learned in the analysis to recommend methods for resistance groups to disrupt supply chains in potential future atrocities.

FROM VALLEY TO VOID IN THE FRONTIERS OF THE WORLD'S LARGEST DEMOCRACY: HOW BALLOTS, BULLETS, AND BACKSLIDING IMPACT POLITICAL CONTENTION IN NORTHEAST INDIA
Presenter(s): Lowell Monis
Category: History, Political Science, and Economics
Mentor(s): Andrew Halterman (College of Social Science)

India's standing as the world's largest democracy has come under sustained scrutiny following the Bharatiya Janata Party's consolidation of power since 2014. While national-level democratic erosion has been extensively documented, its subnational dimensions remain underexplored, particularly the role that organized political violence plays in accelerating or reflecting that erosion. This project extends prior exploratory analyses of the Manipur ethnic conflict, which commenced in May 2023 and culminated in the imposition of presidential rule in February 2025, to develop a broader empirical and theoretical framework linking insurgent violence to democratic backsliding across Indian states. Drawing on event-level data from the Armed Conflict Location and Event Data Project and subnational electoral democracy scores from the Index of Subnational Electoral Democracy (ISED), this study employs a combination of spatial analysis, statistical modeling, and OLS regression to examine the relationship between the character of political contention, violent versus nonviolent, and the health of subnational democratic institutions. Preliminary findings suggest that violent contention systematically predicts lower subnational democracy scores, while nonviolent mobilization correlates with democratic resilience. Critically, Manipur ranked first among all Indian states on the ISED before the conflict, a paradox this paper resolves by demonstrating that ISED's Vanhanen-derived methodology mistakes inter-ethnic electoral rivalry for democratic vitality, masking the coercive fragility that collapsed in 2023. The project contributes to comparative work on democratic backsliding in large federal democracies by treating insurgencies not merely as governance failures, but as diagnostic windows into the depth of authoritarian consolidation at the subnational level. Further analysis is ongoing.

RELATIONSHIP BETWEEN CAREGIVER COPING STRATEGIES AND PRESCHOOLER HAIR CORTISOL LEVELS IN LOW-INCOME FAMILIES
Presenter(s): Abdiel Soto Figueroa, Erin Connelly
Category: Human Development and Relationships
Mentor(s): Jiying Ling (College of Nursing)

Chronic stress during early childhood can have lasting effects on health and development, with hair cortisol serving as a biomarker of long-term stress exposure. However, limited research has examined the relationship between caregiver coping strategies and preschooler hair cortisol levels in low-income families. To fill this literature gap, this study examined the associations between caregiver coping strategies and preschooler hair cortisol among 104 caregivers (Mage=31.61) and 113 Head Start preschoolers (Mage=47.35 months). Caregivers completed the 28-item Brief COPE survey via Qualtrics to assess 14 coping strategies: active coping, planning, positive reframing, acceptance, humor, religion, emotional support, instrumental support, self-distraction, denial, venting, substance use, behavioral disengagement, and self-blame. The caregiver sample included 23.1% non-White and 92.3% female; 35.6% had an annual income below $20,000; and 42.3% reported a high school diploma as their highest level of education. The most frequently reported coping strategies among caregivers were acceptance (M=5.8364), active coping (M=5.7273), planning (M=5.7182), positive reframing (M=5.37270), and self-distraction (M=4.8364). Religious coping was positively correlated with preschoolers' hair cortisol (r=0.20, p=.038). Active coping (r=0.12, p=.204) and planning (r=0.10, p=.287) revealed small, non-significant, positive associations; while self-distraction (r=-0.11, p=.257) and humor (r=-0.10, p=.296) showed small negative associations. These results suggest that specific caregiver coping strategies may be modestly associated with preschoolers' physiological stress in low-income families. Further longitudinal research is needed to investigate the potential causal relationships between caregiver coping and preschooler chronic stress to inform interventions supporting caregiver coping and early childhood well-being.

UTILIZATION OF GENERATIVE AI FOR SOCIAL AND EMOTIONAL PURPOSES AMONG COLLEGE STUDENTS
Presenter(s): Adeline Loftis, Delaney Garrett, Nyla Fenner
Category: Human Development and Relationships
Mentor(s): Yijie Wang (College of Social Science)

Background: Generative artificial intelligence (AI) is increasingly used beyond academic and creative tasks, with evidence suggesting that individuals may also rely on these technologies for social and emotional support. However, the extent to which people use AI for social and emotional support, such as companionship and mental health advice, has yet to be fully explored. Methods: For this study we created a survey that was distributed to 136 college-aged students across various majors. The survey collected information on demographics, types of AI used in day-to-day life, purposes for using AI, reasons

for using, and comparison to other forms of support. Participants also responded to various mental health and mood questionnaires. Results: Of 136 participants, 28% of respondents reported using generative AI for various social and emotional reasons. Of the 28%, 97% of participants report using AI 1-2 times or more per month, 68% use AI because it is available at any time, and 42% use AI because they worry about being judged. Out of the 136 respondents, individuals ages 20-22 use AI the most frequently for social and emotional purposes, with 37% of people aged 21 reporting using AI for these reasons. Discussion: This study aims to contribute to the exploration of artificial intelligence and examine the various areas, specifically social and emotional well-being, AI could be utilized in. Individuals use generative AI because of its accessibility and neutrality. Further research should investigate how individuals interact with AI for social and emotional purposes in comparison to other forms of support.

DIFFERENCES IN RATINGS OF PRESCHOOLERS' SOCIAL SKILLS AND PROBLEM BEHAVIORS BETWEEN CAREGIVERS AND TEACHERS

Presenter(s): Kyler LaFond, Sam Leahy
Category: Human Development and Relationships
Mentor(s): Jiying Ling (College of Nursing)

Problem behaviors including inattention and hyperactivity, along with challenges in social functioning, can negatively affect preschoolers' learning and development. Although it is commonly believed that preschoolers behave differently across settings, limited empirical evidence quantifies the extent of these differences between home and school environments. The purpose of this study was to examine how caregiver and teacher ratings of preschoolers' social skills and problem behaviors differed across home and classroom settings. This was a secondary data analysis using baseline data collected in a cluster RCT among 299 preschoolers. Caregivers and teachers independently completed the Preschool and Kindergarten Behavior Scales (PKBS-2) assessing preschoolers' social skills and problem behaviors. According to the scoring instructions, preschoolers were categorized as high risk, moderate risk, or no risk. For social skills, 5.7% of caregivers rated preschoolers as "high risk" compared to 14% of teachers ($p<.001$). Across all social skills subdomains, teachers consistently identified a higher proportion of children as "high risk" than caregivers. For problem behaviors, 7.4% of caregivers and 8% of teachers rated children as "high risk," but the differences were not significant ($p=.054$). However, significant differences in ratings ($p<.05$) were observed across several subdomains, including self-centeredness, attention problems, aggressiveness, social withdrawal, and anxiety. Findings suggest that preschoolers' behaviors and social functioning differ across home and school contexts, as reflected in caregiver and teacher ratings. Further research is needed to identify factors in contributing to these discrepancies and to inform targeted interventions that support optimal child development across settings.

RELATIONSHIP BETWEEN PRESCHOOLER-CAREGIVER DYADS' ACTIGRAPH WEAR TIME AND PRESCHOOLERS' SOCIO-BEHAVIORAL FUNCTIONING
Presenter(s): Clare Daniels
Category: Human Development and Relationships
Mentor(s): Jiye Chang (George Mason University Korea), Jiying Ling (College of Nursing)

Significance and Purpose :The purpose of this study was to examine the relationship between preschooler-caregiver dyads' ActiGraph wear time and preschoolers' socio-behavioral functioning. Methods: Data were collected from 155 preschoolers and 141 caregivers. Preschoolers' socio-behavioral functioning was assessed using the Preschool and Kindergarten Behavior Scales-Second Edition (PKBS-2), completed by classroom teachers. In addition, ActiGraph accelerometers were distributed in person to both caregivers and preschoolers to wear over a 7-day period. Results: Of the preschoolers, 51.6% were male and 48.4% were female. In terms of race and ethnicity, 71.0% were White, 9.7% Black, 1.3% Asian, 16.1% multiracial, 0.6% identified as Mexicana, and 1.2% did not report their race. Caregiver ActiGraph wear time was positively and significantly correlated with preschooler wear time ($r = .45$, $p < .001$). Lower preschooler wear time was associated with higher levels of teacher-rated problem behaviors overall ($r = -.24$, $p = .004$), including internalizing behaviors ($r = -.28$, $p < .001$) and externalizing behaviors ($r = -.17$, $p = .040$). Discussion and Conclusions: This study provides insight into factors related to accelerometer compliance among preschoolers and their caregivers. Findings indicate that children with greater behavioral challenges may be less likely to comply with wearing accelerometers, implying that future studies should consider strategies to support behavioral challenges to improve compliance with wearable device protocols among young children.

MINDFULNESS INTERVENTION TO SUPPORT WELL-BEING OF PARENTS OF CHILDREN WITH DEVELOPMENTAL DISABILITIES
Presenter(s): Alekya Vudathu, Sriya Deva
Category: Human Development and Relationships
Mentor(s): Chandani Bhandari (College of Social Science), Sarah Douglas (College of Social Science)

Parents of children with developmental disabilities (DD) face more significant challenges and responsibilities in caring for their children compared to parents of typically developing children. The specialized and long-term nature of caregiving frequently leads to chronic stress, depression, and other adverse mental health outcomes among parents of children with DD. Henceforth, there is a strong need for accessible, brief, and cost-effective interventions tailored to support parents' well-being. This pilot study investigated the feasibility and preliminary outcomes of a two-week online Mindfulness-Based Stress Reduction (MBSR) program designed for parents of children with DD. A mixed-methods feasibility intervention design was used, integrating quantitative pre- and post-intervention assessments using the Parental Stress Scale and the Mindful Attention Awareness Scale, along with qualitative interviews and daily reflection surveys. The intervention included daily 10-minute guided practices, a mindful body scan practice during Week 1, and mindful breathing during Week 2. A total of 18 participants completed the program, and only 1 parent dropped out of the intervention study, indicating strong feasibility. Quantitative findings demonstrated a medium effect size reduction in parenting stress (Cohen's d = 0.64)

and a large effect size increase in mindful awareness (Cohen's d = 1.10). Qualitative feedback highlighted high levels of satisfaction and practical integration of mindfulness strategies into daily caregiving routines. These findings supported that a short, accessible mindfulness program can address caregiving stress issues among parents and inform the development of scalable interventions.

Humanities

GENAI IN THE WRITING PROCESS
Presenter(s): Austin Hornfisher, Isabella Barrett, Scarlet Ericksen
Category: Humanities
Mentor(s): Michael Ristich (College of Arts & Letters)

Deciding when it is appropriate to use generative writing AI is an ongoing conversation. These conversations have been important for the humanities because AI brings up questions of authorship. Examining how generative writing AI can be used during the writing process will help humanities majors navigate and shape the acceptability of AI in the workforce. This project looks at the capabilities and limitations of generative writing AI in the brainstorming, drafting, and research stages of writing. Conclusions were drawn by utilizing generative writing AI in different writing formats and evaluating the outcomes. As a result, we hope to understand how generative writing AI can be used during the brainstorming, research, and drafting stages of writing.

REPRESENTATIONS OF DISABILITY IN FILM THROUGH THE LENS OF AUTEUR THEORY
Presenter(s): Abigail Bowers
Category: Humanities
Mentor(s): Tama Hamilton Wray (Residential College in Arts & Humanities)

Representations of disability in film are often influenced by the directors who are making the crucial decisions about how to convey certain tropes or messages. George Miller's movies tend to implicitly or explicitly represent disability through the characters and storylines, and I plan to analyze the content of these representations and make an argument about the messages they perpetuate regarding (dis)ability. I will analyze the representation of disability in George Miller's movies through the lens of auteur theory, which suggests that a director has the most creative influence over a film. Miller's films perpetuate tropes of able-bodied guilt through the representations of disability in Happy Feet, Lorenzo's Oil, and Mad Max: Fury Road.

FIGHTING DEFUNDING & CENSORSHIP OF CULTURAL INSTITUTIONS AS HUMANISTS
Presenter(s): Jasper Hirt, Julia Bolash
Category: Humanities
Mentor(s): Michael Ristich (College of Arts & Letters)

Cultural institutions like museums and libraries face government defunding and censorship, leading to devaluing by the public, barriers to accessing knowledge, and the erasure of history. To help solve the defunding and devaluing of cultural institutions in the United States, humanists can contribute by using their interdisciplinary, justice-focused approach to research to develop a comprehensive understanding of the current and historical circumstances impacting cultural institutions and their futures. Humanists are uniquely positioned to craft persuasive arguments in order to increase public awareness and combat government suppression of marginalized perspectives. By creating alternative resources to replace those affected and maintain support for the communities they serve, humanists have the skillset necessary to skirt the systemic pressures working against cultural institutions, bringing together local and national communities to empower public movements for change.

WRITING CENTER LITERARY JOURNAL
Presenter(s): Mia Wertheimer
Category: Humanities
Mentor(s): Grace Pregent (College of Arts & Letters)

In coordination with the MSU Writing Center, I will organize and introduce the first issue of a recurring creative literary journal to challenge the notion of Writing Centers as "academic" spaces. Historically, Writing Centers have had a legacy of being understood as fix-it shops for academia, which has caused reverberating harm to both infrastructure, writers, and their identities (Carino 1995). The MSU Writing Center actively challenges these notions and works to honor the needs of their writers and their whole and complex identities in and outside of academia. In my experience as a MSU student I have noticed the continuous perceptions of the Writing Center as solely a space for academic writing. With the frame of action oriented research, I hope to provide an outwardly perceivable representation of the Writing Center as more than what we have historically associated with it. Offering our writers and staff a chance to participate in creative pursuits as an extension of the Writing Center will not only more wholly honor the complex identities of our community, but work to actively acknowledge and press forward from the Writing Center's historical academic connotations. In practicality this would look like organizing a "call for submissions," a review panel, an editing and design team, as well as continuous consulting from Writing Center staff. Presenting at UURAF I plan to provide an overview of the history of Writing Centers as "academic" spaces, the process of organizing this journal, and potential methods of continuation and support for the future.

A PHILOSOPHICAL STUDY OF THE ZOOT SUIT IN CHICANO CULTURE
Presenter(s): Ashley Romo
Category: Humanities
Mentor(s): Daniel Smith Jr. (College of Arts & Letters), John Grey (College of Arts & Letters)

Fashion is often treated as an aesthetic choice or personal accessory, yet clothing can function as a powerful medium of social meaning. This paper argues that fashion participates in a form of social ontology: particular garments can operate as socially meaningful objects that express self-identity and structure in relationship between individuals and communities. Drawing on philosophical approaches to social ontology, I examine how clothing creates and attaches meaning to identity. As a case study, I analyze the Zoot Suit and its significance within Chicano communities in the United States during the 1940s in Los Angeles. The Zoot Suit functioned not merely as a style of dress but as a socially charged symbol associated with youth culture, resistance, and identity, particularly in the context of the Zoot Suit Riots. I further examine the play Zoot Suit to demonstrate how theater stages and reinforces the social meaning from clothing attaching meaning to identity, specifically a social identity through a metaphysical lens. Through performance and representation, the play demonstrates how garments can embody political and self-identity and collective memory. By connecting philosophical analysis with historical and theatrical examples, this paper shows how clothing can create and attach a social ontological lens that identity exists as a socially real category constituted by institutional practices, classifications, and cultural representations.

EXPERIENCE ARCHITECTURE (XA) AT MSU: PIONEERING INTERDISCIPLINARY INNOVATION IN HIGHER EDUCATION
Presenter(s): Alex Guo
Category: Humanities
Mentor(s): Casey McArdle (College of Arts & Letters), Michael Ristich (College of Arts & Letters)

Experience Architecture (XA) at Michigan State University is a groundbreaking interdisciplinary program that uniquely blends humanities, STEM, UI/UX design, and communication studies. As the first program of its kind nationwide, XA equips students with versatile skills through a rigorous curriculum integrating technical proficiency and rhetorical expertise, particularly through the Writing, Rhetoric, and Cultures (WRaC) department. This research poster highlights XA's distinctiveness compared to traditional majors, its emphasis on the arts and humanities role in shaping experience design, and how it prepares students for competitive careers. Additionally, XA offers a promising pathway to restore the standing of the humanities by demonstrating their essential role in technology-driven fields. Feedback collected from students over the 2025-2026 school year reveals the program's impact on their academic growth and career readiness, supporting XA's potential as a national model for other institutions.

ART AS MEDICINE: INTEGRATING VIRTUAL ART EXHIBITIONS INTO A REPLICABLE MODEL FOR CREATIVE THERAPY
Presenter(s): Abigail Brooks, Brayden Chrisman
Category: Humanities
Mentor(s): Natalie Phillips (College of Arts & Letters)

Art as Medicine is a Digital Humanities and Literary Cognition Lab project which adapts the Creativity in the Time of Covid-19 archive of over 2000 pandemic artworks into digitally-integrated models for creative therapy practice. Our goal is to determine whether digital tools can help minimize the well-documented financial barriers and time constraints that typically restrict regular participation in creative therapy for medical professionals. We accomplish this by developing a virtual exhibition of artworks that both represent the unique struggles that healthcare workers face in times of crisis, as well as demonstrate the therapeutic value of multiple artistic practices, including those not traditionally considered artistic. Our virtual experience is designed as an inclusive aide for either professionally guided or self-directed art therapy in medical schools, healthcare settings, or other spaces where medical professionals gather for work and learning. The virtual modality of Art as Medicine is adaptable for a variety of spaces and time blocks, making it optimal for unburdensome integration. We seek to prove that digital exhibition spaces can lower barriers to access to creative therapy experiences, expand the dissemination of creative therapy aides, and ultimately encourage the adoption of art as medicine an everyday practice

Integrative & Organismal Biology

EPIDIDYMAL ADENOMATOUS HYPERPLASIA: IS THERE A RELATIONSHIP WITH TESTICULAR DISEASE
Presenter(s): Bonnie Howard
Category: Integrative and Organismal Biology
Mentor(s): Dalen Agnew (College of Veterinary Medicine)

Pathology of the epididymis is a critical determinant of male fertility, with lesions typically arising from inflammatory, degenerative, or neoplastic processes. In humans, hyperplasia of the epididymis is also correlated with testicular disease. Pathologic change in the canine epididymis remains understudied. Given that epididymal integrity is essential for sperm maturation and reproductive success, a comprehensive characterization of canine epididymal hyperplasia is warranted. Our study aimed to investigate and characterize the occurrence of epididymal hyperplasia encountered in the dog. Epididymal samples were collected from dogs with suspected testicular disease (n=81) and from young dogs at the time of neuter (n=30). Tissues were stored in formalin until time of further analysis, to include trimming, paraffin embedding, and hematoxylin and eosin staining. Corresponding slides were evaluated under light microscopy for presence or absence of epididymal hyperplasia. A rubric was generated to grade epididymal hyperplasia encountered (0=absent; 1= mild, local change in 1-2 tubules; 2= moderate, more than 2 tubules affected up to 50% of tubules; 3= severe, widespread change in greater than 50% of tubules visualized). Epididymal scores were analyzed utilizing a student's t-test (absent vs. present; $p<0.05$). Results of this study reveal that epididymal hyperplasia is encountered in

dogs more commonly than expected. Future research should be preformed to determine the etiology and pathogenesis of epididymal hyperplasia and its effects on fertility in the stud dog.

LIPOPOLYSACCHARIDE STORAGE IN BOVINE AND MURINE ADIPOSE TISSUE
Presenter(s): Lauren Kane
Category: Integrative and Organismal Biology
Mentor(s): Andres Contreras (College of Veterinary Medicine)

Periparturient dairy cows are more likely to experience endotoxemia events, which are caused by the presence of bacterial-derived endotoxins, specifically lipopolysaccharides (LPS). Endotoxemia affects adipose tissue (AT) function by inducing inflammation, lipolysis dysregulation, oxidative stress, insulin resistance, and altering adipokine secretion. Importantly, cows that experience a health event during early lactation are more likely to develop a second disease in the following week; health events in periparturient cows are often associated with endotoxemia-related diseases. This raises the question of whether there are LPS reservoirs in dairy cows. The objective of this study is to analyze whether adipose tissue acts as a reservoir of LPS and, if so, identify the specific cells and organelles within the fat where the LPS is being stored. Murine models of endotoxemia are used prior to experimentation with large animals such as cows; thus, to conduct this project, murine adipose tissue explants are exposed to LPS tagged with fluorochromes in an FBS cocktail for 20 hours. Following the exposure, the explants are spatially analyzed for LPS with a confocal microscope. If our results from the first part strongly suggest that AT does uptake LPS, we would perform the same experiment in adipose tissue samples harvested from cows that experienced high-risk endotoxemia events.

HOW DOES GLOBAL CHANGE AFFECT KLEPTOPARASITISM PREVALENCE IN NORTH AMERICA?
Presenter(s): Addison Hoddinott, Elliot Palmer, Liz Bauer
Category: Integrative and Organismal Biology
Mentor(s): Phoebe Zarnetske (College of Natural Science)

Global changes have large impacts on avian communities across North America. The effects of increasing temperatures and drought are especially pronounced in some ecosystems where increased urbanization and agriculture have reduced habitat and water availability. We know very little about how these changes affect interactions among birds, specifically kleptoparasitic relationships. Kleptoparasitism is a foraging behavior that occurs when a species steals food or resources from another species and may become more common under resource scarcity due to global changes, especially in areas with high human impacts and more rapid climate change. We will use the Avian MetaNetwork (which includes 25,948 interactions between birds from North America) and the North American Breeding Bird Survey to identify potential kleptoparasitic pairwise interactions among birds in the U.S. and Canadian ecoregions over the past 60 years. We will use ERA5 climate re-analysis (covering 1970-2023) for annual temperature and precipitation, and we will use Human Modification data (available for 1990-2020) for human impacts. For each ecoregion, we will use regression to evaluate the influence of climate and human modification on the species' abundances and potential kleptoparasitism interactions over time.

Our analysis will identify which ecoregions and which species have experienced the most change in kleptoparasitism levels and turnover in kleptoparasitic species. Overall, this study will provide important insights about the effects of global changes on species interactions, which are essential for maintaining biodiversity and ecosystem functioning.

HOW DOES INDIVIDUAL VARIATION AFFECT TIME OF FEEDING IN SPOTTED HYENAS?
Presenter(s): Rory Mehren
Category: Integrative and Organismal Biology
Mentor(s): Eli Strauss (College of Natural Science), Jana Woerner (College of Natural Science)

Spotted hyenas (Crocuta crocuta) live in large social groups, characterized by strict dominance hierarchies and fission-fusion dynamics. They show interesting behaviors in regards to intraspecific competition, feeding, and social ranking. Intraspecific competition is common within clans, as cooperation during hunting leads to fighting over the kill. As a result, spotted hyenas will frequently separate from the group and hunt individually in an attempt to eat alone. We aim to analyze if spotted hyenas will use temporal partitioning to avoid intraspecific competition during feeding. Furthermore, we want to look at the relationship between rank and sex of specific hyenas compared to the time that they undergo feeding bouts. We will use data from a single clan of spotted hyenas in the Maasai Mara National Reserve in Kenya. We deployed tracking collars that record GPS, accelerometer, and audio data on all adult clan members. This provides a detailed record of hyena location, when they were feeding, and if they were feeding alone or in subgroups. This study will further our understanding of the dynamics between social rank and feeding behavior by exploring the intraspecies competition that occurs in spotted hyenas.

EFFECT OF FARMS ON BIRD BIODIVERSITY IN MICHIGAN USING COMMUNITY-SCIENCE EBIRD DATA
Presenter(s): Annie Walton
Category: Integrative and Organismal Biology
Mentor(s): Kevin McGraw (College of Natural Science), Peyton McGraw (College of Natural Science), Trey Ursillo (College of Natural Science), Victor Aguiar de Souza Penha (College of Natural Science)

Agriculture is the main form of land use on the planet and, despite its food-production and economic benefits, can have significant negative effects on natural habitats and communities of plants and animals. Farmland birds have declined more in recent decades than most other avian groups, but more work is still needed at large scales to understand how specific agricultural sites or practices impact different indices of wild bird biodiversity. The objective of our study was to assess how agricultural practices influence bird species richness and community composition across the state of Michigan. We used eBird, a community-science global platform for recording bird sightings, to quantify metrics of avian biodiversity in Michigan from 2020-present and used the National Land Cover Database to classify extent and type of agricultural development (e.g. Pasture/Hay, Cultivated Crop). Within the 500m x 500m grid cells across the state within which at least 60 eBird checklists were reported, we examined effects of the proportion and type of farmland cover on two biodiversity measures (avian species richness and

community composition). We predicted that grid cells embedded in landscapes with higher agricultural extent and farm percentage would exhibit lower species richness and reduced beta diversity, reflected in more homogeneous species composition, relative to less agricultural areas. This study demonstrates how large-scale community-science data can be leveraged to identify landscape-level impacts of farms on avian biodiversity, informing future wildlife-conservation efforts in these ever-expanding agricultural environments.

CONSERVED AND SPECIES-SPECIFIC ARGININE VASOPRESSIN EXPRESSION PATTERNS IN A NOVEL DIURNAL RODENT (ARVICANTHIS NILOTICUS)
Presenter(s): Evan Wilson
Category: Integrative and Organismal Biology
Mentor(s): Alexa Veenema (College of Social Science), Bridgette Weiss (College of Natural Science)

Arginine vasopressin (AVP) regulates various social behaviors across many mammalian species, including rodents and humans. Although rodents have been useful as model organisms in understanding the neural basis of social behavior, most are nocturnal, which limits their applicability to humans, a diurnal species. The Nile grass rat (Arvicanthis niloticus; NGR) is a diurnal rodent which lives in small family groups, shows biparental care and is socially monogamous. However, very little is known about their underlying neurobiology. To begin addressing this gap, we characterized AVP expression in the brains of adult male and female NGRs and compared it to the well-characterized AVP expression patterns in the Wistar rat. We processed adult male and female NGR brains for AVP immunohistochemistry and quantified AVP-immunoreactive (ir) fiber density and the number of AVP-ir neurons in selected brain regions. We found conserved sex differences in 5 of the 17 brain regions analyzed and there were species-specific sex differences in another 5 of the 17 brain regions analyzed. In all cases, males had denser AVP-ir fibers than females. Additionally, males had more AVP-ir neurons than females in 2 of the 5 brain regions analyzed. Our findings showing both conserved and unique AVP expression patterns in these two species provide a framework for further research determining the sex-specific roles of AVP in conserved as well as unique social behaviors in the NGR. Using the NGR as a new rodent model with potential translational relevance, may bring us closer to understanding the neural basis of human social behavior.

AQUATIC FOSSILS UNDER A SEM
Presenter(s): Elsa Oonk
Category: Integrative and Organismal Biology
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Over 50 million years ago, a large lake covered much of what is now Wyoming. This lake left behind huge beds of fossils, with many of the organisms once residing in the lake being incredibly well preserved. By analyzing the microstructure of these fossils using Scanning Electron Microscopy (SEM), information regarding the anatomy of larger species and imagery of many of the smaller species can be gained. The differences in structure due to fossils being of different species will be considered when examining the

results. Insight from knowledgeable staff and previous research will be taken into account when evaluating the results, along with the material of the fossils and variations in results stemming from that.

PARADOXICALLY, DOCKED MITOCHONDRIA, ENDOPLASMIC RETICULUM, CORTICAL ACTIN FILAMENTS, AND BEADS BOUND TO THE OUTSIDE OF CNS NEURITES ALL FLOW IN BULK TOWARDS THE CELL BODY DURING NEURITE OUTGROWTH
Presenter(s): Lorenzo Thrasher
Category: Integrative and Organismal Biology
Mentor(s): Kyle Miller (College of Natural Science)

Neurite elongation requires the delivery of materials made in the cell body to growth cones. In chick sensory neurons, Aplysia bag cells, and Drosophila motor neurons, microtubules (MTs) and organelles flow anterogradely due to traction forces exerted by the advancing growth cone. Although bulk forward motion is typical in many systems, hippocampal and cortical neurons present an interesting contrast; despite expectations, a recent study revealed that during initial outgrowth of cortical neurons, MTs within the neurite shaft actually flow retrogradely towards the cell body. To determine if the sliding of MTs or bulk flow is involved, we examined the motion of docked mitochondria, ER, actin filaments, and beads bound to the neurite surface. All components moved retrogradely at similar velocities, indicating bulk flow towards the cell body during their initial outgrowth. To further test this mechanism, we applied the clutch hypothesis on cortical neurons. Additionally, treatment with trypsin, which disrupts substrate adhesion, induced growth cone retraction in both 2D (coverslips) and 3D (collagen gels) environments. These findings suggest that in cortical neurites, tension generated in the cell body or along the neurite pulls materials in bulk toward the cell body, while the growth cone generates traction forces that pull it forward.

USING A F0 CRISPR SCREENING APPROACH TO TEST GUT DYSFUNCTION CANDIDATE GENES IN ZEBRAFISH
Presenter(s): Madalyn Roberts
Category: Integrative and Organismal Biology
Mentor(s): Julia Ganz (College of Natural Science)

The enteric nervous system (ENS) regulates gastrointestinal (GI) motility. ENS dysfunction contributes to disorders including Hirschsprung disease, inflammatory bowel disease, and irritable bowel syndrome. Identifying genes regulating ENS function is critical to understand disease mechanisms. A collaborator's genome-wide association study identified four candidate genes associated with human GI dysfunction - BRAT1, LNFG, CDK18, and NFASC, but which of these genes are connected to GI dysfunction remains unclear. We performed a F0 CRISPR screening in zebrafish to test candidate genes' impact on intestinal transit. Intestinal transit quantifies food movement through the GI tract. CRISPR components targeting slc24a5 and a candidate gene were injected to generate mutations at target loci. Mutations in slc24a5 produce a "golden" pigmentation phenotype, serving as an injection efficiency control. Consistent with previous studies in sox10 mutants, sox10 crispants exhibited reduced intestinal transit. Injected embryos

were screened at 1- and 2-days post fertilization(dpf) for survival and "golden" phenotype to assess injection quality. At 7 dpf, crispants and slc24a5 were assessed for clearance of fluorescently labeled food. Target loci were PCR-amplified and sequenced to quantify insertion/deletion mutations and knockout scores, assessing mutation efficiency. Among candidate genes, lnfg crispants trend towards reduced intestinal transit, whereas brat1, cdk18, and nfasca - one of the two orthologs of NFASC- crispants showed no change. nfascb crispants displayed variable but reduced intestinal transit. Ongoing peristaltic imaging will further evaluate motility to support our findings. These results contribute to identifying candidate genes regulating ENS functions for future studies of the genetic basis of GI disease.

ORNAMENTATION MAKES HOT BODIES: DRAGONFLY WING MELANIZATION INCREASES WITH TEMPERATURE AND CAUSES BODIES TO HEAT FASTER

Presenter(s): Renfield Andrews
Category: Integrative and Organismal Biology
Mentor(s): Alisha Shah (College of Natural Science)

Climate warming is correlated with significant declines in insect biodiversity, yet the direct and indirect effects of warming temperatures on insects remain poorly understood. Pigmentation may be impacted by climate change because darker pigments absorb more solar radiation and could therefore lead to overheating, although melanin may alternatively offer greater protection from ultraviolet rays. The common whitetail is a dragonfly species in which both sexes exhibit wing melanization, providing a powerful study system to test how warming can alter pigmentation. To investigate how the proportion of wing melanization has changed over time, we measured museum specimens from 1916-2017. We predicted that melanization should decrease in response to climate warming. To explore the potential effects of higher proportions of wing pigmentation on body temperature, we experimentally enhanced the pigmentation of wild-caught males and compared the rates at which their bodies heated under a lamp to males that were not pigment-enhanced. We predicted that pigment-enhanced males should experience faster heating rates than unenhanced ones. Surprisingly, our results showed that wing melanization in the forewings of both sexes and the hindwings of males have significantly increased with warmer fall temperatures. Our experiments revealed that males with pigment-enhanced wings had significantly higher thoracic heating rates than their unenhanced counterparts. These results suggest that wing pigmentation is changing with warming and that males with more pigmentation may experience more frequent overheating. Because wing pigmentation on males is a sexually selected trait, sexual selection pressures may have thermoregulatory consequences as climate warming continues.

MICROSCOPIC PATTERNS OF MENOPAUSE-LIKE AGING IN ORANGUTAN OVARIES
Presenter(s): Madison Cole
Category: Integrative and Organismal Biology
Mentor(s): Anneke Moresco (College of Veterinary Medicine), Dalen Agnew (College of Veterinary Medicine)

Menopause has traditionally been viewed as a uniquely human trait, while reproductive aging in non-human primates remains poorly understood. This study examines age-related changes in orangutan ovaries to assess whether patterns consistent with menopause-like reproductive aging can be identified at the microscopic level. Using histological sections of ovarian tissue from individuals of varying ages, this project focuses on measuring and characterizing age-associated changes in ovarian morphology, including follicle presence and classification, as well as overall tissue structure. Quantitative analysis of these features allows for comparisons across individuals of varying ages and helps clarify how ovarian structure changes over time. By examining anatomical markers of reproductive aging, this work contributes to ongoing discussions about how menopause should be defined and studied in non-human primates. The findings provide comparative insights into primate reproductive biology and are relevant to veterinary care and captive population management.

FOLLOWING THE FINCH: A FINE-GRAINED ETHOGRAM OF ZEBRA FINCH PARENTAL CARE BEHAVIORS
Presenter(s): Imahnie Mason
Category: Integrative and Organismal Biology
Mentor(s): Grace Smith Vidaurre (College of Natural Science), Summer Eckhardt (College of Natural Science)

Altricial offsprings are highly dependent on their parents for successful development after hatching, which makes parents an important figure. Like humans, altricial birds are born unable to feed or regulate their body temperature without help from their parents. Many bird species, including zebra finches (Taeniopygia guttata), are relying heavily on their parents for parental care until they fledge. Birds that produce altricial offsprings and exhibit complex social behaviors like humans, such as the social learning of vocalizations, provide useful opportunities to test ideas about how parental care shapes the development of new behaviors. However, testing such ideas requires describing variation in adult parental care behaviors during development. I am developing a fine-grained ethogram of parental care behaviors in zebra finches (Taeniopygia guttata), a songbird species that exhibits biparental care. These small songbirds are native to Australia and commonly used for studies to understand social learning of vocalizations. To create the ethogram, I completed video scoring training and scored 25 videos of adult zebra finches caring for their young. In addition, I am also reviewing literature articles to enhance my understanding of avian parental care behaviors. While observing the videos, I documented the observation duration, number of subjects presented, and coarse-grained behavioral states used by the Smith-Vidaurre (BIRDS) Lab in another research. Using insight from these observations and the published literature, I created fine-grained categories and detailed descriptions of zebra finch parental care behaviors. This ethogram provides an important foundation for scoring variation in parental care behaviors in future research projects.

RELATIONSHIP BETWEEN INFLUENTIAL BIRD SPECIES OF THE AVIAN METANETWORK AND IUCN THREAT STATUS
Presenter(s): Caroline Roche, Olive Graves, Vivian Smith
Category: Integrative and Organismal Biology
Mentor(s): Phoebe Zarnetske (College of Natural Science)

Reaching every corner of the globe, birds fulfill a broad range of ecosystem roles, but global anthropogenic change is creating an increasingly uncertain future for many bird species. The International Union for Conservation of Nature (IUCN) Red List of Threatened Species serves as a conservation authority and has quantified the extinction risk of over 170,000 species, including over 11,000 birds. Threatened and endangered birds provide valuable interspecific interactions that would be lost should those species become extinct. Species that are more connected within interaction networks may be more vulnerable to extinction if they are replaceable by other species that fill similar roles. Alternatively, species that are more connected may be less vulnerable to extinction if there is high functional redundancy in the roles provided by their interacting species. Without comprehensive data on species interactions, it is difficult to quantify the relationship between a species' influence in their network and their conservation importance. The Avian MetaNetwork is a working database created by the Spatial and Community Ecology Lab at MSU that aims to fill this gap by systematically documenting and classifying avian interspecific interactions. This database includes 25,948 pairwise interactions involving 731 focal species in the continental United States and Canada. With these data, we will identify which species are most influential through network analysis and determine which species and interactions are most at risk using IUCN Red List threat categories. The results of this analysis will produce a new threat status which accounts for both IUCN status and interspecific influence.

HAEMOSPORIDIAN PARASITEMIA AND SEX PREDICT BODY CONDITION IN BROWN-HEADED COWBIRDS (MOLOTHRUS ATER) ACROSS AGRICULTURAL LANDSCAPES
Presenter(s): Isa Musters, Margaret Greene
Category: Integrative and Organismal Biology
Mentor(s): Kevin McGraw (College of Natural Science), Victor Aguiar de Souza Penha (College of Natural Science)

Body condition is a valuable metric of avian health, reflecting how individuals balance nutritional/energetic demands, physiological stress, and pathogen/parasite pressures. Variation in body condition can also arise from intrinsic factors such as sex and age, as well as extrinsic factors including habitat quality. Haemosporidian blood parasites (Haemoproteus and Plasmodium) are ubiquitous in birds and may impose energetic costs, but little is known about the links between malarial infection, body condition, and other life-history and ecological variables. Here, we examined how body condition in Brown-headed Cowbirds (Molothrus ater) varies across livestock farms in Michigan. We predicted that (1) individuals with higher parasitemia would exhibit lower body condition, and (2) juveniles would be in poorer condition than adults due to developmental and energetic constraints. Given limited prior evidence, we made no directional predictions for sex- or farm-specific effects on body condition. We mist-netted, sexed, aged, measured, and sampled cowbirds during the 2025 breeding season at sheep,

dairy, and beef farms. We used residuals from a body mass v. tarsus length regression to calculate body condition and examined blood smears using microscopy. We found that body condition declined significantly with increasing parasitemia and that males were typically in better condition than females. These results suggest that variation in body condition among cowbirds is shaped by infection intensity and sex-specific energetic demands during the breeding season, even in a brood-parasitic species. In ongoing work, we will complete blood smear microscopy and PCR-based pathogen screening to expand the infection and parasitemia datasets.

A NEW NUDIBRANCH DEFINES A DISTINCT LINEAGE WITH UNIQUE MORPHOLOGY
Presenter(s): Suhaylah Ahmad Ali
Category: Integrative and Organismal Biology
Mentor(s): Terrence M. Gosliner (California Academy of Sciences)

Aeolid nudibranch diversity within the family Flabellinidae remains incompletely resolved, particularly for Indo-Pacific taxa with uncertain generic placement. In the 1980s, specimens of an undescribed aeolid nudibranch were first collected from Papua New Guinea and tentatively identified as a species of Piseinotecus. Subsequent molecular data suggested this classification was inaccurate. This study aimed to clarify the phylogenetic position and taxonomic status of this species and tested the hypothesis that it represents a distinct lineage relative to Flabellinidae. Specimens from Papua New Guinea, the Marshall Islands, and the Philippines were analyzed using Sanger sequencing of COI, H3, and 16S genes. Morphological assessments included scanning electron microscopy of the radula and microscopic examination of reproductive anatomy. Phylogenetic analyses recovered this taxon within a clade including Flabellina iodinea and F. baetica, rather than with other Piseinotecus species. Morphological evidence further supported its distinctiveness: within Flabellinidae, only Piseinotecus species and this taxon possess a uniseriate radula, and additional diagnostic differences were observed in radular and reproductive morphology. These findings initially supported recognition of a novel genus and species. Subsequent synthesis of published literature, public observation records, and recent taxonomic work indicates a broader Indo-Pacific distribution. Notably, later studies placed this taxon within a newly described family separate from Flabellinidae, reflecting continued refinement of aeolid nudibranch systematics and underscoring the value of integrating historical museum collections with modern analytical approaches.

RELATIONSHIP BETWEEN HAEMOSPORIDIAN PARASITAEMIA AND BODY CONDITION IN BLACK-CAPPED CHICKADEES (POECILE ATRICAPILLUS)
Presenter(s): Chase Seaberg, Ruby Werner
Category: Integrative and Organismal Biology
Mentor(s): Kevin McGraw (College of Natural Science), Victor Aguiar de Souza Penha (College of Natural Science)

Avian malaria, caused by haemosporidian parasites, is widespread in songbirds and causes chronic parasitemia with potential physiological and fitness costs. Body condition reflects energetic balance,

immune investment, and has been linked to avian malaria in multiple species, yet associations between haemosporidian infection, body condition, and other physiological metrics (e.g., circulating nutrients, immune cells) remain poorly understood in passerines. We investigated relationships among body condition, parasitemia, and physiological metrics in Black-capped Chickadees (Poecile atricapillus), a common backyard bird in the northern USA. We hypothesized that individuals in better body condition would have (a) lower blood glucose and ketone concentrations and heterophil/lymphocyte ratios (HL), (b) reduced global leukocytes (GL), (c) lower parasitemia, and that adults would be in better condition than juveniles. From May-August 2025, we captured, sampled, and measured 66 chickadees across Michigan State University natural areas (Baker Woodlot, Toumey Woodlot, Inland Lakes, and a residential area). We quantified blood glucose and ketone concentrations using point-of-care devices, and screened 100 fields per blood smear for leukocytes, erythrocytes, and blood parasites at 100x magnification. We estimated body condition as the residuals of a body mass vs. tarsus length regression, and analyzed data using linear models incorporating location, parasitemia, and aforementioned physiological metrics as predictors. We found that Haemoproteus parasitemia was negatively associated with body condition, but no other variables of interest were related to body condition. These results suggest that chickadees infected with malaria may experience a decline in condition, or that birds in worse condition are more susceptible to Haemoproteus infection.

SEX DIFFERENCES IN NEST ATTENDANCE ACROSS CHICK DEVELOPMENT IN A BREEDING PAIR OF ZEBRA FINCHES

Presenter(s): Parker Major
Category: Integrative and Organismal Biology
Mentor(s): Grace Smith Vidaurre (College of Natural Science), Grethel Alexandra Juarez (College of Natural Science), Summer Eckhardt (College of Natural Science)

The quality of parental care is critical for organisms that experience altricial development. For instance, many songbird species (Passeriformes) produce offspring that must be fed intensively post-hatching, and some require behavioral interactions with adults to develop species-typical communication signals. While avian biparental care behavior has been described in comparative approaches, we are still missing important knowledge about how adults may differentially allocate their time to parental care behaviors. Such behavioral sexual dimorphism holds great potential to drive evolutionary change over short timescales, but collecting data to quantify intraspecific variation in parental care behavior remains very challenging. We used the tracking system ABISSMAL (Automated Behavioral tracking by Integrating Sensors that Survey Movements Around a target Location) to collect a large dataset of videos from one opposite-sex breeding pair of captive zebra finches (Taeniopygia guttata). Zebra finches form strong socially monogamous breeding pairs, exhibit biparental care, and readily breed in captivity. We used the BORIS video scoring software to manually annotate five coarse-grained behaviors for 4037 videos, and performed a preliminary analysis of sex differences in time allocated across these behavioral categories. Our results showed that both adults spent most of their time inside the nest container throughout the entirety of chick development, but the female allocated more time inside of the container compared to the male. This work provides a foundation for future research that will yield new insights into

automating data collection for cryptic long-term behaviors, and how behavioral variation can impact the phenotypes of subsequent generations.

PREY DISPLAY HIGHER HEAT TOLERANCE THAN PREDATORS IN A SOUTHWEST MICHIGAN LAKE COMMUNITY
Presenter(s): Phoebe Bosch
Category: Integrative and Organismal Biology
Mentor(s): Stephanie Bristow (College of Natural Science)

Climate change is leading to increasing average environmental temperature and the frequency of heat waves. Ectothermic species are expected to be especially vulnerable to warming as their physiology and behavior are strongly linked to environmental temperatures. Yet not all ectotherms will be affected by climate change equally. The trophic sensitivity hypothesis suggests that top consumers are more sensitive to environmental stress than lower trophic levels. Testing this hypothesis in a community of ectotherms may improve our predictions for individual responses and shifts in community stability under climate warming. Here we tested the prediction that prey have higher tolerance to heat stress than their predators using local species in SW Michigan lakes. In this experiment, we measured the maximum thermal limits at which an organism loses locomotor function (i.e., critical thermal maximum or CTmax) in two damselfly genera (Enallagma & Ischnura) and their predator, bluegill sunfish (Lepomis macrochirus). Organisms were collected from ponds and lakes surrounding Kellogg Biological Station and acclimated to a common temperature (22°C) prior to CTmax trials. For CTmax trials, we used dynamic ramping assays with three different ramping rates (0.1, 0.3, and 0.5°C/minute) to record the temperature at which damselfly larvae experienced a loss of righting response, and bluegill a loss of equilibrium. Enallagma and Ischnura damselflies were found to have higher CTmax than bluegill sunfish but had little variation between species of damselfly. CTmax increased when higher ramping rates were applied. Overall, our findings support the trophic sensitivity hypothesis between bluegill predators and damselfly prey.

DISCOVERING SAPROLEGNIA SPP. DIVERSITY IN THE GREAT LAKES REGION
Presenter(s): Suhaylah Ahmad Ali
Category: Integrative and Organismal Biology
Mentor(s): Bartolomeo Gorgoglione (College of Veterinary Medicine)

Saprolegnia is a widespread oomycete in aquatic environments, although its genetic diversity and species/strains distribution throughout the Great Lakes region remain poorly characterized. Species within this genus may cause saprolegniasis to freshwater fish and their eggs, leading to a consistent economic impact in aquaculture and with a potential ecological impact for immuno-compromised wild fish populations. Although Saprolegnia parasitica is widely recognized as a primary pathogen, variation in infection prevalence and morphological diversity among isolates suggests multiple species may contribute to disease dynamics. We hypothesize that S. parasitica will be the predominant species isolated from symptomatic fishes, while other Saprolegnia species may occur at lower frequencies across

sites and sample types. The objective of this study was to isolate Saprolegnia spp. from environmental samples and fish farms collected across Michigan, aiming at species identification and genetic diversity assessment upon laboratory culturing. Samples were collected from riverine locations and fish hatchery facilities, mucus swabs from skin lesions of symptomatic salmonids. Mucus samples were cultured on glucose-yeast agar supplemented with penicillin and streptomycin. Water samples were processed using micropore filtration or with hemp seed baiting techniques prior to culture. Primary cultures were incubated at room temperature for 3-5 days, sub-cultured, isolated, and stored at 4°C for DNA extraction for confirmatory PCR and sequence analysis. Thirty-one isolates from six locations were successfully cultured, with most originating from fish skin lesions at Little Manistee River. The Saprolegnia isolates exhibited the characteristic morphology of the genus, with an intensely colonized agar medium and long white aerial mycelium. To further investigate the Saprolegnia diversity, ongoing phylogenetic analyses will characterize genetic variation and identify potentially virulent strains.

HOW DOES INDIVIDUAL VARIATION AFFECT FEEDING IN SPOTTED HYENAS?
Presenter(s): Delaney Chapman
Category: Integrative and Organismal Biology
Mentor(s): Eli Strauss (College of Natural Science), Jana Woerner (College of Natural Science)

Spotted hyenas (Crocuta crocuta) are some of the most densely populated carnivores in Africa as they are highly efficient hunters and scavengers, feeding on whichever prey species is most abundant. They live in fission-fusion societies called clans that are ruled by strict dominance hierarchies where all immigrant males rank below their female conspecifics. High-ranking female hyenas have priority access to food, frequently usurping kills from lower-ranking group mates. Hyena skull development is also very slow, requiring a dependency on big carcasses to be scavenged by young hyenas before they're fully grown around three years old. Additionally, their reproductive status is costly both in time and space, forcing mothers to eat more to sustain nursing for their cubs. Despite the extensive research on interspecific competition with other local predators, we lack a refined understanding of how individual variation shapes the dynamics of feeding competition within a single social group. To address this gap, we deployed tracking collars on all adult members of a single hyena group in the Maasai Mara National Reserve, Kenya. These collars recorded fine-scale GPS, audio, and accelerometer data, providing a high-resolution picture of daily movement, feeding events, and conspecific interactions. We will assess how rank, sex, age, and female reproductive status drive intraspecific competition over food resources, using feeding duration as a proxy for competitive ability.

PHYSIOLOGICAL CORRELATES OF BODY CONDITION IN HOUSE SPARROWS (PASSER DOMESTICUS) ACROSS AGRICULTURAL LANDSCAPES
Presenter(s): Daniela Vargas Carrion, Lorelei Bearss, Madison Godfrey
Category: Integrative and Organismal Biology
Mentor(s): Kevin McGraw (College of Natural Science), Victor Aguiar de Souza Penha (College of Natural Science)

Agricultural environments impact wild avian health through altered diets and exposure to stressors. Although body condition is commonly used to assess bird health, its relationship with physiological markers is not fully understood. We studied house sparrows (Passer domesticus), a common wild bird, and hypothesized that body condition was associated (a) positively with carotenoid, vitamin, and glucose levels; (b) negatively with ketones and parasitemia; was (c) higher in males; and (d) lower during peak breeding season. Using mist nets, we captured 106 sparrows at four Michigan State University livestock farms from May-August 2025. We banded, aged, and sexed sparrows, and, using residuals from a body mass/tarsus regression, quantified body condition. We measured parasitemia via microscopy; glucose and ketone levels with point-of-care devices; and carotenoid and vitamin concentrations using high-performance liquid chromatography. We found that body condition declined through the breeding season and that males were in better condition overall. Body condition differed among farms, with sparrows from the sheep farm in better condition than those from an adjacent beef farm. We also found body condition to correlate positively and negatively with plasma vitamin A and vitamin E levels, respectively. Carotenoid levels were unrelated to body condition. These patterns likely reflect higher energetic investment of females relative to males, farm-specific differences in resource availability and disturbance, and increases in reproductive effort throughout the breeding season. Future study will focus on hematology and PCR to quantify parasitic and bacterial infections in P. domesticus to further investigate drivers of passerine health on farms.

DETECTION OF IDENTITY INFORMATION RELATIVE TO POSITION IN SYNTHETIC BIRD CALLS
Presenter(s): Ollia Miller
Category: Integrative and Organismal Biology
Mentor(s): Grace Smith Vidaurre (College of Natural Science)

A small handful of species learn their vocalizations-similar to humans-and can transmit information about their social identities through their learned vocalizations. This information encoding can be complex, with multiple types of information encoded in a single vocalization, including group membership and individual identity. However, it remains unclear how the location of identity information in these vocalizations can influence the ability to detect it with quantitative bioacoustics tools traditionally used for empirical calls, which can reveal the effectiveness of these tools. I performed experiments manipulating the position of identity information detection in synthetic vocalizations using the paRsynth package and a computation bioacoustics pipeline developed by the Smith-Vidaurre Lab. This pipeline utilizes spectrographic cross-correlation, multidimensional scaling, and unsupervised clustering. Then, we assessed information detected by quantifying how well predicted group and individual labels match the respective original labels. I found that the detection of identity information

was impacted by the position, such that our accuracy in detecting group information was lower when this information was placed later in vocalizations, indicating a small but significant effect size. The same pattern was observed with individual information. Future work will focus on performing more simulation experiments and further development of the paRsynth package.

ROUTES TO ROOTS: A MODULAR INTERCONNECTED POT SYSTEM (MIPS) FOR INVESTIGATING PLANT-MYCORRHIZAL FUNGI SYMBIOSES.
Presenter(s): Karissa Johnson
Category: Integrative and Organismal Biology
Mentor(s): James Moran (College of Natural Science)

Soil microorganisms, such as arbuscular mycorrhizal fungi (AMF), form a symbiosis with plants where they exchange soil-derived nutrients for plant-derived carbon. AMF colonization occurs within plant root cells, and common mycorrhizal networks (CMN) facilitate this inter-plant nutrient exchange by connecting more than one plant via a shared hyphal network. We have developed and are optimizing a Modular Interconnected Pot System (MIPS) for greenhouse experimental manipulation of plant-AMF and therefore CMN, symbioses to study the pathways of nutrient exchange in multi-plant configurations. A central feature of this design is its adaptability and flexibility; MIPS can be rearranged and reassembled to investigate diverse experimental designs testing nutrient-plant-microbe interactions. In a greenhouse growth experiment using MIPS, we are growing switchgrass (Panicum virgatum Var. Cave-in-Rock) which is a common model biofuel plant. Field soil collected from cellulosic biofuel switchgrass plots will provide the naturally derived microbial (including AMF) inoculum. Plants are segregated from nutrient chambers, connected by substrate-filled tunnels which connect each chamber. Tunnels were capped with root-exclusion mesh which allows AMF to explore each chamber. Soil and plant above and below ground biomass will be sequentially harvested throughout growth. We will use Elemental Analyzer coupled with an Isotopic Ratio Mass Spectrometer (EA/IRMS) to quantify nutrient exchange between chambers. Findings of this exploratory experiment will validate the versatility and functionality that the MIPS offers plant-mycorrhizal and CMN study systems. This will aid in elucidating nutrient exchange dynamics between plants and their fungal symbionts- a critical area of study within both agriculture and natural systems.

INVESTIGATION OF EXTANT MARTIAN LIFE THROUGH CONFOCAL LASER MICROSCOPY
Presenter(s): Rorey Welch, Sanjit Chadha
Category: Integrative and Organismal Biology
Mentor(s): Michael Velbel (College of Natural Science)

Although Mars may currently be a desolate, chilly desert, it was not always this bleak. The planet once hosted a tropical climate that allowed liquid water to flow at its surface, creating a habitable environment for a variety of organisms. Recent studies propose that this water may still be present on Mars, suggesting extant life could occupy the red planet. Substantiating evidence was unearthed by the Mars 2020 Perseverance rover, which has been traversing the planet's surface for collection of Martian

rock and regolith samples. These samples are set to be returned to Earth through the NASA-ESA Mars Sample Return mission. However, it is important to consider the potential contamination and hazards that extraterrestrial bodies could impose on terrestrial biomes. Immediately after the samples are returned, the MSR Sample Receiving Project (SRP) must perform a routine Sample Safety Assessment Protocol (SSAP) on the regolith. This occurs in a terrestrial laboratory known as the Sample Receiving Facility (SRF), which searches for the presence of potential biohazards within interplanetary samples before they are distributed to external research facilities. We tested feasible methods utilized during the SSAP on sublunar analogs (Mars regolith simulant), including confocal laser microscopy. This procedure detects biochemical species such as proteins, lipids, and nucleic acids, which would indicate the presence of a biohazard in the SRF. Analyzation of the accumulated data would provide extremely valuable evidence on the habitability of Mars, along with insights into the fundamentals of life and universal evolution.

ENVIRONMENTAL FACTORS DRIVING FOREST-DWELLING SALAMANDER PRESENCE AT SPARCNET COVERBOARD PLOTS

Presenter(s): Jaylyn Wilder
Category: Integrative and Organismal Biology
Mentor(s): Alexa Warwick (College of Agriculture & Natural Resources)

The Salamander Population Adaptation and Research Collaborative Network (SPARCnet) is a multi-institutional project that uses red-backed salamanders (Plethodon cinereus) as a model species for understanding how environmental change impacts salamander ecology. P. cinereus inhabits a wide range across eastern North America and is often found in high densities. It is ecologically important for food webs, nutrient cycling, and as a general indicator for ecosystem health due to its sensitivity to environmental quality. The specific question my research explores is: what fine-scale environmental variables are driving salamander presence at these SPARCnet coverboard plots? At our two study locations, Rose Lake State Wildlife Research Area (RLS) and Corey Marsh Ecological Research Center (CMERC), we've piloted various methods of environmental data collection focusing on soil, vegetation, invertebrates, and topography. After narrowing down what variables were most relevant, preliminary comparisons of our plots using principal component analyses indicate significant environmental variation between RLS (with P. cinereus) and CMERC (without P. cinereus). Some of the variables we've found to be of interest include ground cover, soil pH and minerals, invertebrate counts, elevation, and distance to wetlands. The continuing goals for this project are: 1) To determine whether the difference between salamander presence at these plots can be attributed to the environmental variables we've explored. 2) Collaborate with other SPARCnet locations to expand the geographic scope of this project. 3) Continue collecting these environmental variables during regular SPARCnet salamander surveys and compare temporal environmental variation as part of a long-term monitoring project.

SITE FIDELITY AND MOVEMENT IN A TERRESTRIAL SALAMANDER PLETHODON CINERUS
Presenter(s): Aisha Etheridge
Category: Integrative and Organismal Biology
Mentor(s): Louise Mead (College of Natural Science)

Plethodon cinerus individuals are known to show high levels of side fidelity throughout their range and have mostly been observed to occupy small home ranges. However, it's suspected that individuals also have the potential to travel long distances due to experimental observations and the species' natural history. There is also mixed evidence indicating differences in movement behavior across morph, sex, geography, and age class, but with no real consensus. In this study, we seek to investigate the levels of site fidelity and movement throughout the range of P. cinerus, as well as any variation by sex, age, or morph. We will use the SPARCnet capture-recapture data to answer these questions. We will be using capture-recapture data from 2013 through 2024 across Ohio, Virginia, Michigan, Massachusetts, and Pennsylvania, allowing us to also investigate variation across the species range. This large dataset will help to provide evidence for the extent of long-distance movements in P. cinerus. It will also provide evidence for the variation in movement behavior and site fidelity by factors like age, geography, and color morph.

Kinesiology

ASSESSMENT OF THE HIPPO SIGNALING PATHWAY IN POSTNATAL GROWTH-RESTRICTED MICE
Presenter(s): Jayden Savin
Category: Kinesiology
Mentor(s): David Ferguson (College of Education)

Early life postnatal growth restriction (PNGR) has profound consequences in health outcomes including an increased risk of cardiovascular disease, extending far into adulthood. The use of exercise as an appropriate therapy in cardiovascular disease can adversely lead to negative outcomes in these unique populations. Most notably, female specific altered cardiac structure, increased stiffness, and variation in HIPPO pathway production. PURPOSE: To investigate the levels of key transcription factors/proteins within the HIPPO pathway for potential variation in expression. METHODS: Mouse dams were fed either a normal protein diet or an isocaloric low protein diet. On postnatal (PN) day 1 of birth, all pups born from dams fed the normal protein diet were randomly assigned to two of the experimental groups, normal protein dams or low protein dams. On PN day 21 female mice from each litter were euthanized for collection. Western Blot analysis was performed to identify and quantify key HIPPO pathway proteins. RESULTS: At PN 21, Mob1 was decreased in PNGR mice (0.08700±0.0094) compared to CON mice (0.12100±0.0094) (=0.0433). Phosphorylated YAP to YAP ratio trends to increased in PNGR mice (1.13905±0.2438) compared to CON mice (0.53236±0.2438) (=0.1290). CONCLUSION: The HIPPO pathway, largely known for cell proliferation and growth in early life, downregulates Mob1 leading to degradation of downstream molecules Yap/Taz. This degradation causes inactivation of HIPPO signaling leading to inefficient cardiac growth and production.

EFFECTS OF A 4-8 WEEK FINNISH SAUNA INTERVENTION ON RESTING HEART RATE AND BODY MASS IN ADULTS

Presenter(s): Margaret Gillett, Tatum Morrill
Category: Kinesiology
Mentor(s): Katharine Currie (College of Education), Mason Lentz (College of Education)

Long-term Finnish sauna use has been found to improve cardiovascular function and reduce body mass (BM) in Northern European male populations. There is limited evidence on the short-term effects of sauna therapy in American populations. This study aimed to determine the effects of a 4-8-week Finnish sauna intervention on BM and resting heart rate (RHR) in American adults. Adults (30-80 years) from the greater Lansing area were recruited to complete four, 30-minute Finnish sauna (80-110°C) sessions per week for 4-8 weeks. Pre- and post-intervention assessments of BM were recorded in the lab using a digital scale. An automated oscillometric device was used to measure RHR in the lab and at-home during the first and final week of sauna use. Paired-sample t-tests were used to compare pre-post values for all variables. Fifteen participants (55±14 years, 4 males) completed the study with six (40%) participating in 8 weeks of the intervention. Mass decreased from 80.8±19.8 to 79.8±19.4 kg (P=0.020). Lab RHR remained unchanged from 66±7 to 64±7 bpm (P=0.146). Similarly, there was no change in at-home RHR from 70±7 to 69±8 bpm (P=0.719). While 4-8-weeks of Finnish sauna treatment was not associated with statistically significant reductions in lab or at-home RHR, we did observe a small reduction in BM. Additional research on chronic sauna use may be useful in determining whether sauna bathing can be implemented as a lifestyle modification to help manage cardiovascular risk factors in American populations.

QUADRICEPS MUSCLE SIZE AND QUALITY FOLLOWING ACLR: ULTRASOUND ASSESSMENT

Presenter(s): Gregory Thomas
Category: Kinesiology
Mentor(s): Corey Grozier (College of Education)

Introduction: Quadriceps deficits, including reduced size and altered composition, can persist for years after anterior cruciate ligament reconstruction (ACLR), impacting function and joint health. Ultrasound is a feasible tool to assess muscle cross-sectional area (CSA) and echo intensity, a valid estimate of intramuscular fat. However, side-to-side differences in rectus femoris CSA and echo intensity remain unclear. This study compared these measures between ACLR and contralateral limbs 1-5 years post-surgery. Methods: Ultrasound images from participants aged 18-35 years, 1-5 years post-ACLR, were analyzed. Transverse panoramic images of the mid-thigh were obtained with the participant supine and the knee flexed to 30°. Three images per limb were acquired. A single investigator manually segmented the rectus femoris using ImageJ. Outcome measures included CSA (cm2) and echo intensity (arbitrary units, 0-250; higher values indicate greater intramuscular fat). The mean of three images per limb was used for analysis, and paired t-tests compared ACLR and contralateral limbs. Results: Twelve participants (7 females; 23.9?±?9.7?years; 73.7?±?21.1?kg) were included. Rectus femoris CSA was smaller in the ACLR limb (7.9?±?0.6?cm2) than the contralateral limb (9.2?±?0.6?cm2; mean difference: -1.3?cm2 [-2.0, -0.5], p=0.003). Echo intensity did not differ between ACLR (64.9?±?8.0) and contralateral (62.6?±?5.6)

limbs (p=0.131). Conclusion: Individuals post-ACLR exhibit reduced rectus femoris CSA in the reconstructed limb, while echo intensity remains similar, suggesting preserved intramuscular composition despite muscle atrophy.

EFFECTS OF A 4-8 WEEK FINNISH SAUNA INTERVENTION ON PERCEPTIONS OF SLEEP QUALITY AND HEALTH IN ADULTS
Presenter(s): Maimuna Ahsan, Sajal Pearson
Category: Kinesiology
Mentor(s): Katharine Currie (College of Education), Mason Lentz (College of Education)

Heat therapies, such as Finnish sauna, are commonly used for pleasure and relaxation but have been linked to several health benefits, including improved cardiovascular health. There is limited evidence on the effects of sauna use on sleep quality and perceived health, specifically in American populations. The purpose of this study was to examine the effects of a 4-8 week Finnish sauna intervention on perceptions of sleep quality and general health in adults aged 30-80 years. Female and male participants with stable physical activity levels and drug therapies were recruited to complete four 30-minute sauna sessions per week for either 4 or 8 weeks. Sleep quality and general health were assessed before and after the intervention using the Pittsburgh Sleep Quality Index (PSQI) survey and the Short Form-36 survey (SF-36), respectively. Paired t-tests and Wilcoxon signed-rank tests were used to analyze PSQI global scores and the scores of the eight health domains of SF-36. Data are reported as mean±SD. Fifteen participants (56±14 years; 4 males) completed the intervention. Global PSQI scores decreased from 6.7±3.4 to 4.9±3.3 (P=0.007) following the sauna intervention indicating better perceived sleep quality. Of the eight SF-36 domains, only vitality demonstrated an improvement from 62±21 to 69±19 (P=0.0429) following the intervention while the remaining health domains showed no meaningful change (all P>0.05). Our short-term sauna intervention improved perceived sleep quality and vitality (i.e., energy levels and fatigue) levels in adults, suggesting that regular sauna use may lead to better sleep and more energy throughout the day.

HIIT ON RUNNING POWER
Presenter(s): Ally Nathan, Deedee Hernandez, Isabella Yu
Category: Kinesiology
Mentor(s): David Ferguson (College of Education), Michael Kim (College of Education)

Postnatal growth restriction (PNGR) is associated increased risk of cardiovascular disease and impaired exercise capacity. High-intensity interval training (HIIT) increases exercise capacity and cardiovascular function. The purpose of this study is to investigate HIIT on exercise capacity. Two weeks prior to birth, mouse dams were randomly assigned to either a low protein diet (8%) or a normal protein diet (20%). Pups born to the normal protein dams were cross fostered to a different normal protein dam (control) or a low protein dam (PNGR). After 21 days, all offspring were weaned to a healthy normal protein diet. On PN44, a maximal exercise test was done to set HIIT intensities. On PN45, treadmill HIIT running was done 5 days a week for 4 weeks. An analysis of variance was used to compare the results with the main effects

being diet (control or PNGR), sex (male or female), or training (sedentary or HITT). If significant a Tukey's HSD post hoc test was run. CON females had a 11% increase capacity, CON males had a 21% increase, PNGR females had a 9% and PNGR males had a 6% ($p<0.05$). PNGR mice exert less exercise capacity with HIIT, illustrating a blunted response to exercise thus to get beneficial adaptations to exercise, PNGR mice may need to do longer bouts of activity.

THE IMPACT OF KINESIOPHOBIA ON STANCE-PHASE VERTICAL GROUND REACTION FORCE PATTERNS AFTER ACL RECONSTRUCTION: A LOADSOL-BASED ANALYSIS
Presenter(s): Zachary Underwood
Category: Kinesiology
Mentor(s): Corey Grozier (College of Education)

Psychological factors following anterior cruciate ligament reconstruction (ACLR), particularly kinesiophobia, have been linked to poorer functional outcomes and delayed return to activity. Although fear of movement has been associated with biomechanical deficits, it remains unclear which aspects of gait mechanics are most affected. This study examined whether stance-phase vertical ground reaction force (vGRF) waveforms differ between individuals with high and low kinesiophobia 6-9 months after ACLR. Twenty-one individuals between six and nine months post-unilateral ACLR participated (age: 19.70 ± 5.56 years; height: 169.60 ± 9.41 cm; weight: 71.46 ± 13.05 kg; females = 13). Kinesiophobia was assessed using the Tampa Scale of Kinesiophobia-11 (TSK-11), and participants were categorized into high and low kinesiophobia groups using the median score (cutpoint = 20). Stance-phase vGRF during self-selected walking was collected using a Loadsol in-shoe force-sensing system along a 10-m walkway. Force data were normalized to body weight and time-normalized to 101 points, and waveform differences were evaluated using statistical parametric mapping two-sample t-tests. The mean peak stance-phase vGRF across participants was 1.16 ± 0.09 body weights. No significant differences in vGRF waveforms were observed between high and low kinesiophobia groups at any point in stance ($p > 0.05$). These findings suggest that kinesiophobia does not meaningfully influence stance-phase vertical loading during walking 6-9 months after ACLR, indicating that fear of movement may not contribute to gait loading deficits at this stage of recovery.

SPONTANEOUS OBJECT CARRYING DURING THE TRANSITION TO INDEPENDENT WALKING
Presenter(s): Anna Patel, Sumedha Dondapati, Talia Wallis
Category: Kinesiology
Mentor(s): Mei Hua Lee (College of Education), Promise Robinson (College of Education)

Infants frequently carry objects during everyday exploration, often holding them "just to carry" without a specific goal. As infants begin to walk, they often integrate previously acquired manual skills, such as holding objects, with their emerging locomotor abilities, raising questions about whether carrying remains purely exploratory or becomes goal-directed (e.g., giving objects to caregivers). Carrying objects while walking creates a dual-task demand that challenges stability and coordination because infants must divide attention and manage both tasks simultaneously. The purpose of this study was to examine

how spontaneous object carrying influences walking performance during the transition to independent locomotion, and to characterize the sequence patterns of carrying bouts (infants' behavior before, during, and after each carrying episode) to determine if infants carry "just to carry" or pursue specific destinations. Infants were observed in their natural home environments through 4-hour video sessions conducted 1-2 times per week, every other week. Video data was coded using Datavyu, an open-source behavioral coding software, to identify when infants were standing and walking with and without objects, as well as the before-during-after carrying sequences. We hypothesize that infants' pre-walking tendency to carry objects "just to carry" will persist into early walking, producing individualized strategies that both challenge and support locomotor stability. Specifically, we predict spontaneous sequences early in the transition to independent walking, gradually shifting toward goal-directed patterns (caregiver delivery) as walking matures. Results will reveal how spontaneous object carrying shapes independent walking development.

KNEE INFLAMMATION MAGNITUDE BY GRAFT TYPE FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Presenter(s): Faith Persyn, John Morrison
Category: Kinesiology
Mentor(s): Matthew Harkey (College of Education)

Following ACLR, effusion-synovitis, or knee inflammation, may persist beyond the immediate postoperative period and contribute to post-traumatic osteoarthritis. Surgical factors, including graft selection, may influence postoperative inflammatory responses. Therefore, this study aimed to examine whether graft type and selected demographic characteristics were associated with higher-grade knee inflammation between six- and nine-months following ACLR. A total of 18 participants who underwent primary ACLR between six- and nine-months prior were included (44.4% female; age = 18.1±2.5 years; height = 171.8±8.6 cm; weight = 74.4±12.4 kg; time since surgery = 6.7±0.6 months). Participants were classified by graft type, including hamstring (n=7), patellar tendon (n=4), and quadriceps tendon (n=7) autografts. Ultrasound imaging of the ACLR limb was performed with participants supine and the knee flexed between 20-30° to evaluate effusion-synovitis using the validated OMERACT ultrasound grading scale (0-3). Higher-grade inflammation was defined as OMERACT grades 2-3. Reduced multivariable Firth penalized logistic regression examined associations between graft type, age, and sex with higher-grade effusion-synovitis. Higher-grade effusion-synovitis was present in 38.9% of participants. The prevalence of OMERACT grade 2-3 inflammation was 42.9% in the hamstring group, 25.0% in the patellar tendon group, and 42.9% in the quadriceps tendon group. Reduced Firth penalized logistic regression did not identify significant associations between graft type, age, or sex and higher-grade effusion-synovitis (all $p>0.05$). Graft type, age, and sex were not associated with higher-grade knee inflammation between six- and nine-months following ACLR. Larger studies are needed to further clarify factors contributing to persistent postoperative inflammation.

EXAMINING AGE AND GENDER DIFFERENCES IN THE TRANSFER OF LIFE SKILLS LEARNED THROUGH SPORT TO SCHOOL AND HOME CONTEXTS IN BOTSWANA & MICHIGAN YOUTH
Presenter(s): Aarushi Lokhande
Category: Kinesiology
Mentor(s): Emily Hayashi (College of Education), Madison Chambers (College of Education)

Life skills are critical to youth development and can be developed through sport participation. However, the processes supporting life skills transfer to contexts such as school and home remain poorly understood. This study examined moderators of specific life skills (time management and emotional skills) development in sport and their transfer beyond sport, with particular attention to age, sex, sport type, and cultural context. This survey-based study assessed life skills in youth athletes (N = 206; Mage = 15 years; SD =1.86) from Michigan (N = 160) and Botswana (N = 46). Multivariate analysis of variance was used to examine age, sex, and sport type as predictors of emotional skill transfer to school and home contexts. Consistent with life skills transfer theory, results indicated that age, sex, and sport type were not significant predictors of emotional skills or time management transfer. Follow-up univariate analyses revealed a significant age effect for time management, with older adolescents more likely to transfer these skills from sport to school. No significant age effects emerged for transfer to the home context, potentially reflecting contextual differences between school and home environments. Consistent with the PYD framework, this suggests that emotional skills development and transfer are distinct processes shaped by developmental and cultural context. Findings underscore the need for developmentally and culturally responsive sport-based interventions that intentionally support the transfer of emotional skills beyond the sport context.

THE INFLUENCE OF SOCIOECONOMIC STATUS ON STRENGTH RECOVERY AND PATIENT-REPORTED OUTCOMES AFTER ACL RECONSTRUCTION
Presenter(s): Jenna Lee
Category: Kinesiology
Mentor(s): Corey Grozier (College of Education), Ian Frederick (College of Education)

Introduction: Anterior cruciate ligament injury and reconstruction (ACLR) can be influenced by neighborhood-level socioeconomic disadvantage, with functional outcomes varying by resource availability. This study compared single-limb hop (SLH) performance of the ACLR limb across four groups defined by International Knee Documentation Committee (IKDC) scores and Area Deprivation Index (ADI) values. Methods: 194 participants (Weight:76.9±18.1kg, Height: 174.0±9.4cm, Age: 19.8±5.0 years, TOS: 6.9±1.2) were evaluated within the current study. Participants completed five SLH trials for distance on both the involved and uninvolved limbs, with a limb symmetry index (LSI) calculated for each limb. Participants completed the IKDC to assess self-reported knee function, with scores dichotomized into high and low knee function using a validated threshold of 76.2. ADI values then were derived from participants' ZIP codes and dichotomized into high (6-10) or low (0-5) neighborhood deprivation groups. Group differences in LSI outcomes were evaluated across the four groups using a one-way ANOVA, with Tukey post-hoc comparisons performed if ANOVA outcomes were significant ($p < 0.05$). Results: Significant differences were observed between groups ($p < 0.001$). Post-hoc comparisons indicated

differences between Groups 1 and 3 ($p < 0.001$), Groups 2 and 3 ($p = 0.004$), and Groups 1 and 4 ($p = 0.010$), with Group 3 demonstrating lower SLH values relative to Groups 1 and 2.Discussion: Findings indicate socioeconomic deprivation and IKDC scores should be considered when designing post-ACLR rehabilitation programs, possibly optimizing recovery outcomes as these scores may affect knee function in ACLR patients.

FALLS AS LEARNING OPPORTUNITIES FOR INFANTS DURING THE TRANSITION TO INDEPENDENT WALKING
Presenter(s): Layna Wustman, Sofia Briggs, Talia Wallis
Category: Kinesiology
Mentor(s): Mei Hua Lee (College of Education), Promise Robinson (College of Education)

Falls are a common feature of early locomotion in infants and may serve as important learning opportunities that contribute to improvements in gait and balance. Rather than representing simple motor errors, falling may provide infants with feedback that helps them refine their movements and adjust their behavior. Previous research suggests that infants can learn from falling experiences, although the way this learning is expressed may vary across individuals. The purpose of this study was to examine how fall frequency and recovery behaviors change as infants progress toward independent walking. Infants were observed in their natural home environments beginning when they could stand independently for at least 10 seconds and continuing through the onset of independent walking. Four-hour video-recorded sessions were conducted 1-2 times per week, every other week, until the infant achieved 10 consecutive unsupported steps. The onset of walking was defined as the first occurrence of 10 continuous independent steps. Video data were coded using Datavyu, an open-source behavioral coding software. Based on prior research, we hypothesize that fall frequency will decrease across sessions as infants gain locomotor experience. We also predict changes in behaviors before and after falls, including adjustments in movement patterns and recovery strategies, reflecting the role of falling as a learning mechanism during the transition to independent walking.

PREDICTING SEWING TASK PERFORMANCE USING HUMAN ABILITIES
Presenter(s): Abby Aardema
Category: Kinesiology
Mentor(s): Joshua Vicente (College of Education), Rajiv Ranganathan (College of Education)

Individuals learn tasks in ways different: some performance improvement can be accounted for by task-specific practice, while others rely on general human abilities that encompass cognitive, perceptual-speed, or psychomotor processes. These abilities may predict how an individual sequences or executes a task, allowing us to save resources on training, speed up productivity, and target teaching methods that reach an individual. Our study looks at whether an abilities assessment battery can predict performance outcomes for novices in a sewing task. 40 individuals were recruited and went through an abilities battery (based on U.S. occupational data), including assessments for abilities such as dexterity, memory, and reaction time. After this, participants were asked to complete a work sample and undergo seven

sewing performance trials. For data analysis, we video-coded each attempt to get detailed performance outcomes such as time, behavior frequency, and behavior duration. We then examined correlations between these performance outcomes and our ability assessments scores. Preliminary findings show that dexterity and mental rotation abilities are crucial predictors for starting and final performance outcomes in novice users. These findings suggest that assessing human abilities can predict performance outcomes both before and after learning, and can potentially be used for tailoring of training strategies in work settings.

SEGMENTATION STRATEGIES IN MOTOR SEQUENCES: A REAL-WORLD EXAMPLE USING SEWING
Presenter(s): Jaini Gandhi
Category: Kinesiology
Mentor(s): Rajiv Ranganathan (College of Education)

Motor sequence research has largely relied on tasks composed of brief, fixed-order events (e.g., keypress paradigms), which limit the ability to study how people flexibly organize longer, real-world actions. This project asked two linked questions: (1) does increasing task complexity lead to more segmentation in a state-based motor sequence, and (2) does segmenting a sequence more finely actually make people faster, or can different strategies yield similar performance? To examine this, we used an industrially relevant sewing context that constrains the order of actions but still allows multiple temporal solutions. Participants were employees at an apparel manufacturing plant and were asked to perform two standardized sewing tasks using an industrial sewing machine - a straight stitch and a curved stitch. Performances were video-recorded, and the temporal sequence was coded into three different behavioral categories (Preparation, Alignment and Execution) using BORIS. From these annotations, several strategy metrics were computed. The more complex curved stitch elicited reliably greater segmentation than the straight stitch, confirming that task demands push performers to interleave Alignment and Execution more frequently. However, segmentation was only weakly correlated with total completion time, indicating that operators could reach comparable performance through distinct strategy profiles, either with fewer, longer segments or more, shorter segments, provided their per-step pace was high. We argue that this sewing-based paradigm broadens sequence-learning research to behaviors with finite-duration states and demonstrates that variation in segmentation is not merely "noise" but a meaningful expression of individual constraints and trainable skill, with implications for adaptive instruction in industrial settings.

ASSOCIATION BETWEEN KINESIOPHOBIA AND SINGLE-LEG HOP SYMMETRY FOLLOWING ACL RECONSTRUCTION
Presenter(s): Nikunj Dixit
Category: Kinesiology
Mentor(s): Ian Frederick (College of Education), Matthew Harkey (College of Education)

Kinesiophobia, or fear of movement, is a psychological factor that may influence functional performance following anterior cruciate ligament reconstruction (ACLR). Fear of movement is commonly assessed

using the Tampa Scale of Kinesiophobia-11 (TSK-11) and may affect rehabilitation outcomes. Functional performance is frequently evaluated using the single-leg hop test, which provides insight into lower limb strength, stability, and symmetry. However, the relationship between fear of movement and hop symmetry remains unexplored. The purpose of this study was to examine the association between kinesiophobia and single-leg hop limb symmetry in individuals following ACLR. This study included 182 participants (age = 21.6 ± 8.9 years, height = 171.0 ± 8.7 cm, weight = 75.0 ± 17.5 kg) who completed the TSK-11 questionnaire and performed a single-leg hop test. Hop distance was recorded for both limbs, and limb symmetry index (LSI) was calculated by normalizing the involved limb hop distance to the uninvolved limb. Pearson correlation and linear regression analyses were conducted to examine the relationship between TSK-11 scores and hop symmetry. TSK-11 scores were weakly negatively correlated with hop symmetry ($r = -0.14$). Linear regression indicated that higher fear of movement was associated with lower hop symmetry ($\beta = -0.49$), although the relationship is not statistically significant ($p = 0.057$). These findings suggest a trend toward reduced hop symmetry among individuals reporting greater fear of movement. These findings contribute to emerging evidence that psychological factors such as kinesiophobia may influence functional recovery following ACLR and support the integration of psychological assessment in rehabilitation.

THE PHYSIOLOGY OF THE 4-MINUTE MILE
Presenter(s): Dylan Distelrath, Elizabeth Anderson
Category: Kinesiology
Mentor(s): Chad Wiggins (College of Education)

The four-minute mile represents a historic benchmark in middle-distance running and a valuable physiological reference for evaluating the limits of human performance. Therefore, we used mathematical modelling approaches to estimate the physiological demands associated with the first sub-four-minute mile using Sir Roger Bannister's anthropometric and laboratory data. Bannister completed the mile in 3:59.4 on May 6, 1954. Prior to accomplishing the sub-four-minute result, laboratory testing recorded Bannister's maximal oxygen uptake (VO?max) at approximately 5.3 L·min?1 (77.9 mL·kg?1·min?1). Assuming an average race intensity of ~94% VO?max, mean oxygen uptake during the performance would have approached ~5.0 L·min?1 (73 mL·kg?1·min?1). Using the Fick principle (V?O? = Q? x arterial -venous O? difference), we derived key physiological variables necessary to support this oxygen demand, including maximal heart rate, stroke volume, cardiac output, arterial oxygen partial pressure (PaO?), arterial oxygen saturation (SaO?), hemoglobin concentration, and mixed venous oxygen content (C?O?). These estimates indicate that Bannister's performance depended on a high capacity for oxygen transport and utilization, supported by a large stroke volume, consistent with his documented cardiac enlargement. High hemoglobin concentration relative to body size, and substantial oxygen extraction by the skeletal muscles. Compared against this physiological profile, the four-minute mile appears to require not only a high relative VO?max, but also the ability to sustain a near-maximal fraction of aerobic power throughout the race. This work provides a physiologically grounded framework for understanding the metabolic demands of the first sub-four-minute mile performance.

MILES, MUSCLES, AND CARTILAGE: DO STRONGER QUADS SUPPORT KNEE JOINT HEALTH IN DIVISION I RUNNERS?
Presenter(s): Katie Carothers
Category: Kinesiology
Mentor(s): Corey Grozier (College of Education), Matthew Harkey (College of Education)

Division I cross-country runners experience high training volumes and repetitive loading at the knee joint. Quadriceps strength may help attenuate joint forces during running and support cartilage health. The purpose of this study was to examine the association between quadriceps extension strength and femoral cartilage thickness in Division I cross-country runners. Nineteen Division I cross-country athletes (age: 19.68 ± 1.67 years; height: 169.16 ± 5.04 cm; weight: 59.21 ± 6.53 kg; 68.4% female) underwent ultrasound imaging to assess femoral cartilage thickness with the knee in maximal flexion. Mean cartilage thickness was quantified using image analysis software. Quadriceps extension strength was assessed using dynamometry across five maximal trials per limb. Linear regression analyses examined the association between limb-specific extension torque and corresponding cartilage thickness. Extension strength demonstrated positive but non-significant associations with cartilage thickness in both limbs. Right extension strength was associated with right cartilage thickness ($\beta = 0.230$, 95% CI: −0.014 to 0.474, $p = 0.063$), while left extension strength was associated with left cartilage thickness ($\beta = 0.150$, 95% CI: −0.021 to 0.321, $p = 0.081$). Quadriceps extension strength demonstrated positive trends with cartilage thickness but did not reach statistical significance. These findings suggest that greater muscular strength may contribute to cartilage maintenance in endurance of athletes, though additional factors likely influence cartilage morphology. Larger studies are needed to further clarify the relationship between strength and cartilage health in high-volume runners.

EXPERT GUIDED LEARNING FOR LEARNING NOVEL MOTOR SKILLS
Presenter(s): Anna Elmquest, Morgan Waggoner
Category: Kinesiology
Mentor(s): Brian Fox (Rosalind Franklin University), Rajiv Ranganathan (College of Education)

Learning complex motor skills often requires an expert, who generally provides instruction or feedback. However, certain safety-critical contexts require the expert to collaboratively and guide the novice during learning, such as when learning how to drive. This question is particularly relevant for individuals learning to operate robotic prosthetics or assistive devices. It has been debated whether such expert-guided learning is beneficial because while it results in improved task performance and safety, it may be detrimental to learning if the expert takes over too much of the control during collaboration. Here, we tackled this approach by using an adaptive strategy where we decreased the task contribution of the expert gradually as learning progressed. Participants performed a novel task where they were asked to use upper body movements to control a cursor on a screen to various targets located around the screen. Participants were assigned to either a 'solo' group that performed the training on their own, or the Adaptive group that performed the training with an expert. Training consisted of 160 reaches to the targets, and learning was measured by examining novice performance in test blocks consisting of 24 reaches to the targets. Our findings indicate that the Solo group acquired the task at a faster rate than

the Adaptive group. Given that the ultimate objective for individuals learning to use assistive devices is independent and proficient operation, our research suggests that solo learning is a more effective strategy for enhancing performance if safety is not a primary concern.

GRAFT SPECIFIC QUADRICEPS AND HAMSTRING STRENGTH RECOVERY TRAJECTORIES FOLLOWING ACL RECONSTRUCTION
Presenter(s): Colleen Kubisiak, Jessica Tolzman
Category: Kinesiology
Mentor(s): Jessica Tolzman (College of Education)

Quadriceps and hamstring weakness are common following ACL reconstruction (ACLR). Graft selection may influence postoperative strength recovery. The purpose of this study was to compare quadriceps and hamstring strength recovery trajectories over time among individuals with quadriceps tendon (QT), hamstring tendon (HT), bone-patellar tendon-bone (BPTB), allografts. 292 individuals underwent an ACLR with QT, HT, BPTB, allografts. Quadriceps and hamstring strength assessment utilized peak isokinetic knee extension and flexion torque of the involved limb. Outcomes were categorized into 4-5.9,6-8.9,9-11.9,and ≥12 months post-surgery. Linear mixed models compared strength recovery trajectories by graft type, adjusting for rehabilitation dose. Individual data were plotted with group means and 95% confidence intervals. Quadriceps strength, a significant time × graft interaction ($p < 0.001$) and main effect of time ($p < 0.001$) were observed, with no main effect of graft type ($p = 0.25$). Quadriceps strength increased from 4-5.9 months to later time points, and between-graft differences were observed only at 6-8.9 months, where the HT group demonstrated greater strength than the BPTB and QT groups ($p < 0.05$). For hamstring strength, no between-graft differences were detected (all $p > 0.05$). BPTB, HT, and QT grafts improved significantly over time (all $p < 0.05$), allograft group showed no significant change ($p = 1.00$). Graft type affected the trajectory of quadriceps recovery early post-surgery; trajectory difference reduced across later time points. Early graft specific strength interventions should be implemented, at later stages programs can transition to a more generalized format.

A SOCIAL-NORM APPROACH TO REDUCING ANTISOCIAL PARENT BEHAVIORS AT HIGH SCHOOL SPORT EVENTS.
Presenter(s): Megan Riley
Category: Kinesiology
Mentor(s): Jeemin Kim (College of Education)

Antisocial parent behaviors in youth sports (e.g., yelling at officials or athletes) are often portrayed as common in popular media and parent education materials. Portraying these behaviors as common may be problematic because individuals may be more likely to engage in an antisocial behavior if they believe that such behavior is socially normative (i.e., common). The present study examined whether a social norms intervention that emphasizes positive parent behaviors as the norm can reduce psychological precursors to antisocial conduct. Using an online randomized experimental design, sport parents were assigned to receive one of two messages: (1) a social norms message highlighting that the majority of

parents engage in positive sideline behaviors (e.g., "Most parents stay positive on the sidelines, even when games do not go their way"), or (2) a control message providing general information about the role of parent behavior in youth sports (e.g., "Positive parent behaviors play a key role in shaping the youth sport environment"). Following exposure, participants reported perceived guilt associated with engaging in antisocial behaviors and intentions to engage in antisocial behaviors. It is hypothesized that participants in the social norms condition will report greater perceived guilt and lower intentions to engage in antisocial behaviors compared to those assigned to the control condition. Findings may inform more effective, evidence-based parent education strategies aimed at promoting positive youth sport environments.

IDENTIFICATION OF SEX-SPECIFIC CLINICAL THRESHOLDS FOR ISOKINETIC QUADRICEPS STRENGTH FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Presenter(s): Faith Persyn
Category: Kinesiology
Mentor(s): Corey Grozier (College of Education), Matthew Harkey (College of Education)

Introduction Anterior cruciate ligament (ACL) injury commonly results in reconstruction (ACLR), with quadriceps strength recovery serving as a key rehabilitation target. Because the relationship between objective strength and patient-reported knee function may differ by biological sex following ACLR, this study aimed to identify sex-specific isokinetic quadriceps strength thresholds associated with acceptable self-reported knee function between six- and twelve-months post-ACLR. Methods A total of 541 participants from the ACL Reconstruction and Rehabilitation Outcome Workgroup (ARROW) registry were included if they underwent primary ACLR and completed normalized isokinetic quadriceps strength testing and the International Knee Documentation Committee (IKDC) subjective form. Concentric knee extension torque of the involved limb was assessed at an angular velocity of 90°/s and normalized to body mass (Nm/kg) to account for interindividual variability. Acceptable self-reported knee function was defined using a validated IKDC threshold of ≥76.2. Receiver operating characteristic (ROC) curve analyses were performed to identify optimal quadriceps strength cutpoints overall and separately between males and females. Results Within the overall sample of 541 participants, quadriceps strength demonstrated modest discrimination between participants with and without acceptable self-reported function (AUC=0.638), with an optimal threshold of 1.375 Nm/kg. Whereas sex-stratified analyses showed greater discriminative accuracy in females (n=290, AUC=0.664; threshold=1.375 Nm/kg) compared to males (n=251, AUC=0.583; threshold=1.385 Nm/kg). Conclusion Isokinetic quadriceps strength demonstrates moderate discriminatory ability for identifying acceptable self-reported function following ACLR, with strength thresholds varying across sex groups. These findings underscore the value of individualized strength benchmarks to support clinical decision-making and progression of return-to-activity during post-ACLR rehabilitation.

PATELLAR, HAMSTRING, AND QUADRICEPS TENDON GRAFTS SHOW SIMILAR EARLY OSTEOARTHRITIS SYMPTOM PROFILES AFTER ACL RECONSTRUCTION

Presenter(s): Isabela Griwatsch
Category: Kinesiology
Mentor(s): Jessica Tolzman (College of Education), Matthew Harkey (College of Education)

Introduction: Anterior cruciate ligament reconstruction (ACLR) is associated with an increased risk of developing early osteoarthritis (OA). While surgical graft choice has been shown to influence biomechanical and functional outcomes following ACLR, its association with early OA symptom development remains unclear. Therefore, the purpose of this study investigated whether graft type predicts early OA symptom development following ACLR. Methods: A total of 266 participants, approximately 6 ± 1 months post-ACLR were included. Participants received bone-patellar tendon-bone (BPTB), hamstring tendon (HT), or quadriceps tendon (QT) autografts. Early OA symptoms were classified using modified Luyten criteria, defined as Knee Injury and Osteoarthritis Outcomes Score (KOOS) subscale scores ≤85 in at least two of the four domains (pain, symptoms, activities of daily living (ADL), and Quality of Life (QoL)). Chi-square and logistic regression analyses assessed associations between graft type and early OA symptom prevalence. Results: Overall, 219 participants (82.3%) met the criteria for early OA symptoms. Prevalence was high across all graft types with 89.4% of BPTB, 80.2% of HT, and 78.3% of QT recipients classified as symptomatic. No significant association was observed between graft type and early OA symptom development using chi-square ($p = 0.22$) nor logistic regression ($p = 0.19$) analyses. Conclusion: A high proportion of participants reported early OA symptoms within six months of ACLR independent of graft selection. These findings suggest that graft type does not significantly influence early OA-related symptom development. This highlights the need for longitudinal studies to better characterize the progression of early OA following ACLR.

DIFFERENCES IN VESTIBULAR AND OCULAR-MOTOR BASELINE SYMPTOMS BETWEEN CONTACT AND NON-CONTACT SPORT COLLEGIATE ATHLETES

Presenter(s): Jacqueline Sublin, Willa Taylor
Category: Kinesiology
Mentor(s): Lili Klein (College of Education)

Purpose: To determine differences between contact and non-contact sport collegiate athletes in baseline Vestibular Ocular Motor Screen (VOMS) performance. Methods: A cross-sectional study of Division I collegiate athletes was conducted. Participants competing at the NCAA Division I level at Michigan State University (ages 18-25) were given a baseline concussion assessment during the preseason. Demographics, current sport, medical history were self-reported, and the VOMS test was conducted. VOMS change scores were calculated by subtracting the post-test symptom score from the pretest symptom score. Athletes were categorized into contact (e.g., football, hockey) and non-contact (e.g., gymnastics, baseball) groups. Groups were compared using a one-way multivariate analysis of variance (MANOVA). Follow up analyses of significant findings using univariate ANOVAs were conducted. Statistical significance was set at $p<0.05$. Results: A total of 213 athletes (138 female, age=19.4±2.9) were included with 163 (76.5%) non-contact sport athletes and 50 (23.5%) contact sport athletes. Results

revealed a significant multivariate effect of group on baseline test performance, F(3,208)=2.69 p<0.047, Wilks' Lambda=0.96, partial η2=0.04. Univariate ANOVAs revealed that Near Point Convergence (NPC) distance was the only test significantly lower for contact sport athletes (p=0.02, partial η2=0.03,mean?=1.06). Discussion: Contact sport athletes had lower mean NPC average scores than non-contact sport athletes, however other VOMS outcomes were insignificant. This suggests that contact and non-contact sport athletes likely have similar baseline vestibular-oculomotor function, apart from NPC distance. Clinicians should account for pre-injury variability in NPC distance post-concussion for non-contact sport athletes, as increased NPC is a common indicator of concussion.

QUADRICEPS STRENGTH AND KNEE BIOMECHANICS DURING DROP VERTICAL JUMP LANDING IN POST-ACL RECONSTRUCTION PATIENTS: AN SPM ANALYSIS

Presenter(s): Jagger Wraalstad
Category: Kinesiology
Mentor(s): Matthew Harkey (College of Education)

INTRODUCTION: Following ACL reconstruction (ACLR), individuals exhibit aberrant landing mechanics and reduced quadriceps strength, both risk factors of secondary injury. Traditional analyses of strength and jump landing focus on discrete variables such as peak vertical ground reaction force (vGRF) and knee flexion angle (KFA), but do not capture changes throughout the entire jump landing phase. PURPOSE: Examine the relationship between quadriceps strength and jump-landing biomechanics post-ACLR using statistical parametric mapping (SPM). METHODS: 87 participants completed maximum-strength tests, with quadriceps peak torque normalized to body mass. Participants performed jumps onto force plates to record vGRF. Concurrently, KFA was measured using markerless motion capture during landing. vGRF and KFA waveforms were time-normalized to landing (0-100%) and ensemble averaged across trials. SPM omnibus tests were used to identify regions of the waveforms associated with quadriceps strength. Subsequently, SPM general linear models, adjusted for covariates, were used to further examine associations. RESULTS: Omnibus analysis identified significant GRF differences associated with ACLR-limb quadriceps strength from 9.6-99.9% of landing. Post-hoc analysis identified greater quadriceps strength was associated with higher vGRF at 13.7-69.4% and 72.3-91.6% of landing and greater KFA at 22.2-45.9%. DISCUSSION: During early landing, greater KFA suggests a less stiff landing strategy, allowing increased impact force attenuation. Concurrently, higher vGRF may reflect greater eccentric braking capacity with increased strength. Together, this may represent a more effective eccentric loading strategy, which could support joint loading and movement performance. As strength is a modifiable factor following ACLR, it may play an important role in shaping landing biomechanics.

ELASTIC-ASSISTED GAIT MECHANICS DURING INCLINE AND DECLINE WALKING: A CASE STUDY
Presenter(s): Ryan Hertz
Category: Kinesiology
Mentor(s): Clarence Nicodemus (College of Osteopathic Medicine), Ian Frederick (College of Education), Jessica Epstein (College of Osteopathic Medicine)

Aging is associated with gait abnormalities that become prevalent and prominent, affecting quality of life and correlating with a greater incidence of institutionalization and mortality. Further, there has been extensive research into gait-assistive devices that aim to ease the burden of walking. Moreover, 22.9% of at-home falls in the elderly occur on stairs. Nevertheless, the understanding of gait-assistive device biomechanics on inclined and declined surfaces remains limited. This case study examined one healthy individual walking on an inclined, flat, and declined AMTI treadmill with and without an elastic assistive device. The flat, incline, and decline settings were 0%, +10%, and -10% grade. The treadmill was set to a self-designated comfortable speed (2.5 MPH), and the Plug-In-Gait markerset was used to analyze gait biomechanics using a 10-camera Vicon motion capture system. The gait-assistive device was attached to the participant's shoes, hips, and knees to support walking. Peak vertical ground reaction forces (vGRF), averaged across ten gait cycles, increased with the assistive device across all conditions. During level walking, peak vGRF increased from 1.19±0.02 to 1.23±0.01 BW (left) and from 1.22±0.02 to 1.25±0.02 BW (right). Similar increases were observed during incline (1.14-1.21 BW) and decline walking (1.09-1.15 BW), with all comparisons showing higher peak vGRF with the device. Peak knee flexion was slightly greater with the device across all slopes (1.5-2° increase). This suggests the assistive device may increase vertical loading and swing-phase knee excursion during walking while preserving expected slope-dependent gait mechanics.

ASSOCIATION BETWEEN PHYSICAL ACTIVITY AND PERIPHERAL FAT IN FEMALES FOLLOWING ACLR
Presenter(s): Kate Mumford
Category: Kinesiology
Mentor(s): Matthew Harkey (College of Education)

Introduction: Accelerometer-based physical activity (PA) reflects the intensity and frequency of movement following anterior cruciate ligament reconstruction (ACLR). Peripheral Knee Fat (PKF) is defined as the subcutaneous adipose tissue surrounding the knee joint line. This study aims to evaluate the relationship between physical activity levels and PKF distribution in females six months following ACLR. Methods: 11 participants aged 14 to 35. Actigraph accelerometers were used to assess PA over seven days, with responses categorized as sedentary, light, moderate, and vigorous. To evaluate PKF thickness, ultrasound images were obtained of the medial and lateral joint lines of the ACLR and contralateral limb. Images were captured with the proximal tibial border, distal femoral border, and meniscus clearly defined. Peripheral fat distance was defined as the distance from the visceral border of the epidermis to the superficial aspect of the medial or lateral collateral ligament. Measurements were collected bilaterally at the distal femur and proximal tibia. Results: 11 participants were included (age: 20.9±5.36, height: 168±4.73 cm, weight: 70.0±14.4kg, months post-surgery: 6.42±1.81, ACLR limb peripheral fat: 0.62±0.19cm, contralateral peripheral fat: 0.59±0.17cm). There were no significant

differences in peripheral fat thickness in those who participated in physical activity for either the ACLR limb (p= 0.471 (moderate) and p= 0.396 (vigorous)) or the contralateral limb (p= 0.248 (moderate) and p= 0.270 (vigorous)). Conclusion: There was no association between PA and PFK thickness in females post-ACLR. Future research should evaluate factors such as graft type, rehabilitation programs, and the psychological aspects of recovery.

EFFECT OF ADHD AND STIMULANT MEDICATION ON BASELINE PERFORMANCE AMONG COLLEGIATE ATHLETES
Presenter(s): Lia Baudon, Teya Coyle
Category: Kinesiology
Mentor(s): Tracey Covassin (College of Education)

Purpose: To examine how diagnosed ADHD and stimulant medication use impacts baseline test performance in Division I collegiate athletes. Methods: A prospective study of collegiate athletes who completed preseason baseline testing was conducted. Participants self-reported diagnosed ADHD, current medications, and completed a baseline assessment battery (SCAT6/VOMS). Participants were grouped by ADHD and medication status (ADHD/medication, ADHD/no medication, no ADHD/no medication). Symptom severity, VOMS total score, VOMS change score, and SCAT6 total score were compared using a one-way multivariate analysis of variance (MANOVA).Follow-up analyses of significant findings using three univariate ANOVAs and Tukey's tests were conducted. Statistical significance was set at $p<0.05$. Results: 980 collegiate athletes completing pre-season baseline assessments (470 [48.0%] female; age=20.1±1.5 years) were included; 876 (89.4%) no ADHD/no medication, 53 (5.4%) ADHD/medication, and 51 (5.2%) ADHD/no medication. Results revealed a significant multivariate effect of group on baseline test performance, $F(8,1920)=5.00$, $p<0.001$, Wilks' Lambda=0.96, partial $\eta 2=0.02$. Univariate ANOVAs revealed that ADHD and stimulant medication status was only significantly associated with symptom severity ($p<0.001$, partial $\eta 2=0.03$). Follow-up Tukey's tests found that the no ADHD/no medication group reported significantly less severe symptoms than ADHD/no medication ($p<0.001$, mean?=-3.9) and ADHD/medication groups ($p<0.001$, mean?=-3.4). No differences were found for medication status between the ADHD groups ($p=0.91$). Conclusions: There was a significant effect of ADHD on baseline reported symptom severity. Individuals without ADHD reported significantly lower baseline symptom severity than those with ADHD, regardless of medication status. Clinicians should be mindful of ADHD when interpreting preseason symptom reporting during post-injury evaluation.

HEALTH AND PHYSICAL ACTIVITY RELATIONSHIPS IN CHILDREN AND ADOLESCENTS WITH AND WITHOUT DISABILITIES: NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY 2003-2018
Presenter(s): Alaina Barringer
Category: Kinesiology
Mentor(s): Janet Hauck (College of Education)

Introduction: This exploratory study aimed to examine health and physical activity data in children and adolescents with and without disabilities using the National Health and Nutrition Examination Survey

(NHANES). NHANES collects health and nutrition data from adults and children in communities across the USA. Method: 25,351 participants (2,270 with disabilities; 33.2% female) under 18 years of age, some of which received early-on/special education services were included in this secondary data analysis, spanning from 2003-2018. Variables included body mass index (BMI), waist circumference, hip circumference, blood pressure (BP), TV/Video use, and physical activity (PA). For individuals with disabilities, relationships among the variables were examined using bivariate correlations. T-tests were used to examine differences among the variables between those with and without disabilities (SPSS Version 30.0). Results: For individuals with disabilities, moderate-to-vigorous-physical-activity (MVPA) was negatively associated with BMI (r=-.104, p=.001), waist circumference (r=-.101, p=.005), and BP (systolic r=-.159, p=.049; diastolic r=-.252, p=.001). Additionally, there was a significant difference between those with and without disabilities in BMI (and BMI category) [F=45.572 (1, 23112), p=.001], waist circumference [F=15.023 (1, 22319), p=.001], TV/video use [F=12.270 (1, 10908), p=.001], sedentary activity [F=88.230 (1, 4760), p=.001], and several PA related variables, with unhealthier values among those with disabilities.Implications: Children and adolescents with disabilities have several documented health disparities compared to their peers, with MVPA showing significant negative associations with those disparities. Additionally, individuals with disabilities are underrepresented and inconsistently defined among NHANES data, limiting generalization of findings and undermining the value of research in this population.

HIIT ON HEART FUNCTION VIA MRI
Presenter(s): Ally Nathan, Deedee Hernandez, Isabella Yu
Category: Kinesiology
Mentor(s): David Ferguson (College of Education), Michael Kim (College of Education)

Post natal growth restriction (PNGR) is associated with an increased risk for cardiovascular dysfunction and reduced exercise capacity. High Intensity Interval Training (HIIT) has been shown to improve cardiovascular function. The purpose of this study was to determine the effect of HIIT on PNGR mice cardiac structure and function. Two weeks prior to birth, mouse dams were randomly assigned to either a low protein diet (8%) or a normal protein diet (20%). Pups born to the normal protein dams were cross fostered to a different normal protein dam (control) or a low protein dam (PNGR). After 21 days, all offspring were weaned to a healthy normal protein diet. At day 44, a maximal exercise test was preformed to determine the exercise intensity's for HIIT. HIIT training was completed 5 days a week for 4 weeks. MRI analysis of the heart was performed at 72 days of age. An analysis of variance was used to compare the results, with the main effects being diet (control or PNGR), sex (male or female), or training (sedentary (SED) or HIIT). If significant, a Tukey's HSD post hoc test was run. Following HITT, cardiac output was reduced in PNGR mice (male: 13.680 ± 1.186 ml/min; female: 9.796 ± 1.703 ml/min) compared to control (male: 14.782 ± 1.496 ml/min; female: 12.704 ± 0.795 ml/min) ($P<0.05$); females were reduced compared to males, and SED was reduced compared to HITT. HIIT training was moderately effective at improving cardiac function in PNGR mice.

THE EFFECTS OF VOLUNTARY WHEEL RUNNING ON VO2MAX IN POSTNATAL GROWTH-RESTRICTED MICE

Presenter(s): Kaylee Bedell
Category: Kinesiology
Mentor(s): David Ferguson (College of Education), Michael Kim (College of Education)

Purpose: Postnatal growth restriction (PNGR) is associated with long-term impairments in physiological development and has been reported to blunt adaptations to exercise interventions. Previous studies demonstrated that PNGR mice show limited improvements in maximal work performance following voluntary wheel running. However, whether aerobic capacity remains responsive to voluntary physical activity in PNGR mice is unclear. Therefore, this study examined the effects of voluntary wheel running on maximal oxygen consumption (VO?max) in PNGR mice. Methods: Starting from 2 weeks before breeding, dams were split into groups to receive either a normal protein diet or a low protein diet. After birth, the pups born from the NP diet dams were cross fostered between the two groups of dams to yield classifications of controls or PNGR. 21 days after birth, the pups were weaned onto the normal protein diet and a week later, the controls and PNGR were assigned physical activity levels-sedentary or voluntary wheel running until postnatal day 56. All mice underwent VO?max testing at this point. Results: Both control and PNGR mice exhibited significant increases in VO?max following voluntary wheel running compared to their respective sedentary groups. These findings indicate that aerobic capacity remains responsive to voluntary physical activity despite previous evidence suggesting diminished exercise-induced adaptations in PNGR mice. Conclusion: These findings suggest that postnatal growth restriction does not completely abolish physiological responsiveness to exercise, and that aerobic capacity may remain a modifiable component of fitness in PNGR despite other reported limitations in exercise adaptation.

PHYSICAL INTENSITY AND PARTICIPATION OUTCOMES: RED BALL TENNIS IN COMPARISON WITH TRADITIONAL AND CARDIO TENNIS

Presenter(s): Megan Blake
Category: Kinesiology
Mentor(s): Jennifer Roth (College of Education), Karin Pfeiffer (College of Education), Keonyoung Chung (College of Education), Sanghoon Kim (Facility for Rare Isotope Beams)

Building on our prior study on the psychological outcomes of Red Ball Tennis participation (presented at UURAF 2025), this follow-up study extends the evidence by examining physical responses and comparing Red Ball Tennis with Traditional Tennis and Cardio Tennis. Specifically, the purpose of this study was to examine whether these three tennis program formats differ in physiological intensity, participant experiences, and future participation intention. Twenty-one participants enrolled in a tennis program and completed Red Ball, Traditional, and Cardio Tennis sessions while wearing a heart-rate watch. After each session, they completed a survey assessing perceived exertion, enjoyment, attitude, and future intention. All analyses were conducted in SPSS. Results showed no significant difference in average heart rate (beats per minute) between Red Ball (M = 114.76) and Traditional Tennis (M = 114.67), whereas Cardio Tennis (M = 125) elicited significantly higher heart rates than both. Participant experiences were

positive across formats. Enjoyment and attitudes were high for Red Ball (enjoyment: M = 4.30; attitude: M = 4.13), comparable to Traditional (M = 4.50; M = 4.40) and Cardio (M = 4.20; M = 4.00). Future intention was highest for Traditional (M = 4.50), followed by Red Ball (M = 4.00) and Cardio (M = 3.86). Overall, Red Ball Tennis appears to deliver physiological benefits comparable to Traditional Tennis while remaining easy to learn, helping counter the perception that "easier" tennis is less of a workout and providing practical evidence to support the USTA's promotion and implementation of Red Ball Tennis programming.

Late Breaking

EXPLORING ADOLESCENTS' BELIEFS, INFORMATION-SEEKING BEHAVIORS, AND PERCEIVED BARRIERS TO AVOID THC-INFUSED BEVERAGES: A QUALITATIVE INTERVIEW STUDY
Presenter(s): Allysen Davenport
Category: Late Breaking
Mentor(s): Mengyan Ma (College of Communication Arts Sciences)

With Tetrahydrocannabinol (THC)-infused beverages becoming more visible in legalized markets and adolescents increasingly exposed on digital platforms, it is critical to understand how adolescents perceive and navigate these products. Guided by the Integrated Behavioral Model (IM), this interview study examines adolescents' beliefs, information-seeking behaviors, perceived barriers of avoiding the products. Seventeen adolescents aged 15-17 were recruited locally to participate in in-person interviews. Findings indicate that adolescents hold cautious attitudes shaped by uncertainty, perceived risks, and limited product-specific knowledge, as well as broader concerns about health, addiction, and the normalization of cannabis-related products. Normative influences revealed strong parental disapproval contrasted with more fluid, context-dependent peer norms, while adolescents' confidence in avoiding use was situational, influenced by risk assessment, social support, routines, and environmental management. Many adolescents noted that peer normalization and social desirability could override caution. Information about these products was obtained from multiple sources, often passively, and evaluated selectively, with adolescents demonstrating developmental capacities for critical thinking consistent with their age. Barriers to avoidance were not singular but arose from social, environmental, and situational factors. The findings underscore the need for multi-source education, media literacy, accurate knowledge-building, regulatory oversight of advertising, and strategies to resist peer pressure, alongside guidance emphasizing that substance use is not a suitable approach for mental health challenges.

COLLISIONLESS MULTI-AGENT PATH PLANNING IN THE HAMILTON-JACOBI FORMULATION
Presenter(s): Huy Nguyen
Category: Late Breaking
Mentor(s): Christian Parkinson (College of Natural Science)

We present a method for collisionless multi-agent path planning using the Hamilton-Jacobi-Bellman equation. Because the method is rooted in optimal control theory and partial differential equations, it avoids the need for hierarchical planners and is black-box free. Our model can account for heterogeneous agents and realistic, high-dimensional dynamics. We develop a grid-free numerical method based on a variational formulation of the solution of the Hamilton-Jacobi-Bellman equation which can resolve optimal trajectories even in high-dimensional problems. In particular, we resolve the solution using a primal-dual hybrid gradient optimization scheme. We demonstrate the method using synthetic examples involving simple cars and quadcopter drones.

DISCOVERY OF MORPHOLOGICAL MUTANT WHILE SCREENING FOR ER STRESS SUPPRESSOR MUTANTS
Presenter(s): Brooke Brown
Category: Late Breaking
Mentor(s): Joanne Thomson (College of Natural Science)

Endoplasmic Reticulum (ER) stress is caused by a buildup of unfolded proteins in the ER and, if left unresolved leads to cell death. THESEUS1 (THE1) is a cell surface receptor like kinase known to be involved in ER stress. Under chronic ER stress, mutants of THE1 are more resistant to stress compared to WT. To understand how THE1 influences the ER stress response, we carried out an EMS screen using a THE1 overexpressing mutant (THE1OX). However, while screening for suppressor mutants, we discovered a fascinating morphological mutant with a distinct phenotype. When compared to our wild type control (Col-0) plants, a few key distinctions can be made. The mutant's siliques develop early and appear snubbed, with rounded ends, also containing fewer seeds. This mutant has less foliage on average, including a smaller and less dense rosette. Though it is not the suppressor mutant we aimed to find, this mutant likely reflects a new mutation that was introduced through the EMS treatment. The next stages of the experiment will focus on genetically characterizing this mutant via bulk segregation analysis and mapping the causal mutation.

AN INTERVIEW STUDY EXPLORING INTERNATIONAL STUDENTS' USE AND PERCEPTIONS OF CHAT-BASED AI TOOLS
Presenter(s): Xinling Xu
Category: Late Breaking
Mentor(s): Mengyan Ma (College of Communication Arts Sciences)

As artificial intelligence (AI) tools become increasingly integrated into people's everyday lives, international students studying in English-speaking countries may rely on these technologies to navigate various challenges, particularly those related to language limitations and cultural differences. Applying

the Integrated Behavioral Model (IBM), this study examines how international students use chat-based AI tools for communication, and their beliefs of AI use. Participants (N = 20) were recruited from a university student pool to participate in semi-structured Zoom interviews. Thematic analysis revealed that international students face multiple challenges while studying in English-speaking environments, including language barriers, differences in educational systems, and varying cultural and historical backgrounds. Participants reported using chat-based AI tools to assist with communication tasks such as editing emails and messages and checking the cultural appropriateness of their content. AI tools were also perceived to provide several benefits, including increased productivity and improved communication confidence. At the same time, participants expressed concerns regarding the accuracy and reliability of AI-generated responses, potential overreliance, ethical considerations, and privacy issues. Findings further suggest that international students perceive chat-based AI tools as widespread among their peers, while inconsistent policies across instructors contribute to uncertainty regarding what constitutes acceptable use. Overall, the study highlights the growing role of chat-based AI tools as accessibility support for individuals communicating in a second language and underscores the importance of broader conversations about recognizing and de-stigmatizing AI-assisted communication in both educational and everyday contexts. Keywords: International Students, Chat-based AI Tools, Beliefs, Interviews

EMS MUTAGENESIS SCREEN RESULTS IN PHENOTYPE MUTATION: SHORT ROOTS!
Presenter(s): Mia Perea
Category: Late Breaking
Mentor(s): Joanne Thomson (College of Natural Science)

Plants have mechanisms to deal with stressful environments and when the endoplasmic reticulum (ER) becomes overwhelmed, the unfolded protein response (UPR) is initiated. The UPR is a network that aims to resolve ER stress, but when the UPR fails or stress is prolonged, it initiates cell death. THESEUS1 (THE1) is a cell surface receptor kinase that is known to be involved in the ER stress response. Mutants of THE1 survive in chronic ER stress conditions compared to Columbia (Col-0). Ethyl methanesulfonate (EMS) mutagenesis is a tool to screen for suppressor mutations. Using a line that overexpresses THE1 (THE1OX), we carried out a forward genetic screen to identify THE1OX mutants resistant to chronic ER stress. During the screen, we instead discovered a mutant that we named Short Root Mutant 1 (SRM1). Photographs of 10-day-old seedlings show that SRM1 has shorter roots compared to Col-0. Our next steps are to backcross this mutant to WT and perform a bulk segregation analysis to identify the casual mutation and to characterize the gene responsible for SRM1's short root phenotype.

EARLY LIFE ADVERSITY EFFECTS ON MAST CELLS
Presenter(s): Alexandra Ward
Category: Late Breaking
Mentor(s): Alfred Robison (College of Natural Science)

Early life adversity (ELA) is associated with long-lasting changes in immune function and increased risk for inflammatory disease, but the molecular mechanisms behind these effects remain unclear. Mast cells are innate immune cells that drive allergic and inflammatory responses through IgE-dependent degranulation, releasing mediators such as histamine and cytokines. Evidence suggests that ELA can alter mast cell responsiveness, raising the possibility that stress-related transcriptional changes persist in mast cells after early life stress exposure. ΔFosB, a long-lasting transcription factor, is increased during mast cell activation, suggesting a potential link between mast cell functional state and ΔFosB-dependent transcriptional regulation. This project tests whether ELA increases ΔFosB expression in mast cells later in life and whether this is associated with epigenetic reprogramming. To investigate this, we use a neonatal maternal separation plus early weaning model (maternal separation 3 h/day from P1-P16, weaning at P17; controls weaned at P25). Mice were then returned to their home cages, bone marrow harvested at P60, and differentiated into bone marrow-derived mast cells (BMMCs). BMMCs were then activated by IgE-DNP, and ΔFosB expression was quantified at the protein level by western blot and at the transcript level by qPCR. We hypothesize that ELA causes changes in mast cell epigenetic programming that increases ΔFosB expression in BMMCs, linking early life stress to inflammatory neuroimmune outcomes.

PLANT GROWTH PROMOTION FROM THREE PSEUDOMONAS ISOLATES DURING ALKALINE STRESS
Presenter(s): Bethany Nolta
Category: Late Breaking
Mentor(s): Leah Knoor (College of Natural Science)

As the global climate changes, the pH of agricultural soils will change as well. This can be stressful for plants because nutrients including iron become unavailable at high pHs. Plants have a microbiome that is crucial to their health and plays a role in increasing their resilience to these soil changes. When the model plant Arabidopsis thaliana (Arabidopsis) is exposed to alkaline conditions, a family of compounds called coumarins are produced in the roots. These coumarins are essential for assisting in iron uptake and have been recently shown to modulate the root microbiome, yet the extent of this impact is still unknown. Here we tested closely related isolates Pseudomonas simiae WCS417, Pseudomonas sp.PvP003, and Pseudomonas sp.PvP006 for the ability to improve plant health during alkaline stress. In vitro, all isolates demonstrated production of iron-mobilizing siderophores. Because coumarins are selectively antimicrobial, we tested the isolates' ability to grow in the presence of these compounds and found varying degrees of resistance among them. Because of their ability to produce siderophores and survive in the presence of coumarins, we hypothesized these isolates would improve plant health outcomes in alkaline stress. To test this hypothesis, we inoculated Arabidopsis with these isolates in mono-association in both optimal and alkaline conditions. We used wild type Arabidopsis along with coumarin biosynthetic mutants (f6'h1) to further investigate coumarins' role in these interactions. We assessed biomass, root architecture, and visible coumarin production in roots. Wild type plants

experienced greater improvements in health outcomes in alkaline stress compared to coumarin biosynthetic mutants. These findings will better our understanding of constructing beneficial communities to better the health of crops experiencing alkaline stress.

RECONSTRUCTING THE ECOLOGICAL AND CULTURAL HISTORY OF NEWTON WOODS
Presenter(s): Christin Toney
Category: Late Breaking
Mentor(s): David Rothstein (College of Agriculture & Natural Resources)

Newton Woods is an 80 acre section of "old growth" forest located within Russ Forest in Marcellus, MI. Based on its perceived undisturbed condition, Newton Woods has been listed by the National Park Service as a National Natural Landmark and has been included in the Old Growth Forest Network which describes it as "one of the last remaining old-growth mixed hardwood stands in Michigan's Lower Peninsula." However, several lines of evidence suggest that the actual history of this tract is more complicated and interesting, including: 1) The largest, dominant trees in the stand are more light-demanding, disturbance-adapted species such as white oak, red oak, tulip poplar, and walnut, whereas more shade tolerant sugar maple and American beech are virtually all in smaller size classes, 2) At least one of the recently cut white oaks dates to the 1780s, well before European colonization of the area, and 3) the Michigan Natural Features Inventory's Pre European Vegetation map classifies the very northern strip of this tract and extending across many sections to the north and west as "Mixed-Oak Savanna." which represents an Indigenous, fire managed landscape. Together, these suggest that the current structure and composition of Newton Woods reflects a legacy of human disturbance arising from some combination of Indigenous land management and European colonization, rather than a "pristine" forest uninfluenced by people.

CONCEPTUALIZING AND CONTEXTUALIZING THE LEAF SHEEP
Presenter(s): Atlas OBrien, Michael Kwalton
Category: Late Breaking
Mentor(s): Jianping Hu (College of Natural Science)

The sacoglossan sea slug Costasiella kuroshimae, also known as the leaf sheep, presents a unique intersection of heterotrophic herbivory and autotrophic capability within marine ecosystems. This study conceptualizes the specialized ecological niche of C. kuroshimae by examining its reliance on kleptoplasty, a process wherein the mollusk sequesters functional chloroplasts from its algal food source. By retaining these stolen plastids, the leaf sheep effectively gains a significant metabolic advantage that allows it to synthesize its own sugars and survive during periods of nutrient scarcity. This research contextualizes the organism's specialized ecological role. Ultimately, this presentation illustrates how integrating functional physiological phenomena, such as kleptoplasty, with broader ecosystem dynamics provides a comprehensive understanding of specialized marine survival strategies.

RACIAL DIVERSITY IN CLINICAL SUBSTANCE USE DISORDER
Presenter(s): Jaidyn Choi
Category: Late Breaking
Mentor(s): Mallet Reid (College of Human Medicine)

Substance use disorder (SUD) affects 17% of adults in the United States, disproportionately affecting people of color (POC). POC also have more persistent SUD than White people and are more likely to die from drug overdose. Given these health disparities among POC, it is important to investigate whether clinical SUD research includes POC relative to their prevalence rates, to ensure that treatments are effective for non-White patients. We conducted a systematic review of all clinical SUD studies conducted in the United States in the past six years. Across 94 studies, the racial sample diversity was as follows: (53.14% White, 33.33% Black, 11.31% Latine, 5.60% multiracial, 4.74% AI/AN, 0.68% Asian, and 0.19% NHPI). Despite the higher prevalence and disorder burden for POC, White people comprise the majority of participants in clinical trials for SUD and across various SUD types, including opioid use disorder, methamphetamine use disorder, cannabis use disorder, and tobacco use disorder. Our findings show that clinical SUD research does not proportionately include POC relative to their prevalence, and thus, results from these studies may not generalize to POC. Therefore, clinicians may be providing patients with treatments that may not be effective for their needs, sustaining racial health disparities.

EFFECTS OF BINGE-EATING ON STRUCTURAL CONNECTIVITY BETWEEN RED NUCLEUS AND VENTRAL TEGMENTAL
Presenter(s): Charvi Bagewadi Ellur
Category: Late Breaking
Mentor(s): Chunqi Qian (College of Osteopathic Medicine), Zachary Fernandez (College of Osteopathic Medicine)

Binge-eating disorder (BED) is becoming recognized as a condition characterized by modifications in reward-related brain circuitry. Although functional alterations in dopaminergic pathways have been extensively documented, structural connectivity within midbrain reward circuits remains less understood. This study investigates the correlation between binge-eating vulnerability and structural variations in white matter connectivity between the red nucleus (RN) and ventral tegmental area (VTA), a circuit involved in dopaminergic regulation and reward processing. In a preclinical rat model, subjects were categorized as binge-eating prone (BEP) or binge-eating resistant (BER) and diffusion tensor imaging (DTI) methods were used to find that the rats show altered midbrain white matter which suggests structural differences in reward circuitry. Prior literature indicates that reward circuits are experience-dependent and structurally plastic, suggesting repeated binge-eating behaviors may induce measurable circuit-level remodeling. These structural differences may contribute to vulnerability by influencing dopaminergic signaling and reward sensitivity. Understanding RN-VTA connectivity in the context of binge-eating provides insight into circuit-level mechanisms underlying BED and highlights potential targets for future neurobiological interventions.

THE JUVENILE JUSTICE LANGUAGE PROJECT
Presenter(s): Annabelle Parrish
Category: Late Breaking
Mentor(s): Ron Pomper (College of Communication Arts Sciences)

The juvenile justice setting uses a specialized vocabulary with words that are unfamiliar to adolescents. Most interactions with juvenile court judges are brief and mostly consist of yes or no questions (Redlich et al., 2022). Additionally, many adolescents do not recognize when they misunderstand the meanings of words (e.g., believing "obey" means to break the rules), which can have drastic consequences (Sowerbutts, 2021). There is a clear need for measures systematically assessing children's comprehension of legal vocabulary terms. The current project addresses this need via two aims. First, to identify legal terms used in juvenile proceedings that are most likely to impact comprehension or understanding. Second, to develop questions to test comprehension of each term. We conducted a literature review of prior research and 35 legal appeal cases were analyzed to identify terms that were frequently misunderstood by the defendants. 105 terms were identified in total. Definitions were compiled using Black's Law Dictionary. We currently have developed 50 true/false questions and 50 vignette-based questions to test comprehension. The next step for this project will be a survey of juvenile parole officers and judges. Using likert scales, participants will rank the importance of each term and provide an estimated age of acquisition. Adolescents' comprehension will then be tested and compared against legal professionals' perceptions. Current assessments in legal settings focus primarily on competence to stand trial. The current project makes an important step towards the creation of a vocabulary assessment that is necessary to ensure equity in procedural justice.

PROLONGED EFFECTS OF DROUGHT STRESS ON JACK PINE GROWTH IN NORTHERN MICHIGAN
Presenter(s): Joshua Tinkham
Category: Late Breaking
Mentor(s): David Rothstein (College of Agriculture & Natural Resources), Joseph Young (College of Agriculture & Natural Resources)

Using a collection of over a hundred Jack Pine cores I've analyzed the growth per year and compared growth before and after significant droughts to understand the response Jack Pines have and how that influences mortality. Additionally using the data from a singular stand I've worked alongside Dr. Rothstein and his grad student Joe Young to sample recently killed specimens to compare their response to drought compared to healthy specimens. The results of this research indicate a significant correlation between pre drought and post drought growth averages (as taken 10 years before and after the drought). Additional findings revealed that increased variance in post drought growth and cell size could be an important indicator for post drought tree mortality as far as 20 years before their death.

NEW TECHNOLOGICAL AGE
Presenter(s): Chloe Francis
Category: Late Breaking
Mentor(s):

The research explores modern war in the context of the digital age, and what that means for a newfound future. Areas of focus: China, Russia, Ukraine, and Iran.

LISTENING TO LEARN: SUCCESSFUL COMMUNITY ENGAGEMENT IN LANSING
Presenter(s): Alayla Milow
Category: Late Breaking
Mentor(s): Kevin Brooks (University Outreach and Engagement)

As I approach the end of my second semester as an Undergraduate Research Assistant at the Center for Community and Economic Development, I was tasked with producing a reflective report that documented my accomplishments, challenges, and growth over the academic year. Through this process, I recognized that my training as a Mediated Communication student uniquely positioned me to engage effectively with communities, facilitate meaningful conversations, and collaborate across interdisciplinary teams. This presentation highlights how communication-centered skills, such as active listening, relationship-building, and adaptability, contributed to my research work and supported community-based engagement initiatives.

SINGULARITY FILM RESEARCH PROJECT
Presenter(s): Stella Govitz
Category: Late Breaking
Mentor(s): Troy Hale (College of Communication Arts Sciences)

Cameras are everywhere-at the coffee shop, outside the grocery store-there's even one in your pocket. Mass surveillance trends increased after WW2, with an executive order creating the US Office of Censorship. Following September 11 attacks in 2001, surveillance camera technology advanced dramatically. Currently, CNBC reported that there are one billion cameras worldwide. Through Ring cameras, large data centers and private interests-preventing crime is the supposed motivation behind increasing surveillance. This film explores who stands to gain from this surveillance, how humans interact with cameras and how artificial intelligence can impact it. The goal of this research film is to artistically explore invasive surveillance trends and technology and create discussion about whether it is helpful. Through a combination of finding archival and current materials, the film argues that, in fact, the increased surveillance is not in the interest of the people but instead corporations and the government. This is significant because it criticizes these actions and advocates for a less surveilled future.

REAL ENOUGH?
Presenter(s): Alex Fossano, Estelle Wiese, Isa Musters, Kara Svoboda, Lili Knorr, Olivia Gehrke, Sarah Marsac, Sophia Pauna
Category: Late Breaking
Mentor(s): Sheri Lewis (College of Arts & Letters)

Real Enough? explores how a group of young women in undergraduate studies navigate dominant societal expectations. The results of our creative inquiry fashions as a magazine that centers our diverse lived experiences as political, resistant, personal and as imaging new ways of being and becoming "woman". For our presentation, we share our magazine as findings from our exploration.

ANALYZING HASHTAG USE FOR KNOWLEDGE COMMONS ON LINKEDIN: AN EXPERIMENTAL STUDY OF ENGAGEMENT METRICS
Presenter(s): Morgan Myers
Category: Late Breaking
Mentor(s): Larissa Baca (College of Arts & Letters)

Knowledge Commons is an open-access publishing platform for humanities research, with its institutional home at Michigan State University. The project supports scholars in sharing openly accessible work and connecting with broader academic and public audiences. As social media plays an important role in promoting open scholarship, this project examines how intentional hashtag use on LinkedIn may influence engagement and content discovery for Knowledge Commons posts. The main research question guiding this project is: How does using intentional hashtags affect engagement and visibility for humanities-focused content on LinkedIn? Hashtags may help posts reach audiences beyond current followers, signal post topics (such as #Humanities, #OpenAccess, and #DigitalHumanities), and increase interaction through discovery. However, their impact on humanities outreach has not been clearly measured in this context. To test this, I will run two structured two-week social media campaigns for Knowledge Commons. Each campaign will include comparable posts (such as mission-focused content, brand awareness posts, and research highlights). One week will include intentional hashtag strategies, while the mirrored week will use similar content without hashtags. This approach allows for a direct comparison of engagement and visibility. Engagement metrics will be collected using LinkedIn's native analytics, including impressions, reactions, comments, and shares. These results will be analyzed and visualized to compare hashtag versus non-hashtag posts. The findings will provide practical insights into whether and how hashtag strategies can improve visibility and engagement for open humanities scholarship.

MECHANISM OF PERSISTENCE OF STAPHYLOCOCCUS AUREUS SMALL-COLONY VARIANTS
Presenter(s): Zahra Alrumayh
Category: Late Breaking
Mentor(s): Jonathan Hardy (College of Human Medicine)

Small-colony variants (SCVs) of Staphylococcus aureus are associated with persistent and chronic infections, yet the mechanisms underlying their long-term survival remain unclear. In this study, SCVs were derived from the parental Xen36 strain and examined to determine whether their persistence could be explained by enhanced biofilm formation and by increased antibiotic resistance. Antibiotic susceptibility was assessed using disk diffusion assay and biofilm formation was measured using crystal violet assay and bioluminescence imaging. Genome sequencing was also performed to identify mutations associated with the SCV phenotype. Although mutations in rplF and fusA were identified in the SCV isolates, the results showed that the SCVs did not display increased antibiotic resistance and did not form stronger biofilms than the parental strain. These findings suggest that neither enhanced biofilm formation nor antibiotic resistance is the primary mechanism of SCV persistence, indicating that other physiological adaptations contributed to their prolonged survival in the host.

ULTRASOUND-BASED ASSESSMENT OF INFRAPATELLAR FAT PAD CHANGES FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
Presenter(s): Krish Kothiya
Category: Late Breaking
Mentor(s): Matthew Harkey (College of Education)

The infrapatellar fat pad (IPFP) is implicated in joint inflammation and early post-traumatic osteoarthritis (PTOA) following anterior cruciate ligament reconstruction (ACLR). Echo-intensity (EI), derived from ultrasound imaging, may reflect early structural changes in the IPFP, while pre-osteoarthritis (pre-OA) illness-defined using Knee injury and Osteoarthritis Outcome Score (KOOS) subscales-serves as a patient-reported indicator of early disease expression. This pilot study aimed to characterize ACLR limb IPFP EI and between-limb asymmetry during early recovery and to explore differences by pre-OA illness status. Ten participants (7 female, 3 male; age: 20.0 ± 5.7 years) underwent bilateral IPFP ultrasound imaging at approximately 4.8 ± 1.0 months (V1) and 7.7 ± 1.8 months (V2) post-ACLR. ACLR limb EI and limb symmetry index (LSI) were calculated, and pre-OA illness was defined as meeting thresholds on ≥2 of 5 KOOS subscales. Within-subject changes were assessed using Wilcoxon signed-rank tests and paired t-tests, while between-group differences were described using Cohen's d with 95% bootstrap confidence intervals. Pre-OA illness prevalence decreased from 5/10 at V1 to 3/10 at V2. ACLR limb EI decreased from 54.4 ± 8.0 to 51.0 ± 12.7 (mean change: −3.5; d = −0.31, 95% CI [−1.61, 0.28]; p = 0.23). Between-limb asymmetry persisted at both timepoints, with higher EI in the ACLR limb (LSI: 10.2 ± 9.0% at V1; 6.6 ± 13.6% at V2). At V1, participants with pre-OA illness demonstrated higher EI compared to those without (57.0 ± 6.5 vs. 51.8 ± 9.2; d = 0.66), though confidence intervals were wide. These findings suggest that IPFP EI is elevated in the ACLR limb during early recovery and may be greater in individuals with pre-OA illness symptoms, with a small, non-significant reduction over time. This pilot work provides

preliminary effect sizes to inform larger studies investigating IPFP structure as an early marker of PTOA risk following ACLR.

Linguistics, Languages, & Speech

ANALYZING CHILDREN'S DISCOURSE RELATIONS IN CHILD LANGUAGE CORPERA
Presenter(s): Guilherme Roda, Sophie Motawi
Category: Linguistics, Languages, and Speech
Mentor(s): Cristina Schmitt (College of Arts & Letters), John Ryan (College of Arts & Letters)

This project examines child and child-directed adult speech data from the CHILDES corpora of child language (McWinney 2000). We investigate speakers' uses of "and" versus "and then" and "and so." "And" is a conjunction that does not have much inherent meaning, though it can be used to combine two clauses. Beyond this structural usage, "and" can constrain the set of possible discourse relations available to relate the two clauses in the discourse (Kehler 2002; Txurruka 2003). For example, when we say "Alice went to the hospital. She broke her arm," the second sentence could either be an explanation of the first, or a temporal continuation where the first precedes the second. However, when we say "Alice went to the hospital and broke her arm," the sentence can only easily have a temporal interpretation where she broke her arm after arriving at the hospital. Interestingly, there are ways to make the discourse relation between the two sentences even more clear by adding a disambiguator like "then" or "so" after "and" (e.g., "Alice went to the hospital and then broke her arm"), which forces a specific discourse relation like temporal contiguity. We ask two questions: (i) are children initially explicit in their marking of coherence relations, with connectives like "and then" or "and so" being produced at an earlier age than bare "and"? (ii) Do children's early uses of "and" with or without disambiguators match in type and frequency to what they hear in their input (i.e., from their parents)?

ANTI-RACISM, ANTI-CAPITALISM, AND AFRICAN AMERICANS: THE PROPAGANDISTIC EXPLOITATION OF THE BLACK MAN IN SOVIET LITERATURE, CINEMA, AND SOCIETY
Presenter(s): David Rabinkov
Category: Linguistics, Languages, and Speech
Mentor(s): Jason Merrill (College of Arts & Letters)

My presentation will explore how Soviet political institutions instrumentalized Black identity, most notably that of Black Americans, as a symbol to be used in propaganda. Presentations of racial oppression in the United States in Soviet literature, cinema, and eventually, everyday social discourse, were magnified to depict a moral contrast between capitalist and socialist ideologies. The Soviet Union's portrayal of itself as an equal, discrimination-free society is further disproven by the inherently reductionary representations of Black Americans, which posited a complex group identity as a simple tool of rhetoric. This project is a comparative case study that analyzes a variety of literary sources, including the travel writings of Maxim Gorky and Vladimir Mayakovsky, and cinematic sources, such as

the cartoon (and poem) Mister Twister, as well as the experiences of Black Americans living in the USSR, to explore the significance of Black identity in Soviet propaganda. This project incorporates existing scholarly literature, particularly that of Meredith L. Roman, to strengthen its ultimate goal of making a clear distinction between emancipation-driven anti-racist ideology and the USSR's strategic exploitation of the Black American experience for regional self-justification.

DOES THIS PROBLEM NEEDS SOLVED OR SOLVING?
Presenter(s): Kay Humpert
Category: Linguistics, Languages, and Speech
Mentor(s): Alan Munn (College of Arts & Letters)

The verb "need" for all speakers of English can combine with an infinitive in the passive voice as in sentences like "The car needs to be washed". For many speakers of American English, including many from Michigan, the "to be" form is not obligatory, and speakers can also say "The car needs washed", with the same meaning. This form is usually considered to be "non-standard", in that speakers who don't have this form consider it to be wrong or bad English. For those speakers, another form without the "to be" can be used, but instead of using the passive participle -ed, these speakers use the so-called present participle -ing. They can say "The car needs washing", again with the same meaning. Some speakers allow both forms, but for many only one or the other is possible. Despite the fact that the -ing form is considered the "standard" form, it's actually the more linguistically odd one, since the present participle is not a passive, but acts as a passive in the "needs washing" construction. A further puzzle is that for all speakers a sentence like "I need the car washed" is acceptable, while "I need the car washing" is not. This research discusses the differences between the two constructions with an aim to understanding their syntax more fully.

**FROM K-POP TO K-BLOG: UNDERSTANDING KOREAN CULTURAL GENRES THROUGH CREATIVE TRANSLATION PROJECT **
Presenter(s): Tenaya Henderson
Category: Linguistics, Languages, and Speech
Mentor(s): Hala Sun (College of Natural Science)

To gain a deeper understanding of Korean society and culture, this project explores the unique methods of sharing information through popular and informative Korean textual and visual mediums. In comparison to typical North American media sources, Korean sources have cultural-specific language usage, viewer engagement methods, styles, and layouts for accessible readability. Many people who have had limited exposure to Korean culture, people, or informational mediums may be unfamiliar with these differences. This creative research project was conducted to bridge that gap and create a unique understanding of Korea through shared informational methods. Research was conducted by analyzing two popular visual and textual mediums, extracting key themes and content from the first, labeled Genre 1, and translating that content into the second medium, labeled Genre 2. Genre 1 is a Korean Hip Hop song called Paldogangsang (????) by the group BTS (?????). Lyrical content included themes of Korean

national pride and deep cultural references, which yields favorability among young people. This content was analyzed and compared to songs within the Hip Hop genre in Korea and America in order to extract key themes and differences. Lyrics and themes of Genre 1 were then creatively translated into Genre 2, a second popular Korean visual and textual medium, Naver Blog. This translation is reimagined in the visual format of a Korean Naver Blog, which is the final product. Analysis and translation of these Korean genres highlights the unique ways that information is shared by young people in Korea.

HAS BABY TALK CHANGED? WHAT WE HAVE LEARNED FROM DECADES OF PARENT SPEECH DATA
Presenter(s): Daniel Francisco Helo Puccini
Category: Linguistics, Languages, and Speech
Mentor(s): Cristina Schmitt (College of Arts & Letters)

Child-directed speech (CDS), the way parents talk to young children, shapes language development more than almost any other factor. Researchers have spent decades comparing CDS across families, but nobody has asked whether CDS itself has changed over time. This project treats the CHILDES database as an unintentional historical record, analyzing parent speech from four North American English corpora spanning the 1960s to 2000s (approximately 2.47 million words). I measured vocabulary diversity using MTLD, a metric robust to sample size, and tracked what parents talk about by sorting words into five categories: nature, technology, food, emotions, and academics. Lexical diversity increased roughly 16% from the 1960s to the 1990s, matching the cultural shift toward more deliberate, language-rich parenting. Academic and emotional vocabulary grew across decades, while technology words (phone, screen, computer) stayed flat at 0.15% of parent speech in every decade. CDS vocabulary is also converging: the proportion of words unique to each decade dropped from 38% to 18%, suggesting parents across generations are settling on an increasingly shared vocabulary for talking to kids. These results show CDS vocabulary evolves alongside parenting culture, which matters for interpreting developmental norms and designing early language interventions.

¿POR QUÉ NO? WHY NOT CONTINUE STUDYING SPANISH? A STUDY OF ATTRITION IN BEGINNING SPANISH CLASSES
Presenter(s): Nariyah Harris
Category: Linguistics, Languages, and Speech
Mentor(s): Anne Violin Wigent (College of Arts & Letters)

University-level language classes are seeing a decrease in enrollment and retention across the nation (MLA Report 2023). Many suggested responses to counter this decrease are aimed at upper-level language classes, but the largest levels of attribution are seen in the lower-introductory courses. This current research project is part of a larger study which fills that gap by assessing students' reasons for discontinuing language studies after only one semester within multiple language programs, including German, Spanish, Italian, French, and Portuguese. This study focuses on MSU Spanish classes at the 100-200 level, having an average attrition rate of 18.09% and a maximum rate of 28.4% (internal data). Using this knowledge, we explore the possible reasons why Spanish students from SPN 101 to SPN 201 decide

to stop taking language classes at MSU after only one semester. Starting with quantitative analysis, we examine enrollment data to dissect trends in the ebbs and flows of student retention in Spanish classes. We use this data to guide our qualitative analysis through direct interviews with students who have chosen to discontinue their language courses. These interviews allow us to explore the common themes and influences among students who stopped their Spanish studies after one semester. Themes like class structure, career relevance, difficulty, confidence, and more emerge, as well as social influences like friends, family, classmates, and other connections. This mixed methodological approach allows us to draw a conclusion from varied methods that explains why students choose not to continue Spanish classes and hopefully aid course instructors and curriculum creators in making courses that can retain students.

POURQUOI PAS AN ANALYSIS OF STUDENT'S REASONS FOR LEAVING THE FRENCH PROGRAM
Presenter(s): Bridget Miller
Category: Linguistics, Languages, and Speech
Mentor(s): Anne Violin Wigent (College of Arts & Letters)

Within university language programs at MSU and beyond, there is a pattern of attrition of students after only one semester of language classes. Current research on language program vitality looks at surveys with quantitative metrics to explain this trend or employs a qualitative approach focused on factors causing students to continue in the program. However, the current body of research lacks qualitative studies that investigate university students' reasons for discontinuing language studies. This current research project is part of a larger study which fills that gap by assessing students' reasons for discontinuing language studies within multiple language programs, including German, Spanish, Italian, French, and Portuguese. This particular study focused solely on attrition within the French program, in particular on students who did not continue in the program after taking one class (between FRN 101 and FRN 201). After a brief quantitative description of the attrition data, we focus on a qualitative approach through student interviews to find out their reasons for discontinuing. The most reoccurring comments center on the high workload of the class and difficulties of fitting the class into students' schedules. More surprisingly, many students viewed class activities, the professor, and/or the content favorably although they chose to discontinue. These results yield important information to be considered for enhancing the French program.

EXPLORING ALTERNATIVES TO THE TRADITIONAL LANGUAGE CLASSROOM
Presenter(s): Benni Ellis-Goertler
Category: Linguistics, Languages, and Speech
Mentor(s): Emily Heidrich Uebel (College of Arts & Letters)

Language education has historically prioritized widely spoken languages, often at the expense of less commonly taught languages (LCTLs). This combined withuniversities' emphasis on cost efficiency leading to large class sizes and enrollment declines in language nationwide (Lusin et al., 2023) has stretched limited instructional and financial resources within the languages. However, there remains demand for

LCTLs for purposes including research, heritage connections, intelligence, and more. This research project included developing a course proposal and pilot materials for a unique course designed to accommodate demand for multiple LCTLs in one course. To facilitate the development of the course proposal and materials, we looked at a variety of existing self-instructional models (e.g., Thompson & Agoke, 2023; NASILP; https://nasilp.net/). We identified the approach of Facilitated Interdependent Language Learning (FILL) as a launching point for the MSU course, leaning on resources like the founding researcher's blogs (Aoki, 2025), participation in a learning community, and materials from the first-known FILL course in a higher education context (R. Hugo, personal communication, Fall 2025). We identified strategies that enable students to study different languages within a shared classroom and addressed a number of institutional and pedagogical hurdles with our design. We hope that the pilot course will demonstrate the viability of the FILL model and that the toolkit we have developed will encourage broader adoption of FILL classrooms in higher education.

DO AMERICAN ENGLISH DIALECTS AFFECT THE FREQUENCY OF SPEECH DISFLUENCIES?
Presenter(s): Ella Normandin, Malosza Syrocki-Autery
Category: Linguistics, Languages, and Speech
Mentor(s): Molly Stevenson (College of Communication Arts Sciences)

Previous research has shown that international English dialects have different types of frequent speech disfluencies (Shanmukha, 2017). While this study used data from people who do not stutter, our paper will attempt to connect these results with stuttering people across various American dialects. Stuttering, which consists of non-stuttered and stuttered disfluencies, is characterized by involuntary repetitions and prolongation of sounds, syllables, words, and phrases, as well as involuntary silent pauses, with stuttering occurring in approximately 1% of the world's population. The current study aims to compare frequency of specific disfluencies of American English dialects using data from Michigan State University's Spartan Stuttering Laboratory. The dataset includes recorded speech samples from over 100 individuals who stutter, representing multiple states and regional accents. By examining patterns of disfluency in relation to speakers' dialectal features, this research aims to identify potential trends between dialect variation and stuttering behavior.

MUTUAL EXCLUSIVITY IN CHILD LANGUAGE ACQUISITION
Presenter(s): William McLaren
Category: Linguistics, Languages, and Speech
Mentor(s): Alan Munn (College of Arts & Letters), Cristina Schmitt (College of Arts & Letters), John Ryan (College of Osteopathic Medicine)

One important principle in children's word learning is known as the mutual exclusivity principle. Unless there is very good evidence for it, a learner will not associate two labels to the same object. In a sense, children have a learning principle that strongly disfavors synonyms. Although this is a good principle for learning in most instances, we know that languages can use more than one label for a particular object (soda vs. pop, for example). In this project, we will present results from an elicitation experiment with

children and adults where we ask how the bias against synonyms changes with age. We hypothesize that as children get older, their bias against synonyms will become weaker. In the experiment, participants play a game where they move a character X to a particular spot on a game board. Then a second character Y plays the game. These characters are given arbitrary nonce word labels as the experimenter instructs the participant which character to move where. Participants will then be asked to provide the label they learned for a given character in the game based on actions that character made during the course of the game (e.g., "Who is sleeping?").

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RHYTHM PERCEPTION IN CHILDREN WITH DEVELOPMENTAL STUTTERING
Presenter(s): Emilee Allwardt, Jolina Huchingson
Category: Linguistics, Languages, and Speech
Mentor(s): Bailey Rann (College of Social Science), J McAuley (College of Social Science)

Developmental stuttering is a neurodevelopmental condition affecting aspects of speech motor control, leading to sound-syllable repetitions, sound prolongations, and silent blocks. Although the cause of developmental stuttering is unknown, previous studies have found some support for an internal beat deficit hypothesis (IBDH) that posits that individuals who stutter may have a deficit in their ability to internally generate a beat, giving rise to the disruption in the rhythmic flow of speech. The current study investigated the IBDH in children who stutter (CWS) and controls between 8 and 13 years. Participants completed two rhythm perception tasks, a (1) beat-based advantage (BBA) task where they listened to two standard rhythms and judged if a third comparison rhythm was the same or different and a (2) beat alignment task (BAT) where participants determined if a beat track superimposed onto musical excerpts

were on or off the beat of the music. Additional perceptual and cognitive tasks were completed. Results showed that CWS performed significantly poorer than controls on both the BBA (CWS: M = 0.97, SD = 0.76; Controls: M = 1.60, SD = 0.51; p = 0.031) and BAT (CWS: M = 0.24, SD = 0.48; Controls: M = 1.25, SD = 0.80; p = 0.001), providing support for the IBDH.

GENDER-MARKED OCCUPATIONAL TERMS AT THE ELI AND EDYTHE BROAD ART MUSEUM
Presenter(s): Lin Cabada
Category: Linguistics, Languages, and Speech
Mentor(s): Suzanne Wagner (College of Arts & Letters)

This project investigates how gender-marked language is used in Michigan State University's Eli and Edythe Broad Art Museum. Zaha Hadid is the famous architect who designed the museum, but she was regularly described as a female architect, as pointed out by linguist Deborah Cameron (2016). Marked language highlights a diversion from an anticipated norm, so while terms like "female engineer" or "women entrepreneur" are often employed, we rarely see "male engineer" or "man entrepreneur". Through a qualitative analysis of the museum's written archives, including exhibition descriptions, brochures, and other promotional texts, this project identifies instances of when the words female, woman, male, and man are used to describe an occupational noun. Encompassing exhibits from the museum's opening in 2013 to its most recent exhibits, data is represented year by year, allowing us to see emerging patterns and shifts in language use over time. The findings contribute to a broader conversation about gendered language use and how it can subtly reinforce gendered expectations even in an institutional context.

IMPROVING BEGINNER CHINESE OUTCOMES THROUGH ONLINE PRE-CLASS PREPARATION
Presenter(s): Caleb Xiang
Category: Linguistics, Languages, and Speech
Mentor(s): Xuefei Hao (College of Arts & Letters)

In recent years, beginner-level Chinese learners at Michigan State University (MSU) have experienced increasing difficulties in in-class practice and overall learning performance. These challenges are particularly evident in students' insufficient pre-class preparation, which leads to difficulties during classroom activities and subsequently results in declining language application proficiency and reduced learning confidence. To address this issue, an instructor at MSU, Xuefei Hao, developed a free online preparatory workbook designed to support students' learning before class. The workbook emphasizes systematic pre-class preparation and adopts a step-by-step instructional design that covers character recognition, grammatical understanding, sentence construction, and paragraph-level comprehension. Following a trial implementation, student survey feedback was collected to evaluate the workbook, contributing to a more coherent and better guided learning process. By completing targeted pre-class preparatory activities, students are better equipped for in-class learning, thereby allowing class time to focus on effective practice, language use, and deeper language development. Ultimately, this approach

enhances comprehension, accessibility, student participation, and overall learning outcomes in beginner-level Chinese instruction.

REIMAGINING CURRICULUM THROUGH K-WAVE: A MULTIMODAL CO-DESIGNED PROJECT
Presenter(s): Heeryun Kim, Tenaya Henderson
Category: Linguistics, Languages, and Speech
Mentor(s): Hala Sun (College of Natural Science)

This project examines how a supplemental mini-digital textbook can make Korean language learning more culturally responsive, motivating, and relevant for U.S.-based university students. While Korean enrollments in U.S. higher education have grown substantially in recent years, largely driven by the global Korean Wave (Hallyu), many widely used Korean textbooks were originally developed for adult learners in South Korea and do not reflect the lived experiences, identities, or motivations of students learning Korean in the United States. To address this gap, this study focuses on the co-design of a multimodal digital curriculum for a Korean course. The curriculum includes culturally meaningful themes such as K-pop, K-dramas and film, K-beauty, Korean food, and Korean social values embedded in language use (e.g., ?? "nun-chi": a subtle ability to gauge others' moods). A distinctive feature of this project is the central role of two undergraduate researchers as curriculum co-designers. The first author is a sophomore and a heritage speaker of Korean, offering culturally grounded perspectives on language use, identity, and authenticity. The second author is a senior and a fluent non-heritage Korean speaker, contributing insight grounded in four years of learning Korean through the program. The authors provide learner-informed feedback, co-develop multimodal materials, and design modules that reflect students' authentic motivations for learning Korean. This research offers a practical model for student-faculty collaboration in digital curriculum design and demonstrates how language instruction can be aligned with contemporary learner interests to support the growth of a newly launched Korean major.

ATTITUDES AND LANGUAGE PROFICIENCY IN YOUNG ADULT RUSSIAN HERITAGE SPEAKERS
Presenter(s): Elizabeth Abel
Category: Linguistics, Languages, and Speech
Mentor(s): Jason Merrill (College of Arts & Letters)

My talk will present the results of a study of heritage speakers of Russian aged 18-22 that grew up with at least one native Russian speaker in the home. First, I measured participants' knowledge of the Russian language through a 70-question grammar test. Second, I surveyed participants about aspects of their engagement with the Russian language: their assessment of their enjoyment in speaking Russian; the importance of the Russian language to them and their families, and; how important it is for them to pass the Russian language on to any future children. I will analyze these results and try to determine if participants' attitudes towards the language affect their language proficiency and maintenance of the language or vice versa.

"PRETTY" IS PRETTY COOL
Presenter(s): Allison Phillips, Antony Tokrri, Jad Assaf
Category: Linguistics, Languages, and Speech
Mentor(s): Betsy Sneller (College of Arts & Letters), Suzanne Wagner (College of Arts & Letters)

Downtoners such as fairly, pretty, and kind of are adverbial modifiers that decrease the intensity, force, or significance of another word, usually an adjective e.g. "The test was fairly easy." Their counterparts are intensifiers such as very, really, and incredibly, which increase the intensity of the adjective e.g. "The test was really difficult." Prior studies of large English corpora found that most downtoners were produced by men, while most intensifiers were produced by women. However, pretty can be employed as either a downtoner (meaning 'meh, not bad') or an intensifier (meaning 'better than average'). Studies typically classify all instances of pretty as an intensifier or exclude it completely. We ask whether most downtoners are produced by men when pretty is appropriately classified. 120 tokens of pretty were extracted from audio self-recordings produced by two men and two women with similar demographic backgrounds. Tokens were coded using diagnostic cues from the surrounding discourse context and the speaker's intonation. We found that downtoner pretty is more likely to be used by men than women. Out of the total downtoners, 31.03 % were produced by women while 68.97 % were produced by men. Out of the total intensifiers, 43.96 % were produced by men while 56.04 % were produced by women. Previous studies on the use of modifiers in relation to gender reveal similar results (e.g. D'Arcy 2015). The results are clear, yet the mechanisms that lead to these outcomes deserve further study.

EMPOWERING INTERNATIONAL TAS: HOW THE ACES PROGRAM SHAPES COMMUNICATION AND CLASSROOM CULTURE
Presenter(s): Alex Guo
Category: Linguistics, Languages, and Speech
Mentor(s): Alissa Cohen (College of Arts & Letters), Austin Kaufmann (College of Arts & Letters), Michael Ristich (College of Arts & Letters)

The Academic Culture and English Skills (ACES) Program at Michigan State University, developed and administered by the International Teaching Assistant (ITA) Program within the English Language Center, is a well-established three-week intensive program designed to support incoming international teaching assistants (ITAs). ACES is an intensive English and academic culture program aimed at helping ITAs adjust to the American university teaching and learning context prior to their first semester at MSU. The course focuses on strengthening oral communication skills in English and developing an understanding of the American educational system in general, as well as the roles and expectations of teaching assistants and undergraduate students at MSU in particular. This research project evaluates the program's effectiveness using both quantitative and qualitative data gathered from participant feedback. Findings indicate a positive correlation between engagement with ACES course content and participants' sense of preparedness for teaching and adjustment to the MSU academic environment. These insights contribute to the continuous development of inclusive and impactful teaching assistant preparation at Michigan State University.

"SO UHM, YEAH": A CASE STUDY OF "UHM" DEVELOPMENT BETWEEN 5-9 YEARS OLD
Presenter(s): Rachel Ross
Category: Linguistics, Languages, and Speech
Mentor(s): Betsy Sneller (College of Arts & Letters), Suzanne Wagner (College of Arts & Letters)

Speakers of American English can use "um" and "uh" as words to fill a pause; linguists refer to these filled pauses collectively as "uhm". Prior research suggests that adults place "uhm" more frequently in utterance-initial positions, while children place "uhm" more frequently in utterance-medial positions (McDaniel et al., 2010). However, much of the existing research compares children and adults across age groups, leaving the question of when during development children begin to adopt adult-like patterns. This study examines how these patterns shift developmentally over time, asking: At what age do children begin to show developmentally mature patterns of "uhm" placement in speech? Using audio recordings from the MI Diaries corpus, I analyzed one child's speech longitudinally by sampling two diary entries from each six-month age interval (data permitting). All tokens of "uhm" were coded in a spreadsheet according to utterance position (initial, medial, or final) and the child's age at the time of recording. Analysis of the speech samples confirmed variability in the child's placement of "uhm" across ages. At earlier ages, "uhm" most frequently occurred in utterance-medial positions; utterance-initial uses were present, but less consistently occurring. Across later ages, however, utterance-initial "uhm" use increased, while medial placements became less dominant. Utterance-final uses of "uhm" remained consistently rare across the entire dataset. The overall trajectory shows a gradual shift, with notable variability toward increased use of utterance-initial "uhm" with age, making it difficult to identify a single transition age. Because this analysis was limited to longitudinal data from one child, further research examining larger samples of children will be necessary to determine more precisely when this developmental shift occurs. This highlights the importance of longitudinal data in understanding the developmental patterns of children's speech.

IS "LOW-KEY" GOING LOW-KEY ADVERBIAL?
Presenter(s): Bai Yang Clemens, Gaeun Kwon
Category: Linguistics, Languages, and Speech
Mentor(s): Betsy Sneller (College of Arts & Letters), Suzanne Wagner (College of Arts & Letters)

Language is constantly changing, and younger speakers are often the ones pushing those changes forward. One example is the expression low-key. Traditionally, low-key is used as an adjective, such as in "a low-key party," but it is increasingly used as an adverb in sentences like "I low-key want pizza." This study explores whether the acceptance of this newer adverbial use differs across age groups and whether it reflects a broader generational pattern. Using an acceptability judgment survey adapted from Stevens (2018), we surveyed 133 participants and asked them to rate sentences that included both adjectival and adverbial uses of low-key on a five-point scale. Participants were divided into two age groups, with the main comparison between speakers under 35 and over 35. The analysis focuses on whether the two groups differ in how acceptable they find the adverbial use compared with the traditional adjectival use. We predict that younger speakers will be more likely to accept low-key as an adverb, while older speakers will show a stronger preference for its adjectival use. By extending

Stevens's methodology to compare generational patterns, this study provides further evidence about how emerging grammatical uses spread across age groups.

A LOWKEY EXAMINATION OF LOWKEY IN THE MI DIARIES CORPUS
Presenter(s): Connor Mason
Category: Linguistics, Languages, and Speech
Mentor(s): Betsy Sneller (College of Arts & Letters), Suzanne Wagner (College of Arts & Letters)

Until recently, the word lowkey was an adjective meaning "to a low degree" e.g., "Very lowkey celebration in our home. Nothing too special." However, lowkey can also be employed as an adverb whose meaning depends on the discourse context, e.g. "Hugs are like low key literally healthy for us." In 2016, Stanfield and Thomas elicited sentences containing lowkey and found that respondents assigned meaning depending on lowkey's position in the sentence. Stevens (2018) conducted a survey in which respondents rated the naturalness of sentences containing adverbial lowkey and reported how frequently they used it. Adverbial lowkey was used primarily by speakers born after 1983 and its naturalness varied across sentence positions. However, there is no previous study of lowkey's distribution that uses spontaneous speech rather than elicited speech or survey responses. This study aims to explore the adjectival and adverbial forms of lowkey by examining naturally-occurring instances. The present study extracted all eligible tokens of lowkey from the MI Diaries corpus of audio self-recordings. Participants talk freely about everyday topics. A majority of tokens were identified as adjectives and a minority as adverbs. For the adverbs, a minority were sentence-initial and a majority were in other positions. Additional analysis of these positions will be undertaken. Lowkey is frequent in the speech and informal writing of young people, but very little has been published about it. Examining natural examples will help to better understand the syntax and semantics of lowkey.

SOCIAL PERCEPTIONS OF UH VS. UM
Presenter(s): Chae Eun Park, Keira Wesley
Category: Linguistics, Languages, and Speech
Mentor(s): Betsy Sneller (College of Arts & Letters), Suzanne Wagner (College of Arts & Letters)

Speakers of American English use both uh and um as ways to fill pauses in their speech (this is known as a "filled pause"). Previous research (Fruehwald 2016) analyzed the use of filled pauses in a large corpus of natural speech, finding that younger speakers were more likely to use um than uh and that women were slightly more likely to use um than men. Bechler (2026) also found similar patterns in Michigan English. In this study, we aim to determine whether listeners perceive uh as sounding more "masculine" than um. We developed a matched guise test (Lambert et al., 1960) in which participants listen to a speaker tell a story. In one condition, the story contained seven instances of uh. In the other condition, the story contained seven instances of um. Listeners rated the speaker on dimensions like how tough, warm, and assertive they thought the speaker was. We hypothesize that listeners who hear the uh guise will rate the speaker higher on masculinity scales (tough, assertive) than those who hear the um guise.

This research will increase our understanding of how filled pauses are perceived and how they contribute to social meaning.

HOW DO PEOPLE TALK ABOUT ACCENTS IN MICHIGAN'S THUMB AND UP?
Presenter(s): Elle Jacobson, Mary Cavagnetto
Category: Linguistics, Languages, and Speech
Mentor(s): Betsy Sneller (College of Arts & Letters), Suzanne Wagner (College of Arts & Letters)

This research explores how residents of the Thumb and Upper Peninsula regions of Michigan perceive and describe their own accents. While outsiders often discuss regional speech patterns, less attention has been given to how speakers themselves understand and interpret the way they talk. To investigate this, we conducted sociolinguistic interviews within each community. Each interviewer used a consistent set of guiding questions to ask participants about their perceptions of their own speech, whether they believe their accent is distinctive, and how they think others perceive it. These interviews allowed us to collect qualitative data about attitudes toward local dialects and linguistic identity. Because the interviewers are members of the communities being studied in, participants may feel more comfortable sharing their perspectives and experiences. The interviews provide insight into how regional identity, community pride, and outside perceptions influence the way people think about their speech. By comparing responses from the Thumb and Upper Peninsula regions, this study aims to identify patterns in how speakers recognize, describe, and evaluate their accents. Ultimately, this research contributes to a broader understanding of language attitudes and regional dialect awareness in Michigan.

ENROLLMENT DECLINE IN MSU'S GERMAN LANGUAGE PROGRAM
Presenter(s): Sarah Cromwell
Category: Linguistics, Languages, and Speech
Mentor(s): Kathryn McEwen (College of Arts & Letters), Senta Goertler (College of Arts & Letters)

Enrollment in language learning programs has been dropping across the nation for many years (Lusin, et al., 2023). Learning a second language remains an important skill for communication, however fewer and fewer students take the chance to learn a language at a university. At MSU, the German language program sees its lowest retention rate between the GRM 101 and GRM 102 classes. By taking into account student's opinions on curriculum changes, satisfaction with course load, and engagement with class materials, this research will aim to tackle the "why" of this lower enrollment. Interviews provided insight into student's thoughts about the classes, and pointed towards larger themes in causes for continuing or not continuing with the German language program.

Microbiology, Immunology, & Infectious Disease

RESOURCE SPECIALIZATION IN A LONG-TERM EVOLUTION EXPERIMENT WITH E. COLI
Presenter(s): Kushika Sulabelle
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Devin Lake (College of Natural Science), Zachary Blount (College of Natural Science)

The Long-Term Evolution Experiment with Escherichia coli has been used to study evolution in action for more than 83,000 generations since 1988. Over this time, the bacteria adapted to their environment of a minimal glucose medium, and populations evolved simple ecosystems. The most important development was the evolution of aerobic growth on citrate (Cit+) in one population after 31,000 generations, even though E. coli has traditionally been defined as incapable of this trait. This novel ability arose from a mutation that activated expression of a previously silent citrate transporter, CitT. Because CitT couples citrate import to export of C4-dicarboxylates (succinate, fumarate, malate), Cit+ cells created a new resource pool as they grew on citrate. Over time, a lineage of Cit− cells evolved to cross-feed on this new resource pool because of a mutation that expresses the transporter DctA. A similar mutation later evolved in the Cit+ lineage, allowing it to self-cross-feed. Nevertheless, the Cit− lineage persisted. One hypothesis for this persistence is that the Cit− lineage better competes for the ancestral glucose resource, which allows them to maintain higher fitness on glucose relative to Cit+ clones. To test this hypothesis, I will examine how the competitiveness of the Cit− lineage against the Cit+ lineage for glucose changed over time. I will construct a time series of Cit− clones with the dctA gene deleted and compete them against Cit+ constructs lacking dctA from the same generations through 43,000 generations, when the Cit− lineage went extinct.

CHARACTERIZING HUMAN CHORIONIC GONADOTROPIN EXPRESSION AND EXTRACELLULAR VESICLE COUNT IN BEWOS
Presenter(s): Pramika Bodeddula
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Jonathan Hardy (College of Human Medicine)

Trophoblasts are a class of cells that are responsible for placental development and function. They can differentiate into multiple cell types, including extravillous trophoblasts and syncytiotrophoblasts, each with specific functions. Syncytiotrophoblasts are multinucleated cells that release extracellular vesicles (EVs). The damage associated molecular patterns (DAMPs) released in EVs from infected syncytiotrophoblasts have been implicated in placenta mediated immune response and preeclampsia. Detailing the contents of such EVs could lend insight into placental mediated immunity. To explore this concept, preliminary methods to immunostain for human chorionic gonadotropin (hCG) and quantify extracellular vesicle (EV) production were conducted on Human Choriocarcinoma Placental Cells (BeWos). BeWos were cultured and seeded on a chamber slide. A chamber containing only 3T3 cells was used as a negative control. A mixed chamber with both BeWos and 3T3s was included. All chambers were stained with DAPI to visualize nuclei and anti-hCG beta antibodies. BeWos were simultaneously

cultured in serum free and EV depleted serum media. EVs were then isolated using vacuum filtration and then quantified using a NanoTracker across both serum conditions. An upregulation in hCG expression in BeWo cells compared to 3T3 cells was observed. Significant differences were not found in the volume or diameter of the EVs. A preliminary methodology for measuring hCG expression and EV expression in placental cells was established. The methods can be extrapolated to human trophoblast stem cells (hTSCs) to compare the contents and volume of EVs released by uninfected undifferentiated hTSCs, differentiated uninfected hTSCs, and hTSCs infected with Listeria monocytogenes.

GGDEF DOMAIN MISSENSE MUTATIONS INFLUENCE CYCLIC-DI-GMP SIGNALING IN VIBRIO CHOLERAE
Presenter(s): Preethika Lakshminarayanan
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Aathmaja Anandhi Rangarajan (College of Osteopathic Medicine)

Vibrio cholerae is a gram-negative bacterium that lives in aquatic environments and causes diarrheal disease. Cyclic di-GMP - an important secondary messenger located in V. cholerae - controls the switch between the microorganism's motile and stationary states, with high intracellular c-di-GMP levels driving biofilm formation. Diguanylate cyclase (DGC) enzymes encode GGDEF domains and synthesize c-di-GMP while phosphodiesterase (PDE) enzymes encode EAL domains and degrade c-di-GMP. Isolation and sequencing of a hyper-biofilm forming mutant of V. cholerae strain N16961 revealed it had an amino acid substitution of asparagine (N) instead of aspartic acid (D) in the GGDEF domain of vc0653 - a GGDEF-EAL dual domain containing protein. We hypothesized that this mutation was responsible for the mutant's elevated c-di-GMP levels and higher biofilm production. To test this hypothesis, we replicated this point mutation in two other GGDEF domain containing proteins - vc1370 and vc1353 - but these GGNEF mutant proteins formed lower levels of c-di-GMP, which did not support our hypothesis. However, c-di-GMP levels increased when this mutation was made in vc2750, which is a GGDEF-EAL dual domain containing protein. Therefore, we now hypothesize that the GGNEF mutation increases inhibition of the EAL domain, leading to greater c-di-GMP levels. My future analysis of vc0653 will test this hypothesis as I will homologously recombine three constructed mutant vc0653 proteins - vc0653 GGDEF EAL, vc0653 GGNEF EAL, and vc0653 GGNEF EAL - into the genome of V. cholerae strains N16961 and C6706 and perform biofilm assays on the mutated and wildtype strains to elucidate c-di-GMP levels. Also, bioinformatics analysis of all DGCs across bacterial phyla showed that 16% were GGNEF variants and 23% were GGQEF variants, suggesting that the GGDEF domain is amenable to different amino acids, which may impact DGC enzymatic function. To pursue this idea, we will analyze the activity of GGAEF, GGQEF, and GGVEF mutations in different V. cholerae proteins including vc0653 to compare c-di-GMP levels and biofilm formation. Our research will provide insight into the flexibility of the DGC GGDEF domain and how changes in the amino acid structure of the GGDEF domain modulate c-di-GMP levels and control important physiological processes in bacteria such as motility and biofilm formation.

DETECTION AND QUANTIFICATION OF BOVINE LEUKEMIA VIRUS IN MICHIGAN DAIRY CATTLE
Presenter(s): Kat Hacker
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Christi Harris (College of Veterinary Medicine), Scott Sherrill-Mix (College of Veterinary Medicine), Tasia Kendrick (College of Agriculture & Natural Resources), Ted Brooks (College of Agriculture & Natural Resources)

The purpose of this research was to optimize DNA extraction and quantitative polymerase chain reaction (qPCR) procedures to detect bovine leukemia virus (BLV) proviral DNA integrated in cattle chromosomes and viral RNA circulating in virions. We collected whole blood samples from the tail veins of dairy cattle with known BLV status at two farms in Michigan. We tested and optimized DNA extraction methods and various published and novel qPCR assays to amplify, detect, and quantify BLV provirus present in these samples. Ultimately, our goal is to select the best performing open source method of BLV provirus quantification and develop a reverse transcriptase qPCR assay identifying BLV virion circulation that has not yet been documented in animals.

T-EVEN PHAGE INTERACTIONS WITH DEFENSE GENE VCA0483
Presenter(s): Mehak Banga
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Christopher Waters (College of Osteopathic Medicine)

At the cusp of antibacterial therapeutics lies the emergence of phage therapy: an alternative to antibiotics due to the increase of antimicrobial resistance. Using a Vibrio cholerae genomic library in Escherichia coli, we identified a cosmid that protects against T2, T4 and T6 infection. Transposon mutagenesis revealed that vca0483 is required for protection against T-even phage. To better understand this defense system, I conducted evolutionary passages on Wild Type T2, T4, and T6 phages and three phage escape mutants were found - T6 esc 1, T6 esc 2, and T2 esc 1. Confirmation of mutant phage phenotype was achieved through liquid infections on vca0483 host and EV, cosmid and EV, and the transposons. Sequencing of the T6 escape mutants revealed a point mutation in a conserved dCMP hydroxymethylase gene. Since this discovery, I have been working on comprehending the function of this gene through induced over-expression to determine how the bacterial gene vca0483 and T6 mutant gene interact. Moreover, I amplified a stock of T4 phage with unmodified cytosines containing an amber mutation at a gene analogous to that of the T6 escape mutants. Currently, I am running experiments to examine infection of T4 unmodified cytosine phage with the vca0483 defense gene. I have a working model suggesting partial activity of the T6 escape mutant gene allows it to overcome the bacterial defense system. Overall, this study will increase our understanding of how phage defense systems work and highlight mechanisms by which phage can overcome defense systems to improve therapeutics.

DEVELOPING A PHENOTYPIC RAPID DIAGNOSTIC TO DETERMINE ANTIBIOTIC RESISTANCE IN E. COLI USING ZETA POTENTIAL
Presenter(s): Josie Cayen
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Evangelyn Alocilja (College of Agriculture & Natural Resources)

Antimicrobial Resistance (AMR) is a growing public health issue in which infectious bacteria, viruses, parasites, and fungi no longer respond to certain antimicrobials [1]. In 2019, the Centers for Disease Control and Prevention (CDC) estimated that in the United States, AMR affects more than two million people every year [1]. Carbapenems are particularly useful antibiotics that can combat multidrug-resistant bacteria. The rapid determination of a bacterium's antibiotic resistance profile is critical in reducing the clinical and agricultural overuse of last resort carbapenem antibiotics which select Carbapenem Resistant Enterobacterales (CR). One area lacking in the current development of rapid diagnostics for AMR bacteria is the difference in cell surface potentials between AMR and drug-susceptible bacteria [2]. Thus, the aim of this work is to develop a database of zeta potential measurements paired with disk diffusion radii from the gold-standard Kirby-Bauer Test to support the development of a rapid phenotypic diagnostic method for determining drug susceptibility. The zeta potential and the disk diffusion radii of bacterial samples when exposed to Meropenem at minimum inhibitory concentration (MIC) were measured to determine whether there was a correlation in Carbapenem-susceptible and Carbapenem-resistant Escherichia coli (E. coli) samples. Preliminary results indicate a negative linear correlation between zeta potential and disk diffusion radii of E. coli samples. The results from these experiments can guide the development of a more rapid phenotypic biosensing method that takes less than 6 hours, compared to the conventional phenotypic disk diffusion method, which takes 18-24 hours [2].

INVESTIGATING THE ROLE OF PHTHALATES ON TYPE I INTERFERON MODULATION
Presenter(s): Alekya Vudathu
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Aubree Muethel (College of Osteopathic Medicine)

The JAK/STAT signaling pathway plays a critical role in immune regulation, particularly through Type I interferon signaling. Dysregulation of Type I interferons has been implicated in the pathogenesis of autoimmune diseases, including Systemic Lupus Erythematosus (SLE) and Sjogren's Syndrome (SS), making it a promising target for therapeutic intervention. Phthalates are common additives as plasticizers to personal care products, as well as feminine care products that are often an unexplored area of exposure for women or menstruating individuals in particular. We hypothesize that a potential correlation between autoimmune diseases and the sex bias may be present due to environmental influences, such as phthalates, contributing to the alteration in immune signaling pathways. To test this, we investigated whether exposure to varying phthalate compounds alters IFNα-mediated interferon response in HEK293T cells through investigating gene expression changes in interferon-stimulated genes (ISGs). Our findings will provide valuable insights into how Type I interferon modulation via environmental toxicants impact immune function and how it may inform potential therapeutic strategies

for autoimmune diseases; ultimately, further investigating the potential cause to the existing sex bias in autoimmune disease prevalence.

PERSISTENT DETECTION OF TETRACAPSULOIDES BRYOSALMONAE IN MICHIGAN WILD SALMONIDS IN 2025
Presenter(s): Mantaj Singh
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Bartolomeo Gorgoglione (College of Veterinary Medicine)

Tetracapsuloides bryosalmonae is a myxozoan parasite known to cause Proliferative Kidney Disease (PKD) in salmonid fish in Europe and Northwest America. PKD is a severe parasitic disease characterized by chronic lymphoid hyperplasia. Starting from the posterior kidney and immunocompromising the host, PKD may lead to direct and indirect mortality, e.g., upon polymicrobial infections. PKD poses growing concerns for local fisheries, as warmer water temperatures may enhance the parasite's lifecycle reproducibility and increase its virulence in susceptible juvenile hosts. We recently discovered that T. bryosalmonae completes its lifecycle in the Great Lakes watershed, although PKD is not seen yet in infected fish in this region. In 2025, 532 adult salmonids were sampled during their fall spawning migrations. Chinook and Coho Salmon, and some occasional Rainbow Trout, were collected from across five fish weirs operated by MI-DNR, including the fish weirs installed in the Boardman, Little Manistee, Platte River, and Medusa Creek from the Lake Michigan side, and Swan River from the Lake Huron side. DNA was extracted from the individual posterior kidney and used for qPCR screenings specifically targeting the 18S ribosomal subunit of T. bryosalmonae. Positive samples were retrieved from all riverine locations examined, although with low prevalence, and no clinical signs of PKD were seen during this sampling year. These results further corroborate the presence of this reportable fish parasite in adult carriers across Michigan waterbodies, highlighting the need to access juvenile specimens and carry out controlled infection challenges for a better assessment of any PKD occurrence.

ASSOCIATION BETWEEN GROUP B STREPTOCOCCUS STRAINS AND PERSISTENCE & AGAINST ANTIBIOTICS
Presenter(s): Damilola Adissa
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Jonathan Hardy (College of Human Medicine)

Standardized amounts of each Streptococcus agalactiae strain were spread onto agar plates to ensure consistent growth conditions across all samples. Antibiotic disks will be placed on the surface of the inoculated plates, and the cultures were incubated to allow visible zones of inhibition to form. After incubation, the diameter of each inhibition zone is going to be measured in millimeters to determine how strongly each strain responded to the antibiotics. These measurements will be interpreted using CLSI guidelines to classify the strains as susceptible, intermediate, or resistant.

IDENTIFICATION OF A NEW PUNITIVE PHAGE DEFENSE SYSTEM FROM VIBRIO CHOLERAE
Presenter(s): Ariana Straus
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Christopher Waters (College of Osteopathic Medicine)

Phage therapy, or the use of bacterial-specific viruses to treat infectious disease, has been studied as an alternative to antibiotics for centuries and has renewed interest as an effective treatment due to their ability to infect and lyse specific bacterial species. Bacteria, however, have evolved various phage defense systems to protect themselves from phage infection. To develop phage therapies, we must understand the mechanisms of phage defense systems. To identify new phage defense systems, we are using?Vibrio cholerae?as a model as it has evolved several phage defense systems due to its constant predation by phages in its environment. A previous screen of a?V. cholerae cosmid library within?Escherichia coli found a 25kb fragment that provides protection against T2 coliphage. Using a transposon mutant library, we identified that the gene?vca0483?was both necessary and sufficient to protect against T2, T4 and T6 phage infection. Expression of?vca0483 both from its native promoter and an inducible promoter?in E. coli was sufficient for protection against T2, T4, and T6. Overexpression of?vca0483 inhibits cell growth, suggesting the protein it produces is toxic. A colony forming survival count shows overexpression of vca0483 inhibits cell growth without decreasing the viable cell count. Alpha fold predicts the protein vca0483 encodes as a transmembrane protein. My model for how vca0483 functions which I am testing is that vca0483 is expressed during phage infection as a transmembrane protein that induces cell stasis, and inhibits the phage replication cycle.

EXPLORING PHAGE B2 INFECTION MUTANTS
Presenter(s): Dylan Madsen
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Kristin Parent (College of Natural Science)

The bacteriophage (phage) B2 is an N4-like podophage belonging to the Schitoviridae family. B2 also has an increased efficiency of infection when the bacterial protein YajC is present. In an experiment done to force B2 to evolve to infect a knockout strain of yajc knockout strain of Shigella, six B2 mutants with varying infection efficiencies were isolated. Whole-genome sequencing was then performed on two of the six mutants, revealing that both had a single point mutation in the same protein. In addition, the Efficiency of Plating (EoP) was performed on each of the six phage mutants to determine their infection efficiencies. Growth curves were also performed to locate where in the infection cycle these mutations affected. Finally, protein modeling was performed in AlphaFold to compare the mutant phage proteins to the wild-type proteins, and it was found that there was no structural change, indicating that these mutations are mechanical. This research will increase understanding of an understudied phage type and its interactions with inner-membrane host targets.

GUT MICROBIOTAS OF CHILDREN AND ADOLESCENTS
Presenter(s): Hannah Cook
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

Little is known regarding the gut microbiotas of children between the ages of 4-13 years. The objective of this research was to use 16S rRNA gene sequencing to describe the gut microbiotas of children in this age range. To do this I created a 16S rRNA library from43 stool samples from 41 unique participants (2021-early 2023) and 16 stool samples from 16 unique participants (September 2025-Present). Early and middle childhood samples were collected. Early childhood (EC) is defined as ages 4-7 years, and middle childhood (MC) is defined as ages 9-13 years. Total, there are 32 EC childhood samples from 30 participants, and 27 MC samples from 27 unique participants. In total, there are 41 participants in the study, with 16 participants providing a sample at both timepoints. Samples were processed using the 16S PCR protocol and then checked for PCR success using gel electrophoresis. PCR products are then cleaned and pooled. The MSU genomics core will sequence the samples using short read sequencing on the Aviti (Element Biosciences). Sequences will be cleaned and annotated using mothur. The alpha and beta diversity of the gut microbiota will be analyzed, and the resulting data will be visualized using R Studio. This data will give us insight into the makeup of the childhood gut microbiota at two distinct timepoints.

INVESTIGATING THE ROLE OF ERAP1 IN REGULATING B CELL ER STRESS AND UPR PATHWAYS
Presenter(s): Sylvia MacNab
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Andrea Amalfitano (College of Osteopathic Medicine)

INTRODUCTION: We are investigating why the Erap1 gene is associated with Multiple Sclerosis (MS) susceptibility. Our previous work confirmed that Erap1-/- mice have abnormal, immune responses generally, and B cell immune responses specifically during Experimental Autoimmune Encephalomyelitis (EAE), a mouse model of human MS. Recent results identified that Erap1-deficiency leads to decreased surface MHC-I levels, and potentially increased ER stress and abnormal Unfolded Protein Responses (UPRs), in B cells. We hypothesize that abnormal ER stress due to Erap1-deficiency affects B cell functions and survival which abnormally drives EAE. In this study, we aim to verify if abnormal acute and chronic ER stress signatures are present in Erap1-/- derived B cells at baseline, and/or during ER stress. METHODS: Splenocytes were isolated from naive WT and Erap1-/- mice. Untouched B cells were derived via negative selection using Magnetic-Activated Cell Sorting (MACS). Using qRT-PCR, we have begun analyzing the RNA expression levels of genes that compose the ER stress pathways in these two groups. RESULTS: qRT-PCR analysis of HSP1, HSP70, DNAJa3, and PERK/EIF2ak3 genes (normalized with GAPDH expression) revealed significantly elevated expression in Erap1-/- B cells as compared to WT derived B-cells, while expression levels of ATF6 and ERN/IRE1a were similar between the two genotypes, determined using unpaired, two-sided t-test Our results indicate that Erap1-deficient B cells have evidence of abnormal UPRs, including abnormal activation of the PERK arm of the UPR. This could lead to abnormal B cell functions and survival capacities, driving autoimmune neuroinflammation.

CONSTRUCTION OF PLASMIDS TO EXPRESS MUTANT K17 IN CANCER CELLS
Presenter(s): Grishmasri Taminidi
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Wei Wang (College of Human Medicine)

Keratin 17 (K17) is a type I intermediate filament protein expressed in epithelial tissues that has been increasingly implicated in tumor progression and cellular signaling. While K17 is traditionally known for maintaining cytoskeletal structure, emerging evidence suggests it may also play a role in regulating gene expression. RNA sequencing comparing wild-type (WT) K17 cells with K17 global knockout cells revealed that approximately 1,900 genes were upregulated in K17-positive cells, indicating that K17 may influence transcriptional programs associated with tumor growth in cells. However, the cellular localization responsible for this regulatory activity remains unclear, as K17 can be found in both the cytoplasm and nucleus. To determine whether nuclear or cytoplasmic K17 mediates these transcriptional effects, mutant K17 constructs were generated to restrict localization within the cell. A mutant lacking the nuclear export signal (NES) was designed to accumulate in the nucleus, whereas a mutant lacking the nuclear localization signal (NLS) was expected to remain in the cytoplasm. These constructs were expressed in K17 knockout cells to evaluate their ability to restore gene expression patterns observed in WT cells. Expression of candidate genes, including IL33, AREG, and CCL2, was assessed using RNA-based analyses. Based on previous research nuclear K17 mutants have shown that the nuclear pool has helped up-regulate other genes. Thus, we hypothesize that the mutant strain that is lacking the nuclear export NES signal should stay in t he nucleus can rescue gene expression but the mutant lacking nuclear localization sequence will stay cytoplasm.

QUANTIFY MOUSE PAPILLOMAVIRUS ENTRY IN WT AND WHIM KERATINOCYTES USING A PSUEDOVIRUS GFP REPORTER
Presenter(s): Logan Sheard
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Wei Wang (College of Human Medicine)

WHIM syndrome is an immunodeficiency caused by gain of function mutations in CXCR4 that lead to higher susceptibility of warts, hypogammaglobulinemia, infections, and myelokathexis (WHIM). This phenotype is caused by CXCR4 becoming hyperactive and prolonging binding to its ligand, CXCL12. The result of hyperactive binding between CXCR4 and CXCL12 is that neutrophils and other leukocytes are prevented from leaving the bone marrow and circulating as they would within a healthy patient. It has previously been shown that WHIM mice are at a higher risk of mouse papillomavirus type 1 (MmuPV1) infection and development of warts when compared to healthy mice. This project seeks to optimize a pseudovirus green fluorescent protein (GFP) reporter as a way of observing virus entry between WT and WHIM mice. Previous literature has shown pseudovirus reporter systems to be a valuable way of observing virus infectivity within cells without the virus being able to replicate on its own or encode any virulence factors. Our hypothesis is that the pseudovirus reporter will be an effective system of observing the difference in fluorescence between WHIM and WT mouse keratinocytes. Beyond the initial scope of this project, we hope to use this reporter system as a tool to visualize interactions between

MmuPV1 and host cells. This tool could be used to help identify therapeutic targets to lower the burden of HPV associated warts in WHIM patients.

DEVELOPING A RANDOM BARCODED BACTERIOPHAGE TRANSPOSON LIBRARY
Presenter(s): Ashlynn Linet
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Christopher Waters (College of Osteopathic Medicine), Geoffrey Severin (College of Osteopathic Medicine)

This project aims to develop a strategy for generating bacteriophage transposon mutant libraries, similar to the genetic screening technique Tn-Seq used in bacteria, for the identification and characterization of essential bacteriophage genes. Three major hurdles exist to the development of such a tool: 1) identification of a suitable bacterial host, 2) identification of bacteriophage-specific selectable markers, and 3) isolation and propagation of transposon-containing bacteriophage. Thymidylate synthase (ThyA) is an essential bacterial enzyme in nucleotide biosynthesis that catalyses the conversion of dUMP to dTMP. Despite requiring deoxynucleotides for genome replication, many bacteriophages lack their own thyA and are likely dependent on their host to synthesize dTMP. Therefore, we constructed an Escherichia coli thymidine auxotroph (ΔthyA) and an arabinose-inducible transposase and transposon encoding thyA as a selectable marker (TN-thyA) on a plasmid (pTN-thyA). We hypothesized that only bacteriophages harboring a TN-thyA will be capable of infecting and replicating in the ΔthyA host. Bacteriophages were propagated on E. coli DH10B hosts containing pTN-thyA while inducing transposase expression to facilitate transposition into the bacteriophage genome. The resulting bacteriophage progeny were selected on ΔthyA and successful transposition events were confirmed by arbitrary PCR and sequencing. Using this approach, we have constructed transposon mutant libraries for multiple, phylogenetically diverse bacteriophages. Notably, these libraries are barcoded to improve downstream sequencing and identification. These results support the development of a broadly applicable method for constructing bacteriophage transposon mutant libraries.

CAPSULE FORMATION AND VIRULENCE IN GROUP B STREPTOCOCCUS
Presenter(s): Lillian Vanbennekom
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Jonathan Hardy (College of Human Medicine)

Group B Streptococcus is a pathogen which causes sepsis and death in neonates and infants within 48 hours of birth. It colonizes women's genital tracts, being present in roughly 1 of 4 women (https://doi.org/10.1542/peds.2019-1881). Colonization may be lost over the course of pregnancy or it may remain and become invasive. Some Group B Streptococcus show formation of a capsule, which may act as a virulence factor for the organism. This research works to establish a connection between capsular formation and colonization across 10 strains of Group B Streptococcus using Maneval's stain and microscopy to visualize the bacterial capsules.

COVID-19'S ORF8 PROTEIN AND ITS ASSOCIATION WITH CLOTTING DISORDERS
Presenter(s): Thomas McCarthy
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Michael Bachmann (College of Human Medicine)

The goal of this project is to better understand the role of the SARS-CoV-2 ORF-8 protein in COVID-19-associated blood clotting disorders. Our central hypothesis is that the viral ORF-8 protein contributes to the hypercoagulable state observed in COVID-19 patients (Dr. Michael Bachmann). To test this, we have been cloning members of the ADAMTS protein family to investigate their potential binding interactions with ORF-8 ligands. My specific role in the lab is to research different forms of luciferase and the genetic engineering strategies required to insert NanoLuc or Gaussia luciferase into ORF-8 ligands. These luciferase reporters will enable sensitive detection of ORF-8-mediated protein-protein interactions. By elucidating the interaction partners, structural features, and molecular behavior of ORF-8, we aim to gain mechanistic insight into how this viral protein disrupts normal coagulation pathways. Ultimately, a detailed understanding of the structural biology and interaction networks of ORF-8 may guide the development of targeted therapies to prevent or treat long-COVID-associated blood clots.

VALIDATION AND PATHWAY ANALYSIS OF HUR BOUND TRANSCRIPTS
Presenter(s): Reema Korganji
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Johnathon Garber (College of Natural Science)

Human papillomavirus (HPV) is a growing cause of head and neck cancer (HNC). Previous work has shown that the pro-inflammatory chemokines CXCL1, CXCL2, and CXCL8 are negative prognosticators that are upregulated in HPV+ HNC. However, the mechanism of chemokine upregulation remains largely a mystery. Human antigen R (HuR) is a well characterized RNA-binding protein that plays a critical role in post-transcriptional regulation by enhancing the stability and translation of target mRNAs. HuR target mRNAs are reportedly involved in inflammation, proliferation, and tumorigenesis. Our RNA immunoprecipitation (RIP) experiments have shown enrichment of mRNAs coding for chemokines bound directly to HuR in HPV+ HNC cell lines, resulting in upregulation at the transcriptome level. However, HuR-bound mRNAs that are involved in additional pathways in HPV+ HNC remain unknown. In this project, we will use RIP to isolate HuR-associated mRNAs, followed by high-throughput RNA sequencing to identify HuR-bound transcripts and identify the common cellular pathways they belong to using pathway enrichment analysis. Transcripts will further be validated using RIP-qPCR and whole-transcriptome qPCR from HuR knockout cells, with a focus on targets bound to HuR.

LIGAND-SPECIFIC REGULATION OF MACROPHAGE ACTIVATION IN CANCER MICROENVIRONMENTS
Presenter(s): Ibrahima Ndiaye
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Jennifer Jacob (College of Natural Science), Ryann Ray (College of Natural Science)

Macrophages play a central role in coordinating immune responses within cancer micro environments. Their activation state decides whether they promote tumor clearance or immune suppression. This project investigates how distinct microenvironmental ligands: LPS, fibronectin (FN1), apolipoprotein E (APOE), and ALCAM influence macrophage activation and antigen-presentation pathways. Using peritoneal and bone marrow derived macrophages cultured under GM-CSF and M-CSF conditions, cells were stimulated with each ligand, then analyzed by flow cytometry to quantify expression of CD80, CD86, CD40, and MHC class I and II. Preliminary results show that fibronectin and ALCAM increase co-stimulatory molecules (CD80, CD86) and MHC class II expression, suggesting enhanced antigen-presentation potential. APOE exposure produced a comparatively tolerogenic phenotype, maintaining lower CD80/CD86 and moderate MHC expression. These findings highlight how environmental signals selectively modulate macrophage function and may alter downstream T-cell activation within tumors. Ongoing analysis focuses on distinguishing total versus CD11b?CD11c? macrophage to see whether ligand-specific activation is cell-type dependent. Understanding how these pathways shift macrophage behavior contributes to broader efforts in identifying immune-regulatory mechanisms that can be leveraged for cancer immunotherapy.

ENGINEERING MULTI-MODAL NANOTHERAPEUTIC STRATEGIES FOR CHRONIC INFECTED DIABETIC WOUND HEALING USING A RAT MODEL
Presenter(s): Alphan Alpaydin
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Morteza Mahmoudi (College of Human Medicine), Valerie Johnson (College of Veterinary Medicine)

Chronic diabetic wounds represent a major clinical challenge due to persistent inflammation, impaired angiogenesis, and sustained bacterial infection. These wounds frequently fail to transition from the inflammatory phase to tissue regeneration, often leading to severe complications such as lower-limb amputation. Because multiple biological processes contribute to impaired healing, single-target therapies are often insufficient. This project investigates a multi-modal therapeutic strategy integrating regenerative biology and nanotechnology to address several pathological mechanisms simultaneously. A chronic infected wound model was established in streptozotocin-induced diabetic rats. Two full-thickness dorsal wounds were created per animal and infected with bioluminescent Staphylococcus aureus to simulate chronic infection. Treatment groups included structural extracellular matrix support using a colon mucosa bio-patch, regenerative signaling via mesenchymal stem cells (MSCs), and peptide-based modulators including Follistatin-like 1 (FSTL-1) and Ac2-26. Superparamagnetic iron oxide nanoparticles (SPIONs) were incorporated as nanomaterial platforms capable of forming protein coronas, allowing peptide adsorption to potentially enhance peptide stability and local bioactivity within the wound environment. Wound healing progression was monitored through digital wound measurements, while

bacterial burden was quantified using IVIS bioluminescence imaging. Preliminary analyses include linear regression of wound closure kinetics, two-way ANOVA evaluating treatment and time effects, and correlation analysis between infection burden and healing progression. This work explores how integrating structural scaffolding, regenerative signaling, immune modulation, and nanomaterial-based peptide stabilization may improve chronic wound healing. The study also highlights the potential of engineered protein coronas as a translational nanomedicine strategy for complex pathological environments.

USING TCR SEQUENCES TO IDENTIFY POSSIBLE INFECTIOUS AGENTS OF MULTIPLE SCLEROSIS DISEASE (MS)
Presenter(s): Selena Nahhas
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Robert Root (College of Osteopathic Medicine)

Multiple Sclerosis (MS) is driven by dysregulated T-Cell immunity, yet the external triggers that shape these responses remain unknown. Using T-Cell receptor (TCR) sequence analysis, this study explores whether antigens of past infecticous exposures are embedded within MS-associated T-Cell repertoires, suggesting a possible link between infection and autoimmunity

DEFINING EXOPOLYSACCHARIDE REGULATION MECHANISMS IN BRUCELLA OVIS
Presenter(s): Mckenna Goike
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Melene Alakavuklar (College of Natural Science), Sean Crosson (College of Natural Science)

Biofilm formation, driven by the production of exopolysaccharides, is important for many bacterial pathogens during host infection. In the Gram-negative intracellular pathogen Brucella ovis, little is known about its ability to produce exopolysaccharides and subsequently produce biofilms. To evaluate exopolysaccharide production in B. ovis, I use the anionic exopolysaccharide-binding dye trypan blue. Preliminary data suggest that exopolysaccharide production, indicated by trypan blue staining, is elevated in the presence of cell envelope stressors. We wondered what factors regulate exopolysaccharide production in response to changing conditions. To identify regulatory factors, I screened a B. ovis transposon library for mutants with elevated staining under normal conditions. I predict these mutants will have disruptions in genes involved in the regulation of exopolysaccharides. I screened approximately 140,000 colonies and identified 28 independent genes with various insertions that resulted in elevated trypan blue staining. I plan to validate the transposon mutant phenotypes by generating clean deletion mutants of these genes. Insertion mutants in two-component systems, cell wall metabolic genes, and the phosphate starvation response system, among other pathways, show a dramatic increase in trypan blue staining. In the future, I plan to investigate the role of these pathways in exopolysaccharide production as well as their role in B. ovis physiology, pathogenesis, and biofilm generation.

ANALYSIS OF BIOFILM FORMATION ON IMPLANT MATERIALS BY S. AUREUS AND P. AERUGINOSA IN THE PRESENCE OF BIOFILM INHIBITORS
Presenter(s): Mitchell Vaske
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Jonathan Hardy (College of Human Medicine)

One area of concern in medicine is the development of bacterial infection after insertion of surgical implants. Even though implants are thoroughly sterilized prior to the surgical procedure, subsequent exposure to bacteria can result in colonization and formation of biofilm, making these bacteria resistant to antibiotics. The question being addressed in this research is, what methods of treatment are most effective at preventing biofilm formation or inactivating the pathogenic bacteria after formation of biofilm. Our experimental approach will be to grow biofilm forming pathogenic bacteria (Such as Staphylococcus aureus and Pseudomonas aeruginosa) on materials used for surgical implants and apply potential biofilm preventing or disrupting strategies to see if rates of biofilm formation can be reduced.

E. COLI NISSLE 1917 USES LCTP, LLDRD, AND GLCA TO GROW ON L-LACTATE
Presenter(s): Rowan Litts
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Ritam Sinha (College of Natural Science), Victor DiRita (College of Veterinary Medicine)

L-lactate is a key carbon source available in the colon that can be utilized by many gastrointestinal bacteria, including E. coli Nissle 1917. Use of lactate as a carbon source is especially important for colonization of the gut by the pathogen C. jejuni, and lactate competition by probiotic E. coli Nissle 1917 within the gut is believed to inhibit C. jejuni colonization. To study the role of lactate competition by probiotic bacteria, L-lactate uptake genes lctP and glcA were deleted in one mutant (sRDL10) via lambda-red recombineering; a whole-operon knockout mutant delta lldPRD was also constructed using the same methodology.

DETECTING LENTIVIRUSES IN DIFFERENT INFECTION STAGES USING PUMP-PROBE SPECTROSCOPY: FOUNDATIONS FOR RAPID LABEL-FREE DIAGNOSTIC TOOLS
Presenter(s): Tasha Srivastava
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Canchai Yang (College of Human Medicine), Dohun Pyeon (College of Human Medicine)

The COVID-19 pandemic highlighted the high cost and lengthy processing times associated with screening patient samples, underscoring the need for faster methods that reduce turnaround time while maintaining high-throughput capacity. Reapplication of pump-probe spectroscopy has been used to measure a label-free single virion within nanoseconds. Although promising preliminary data have been reported, pump-probe spectroscopy for measuring virions is not yet well established for screening single virions across different stages of virus infection in host cells. My project aims to develop a method for detecting single fluorescently labelled lentivirus particles at different infection stages, including attachment, internalization, membrane fusion, and viral entry into the cytoplasm. To this end, my goal

this semester is to validate and generate fluorescently labelled lentiviruses to track viral entry into host cells. I also plan to label the cell membrane with a lipophilic dye DiD (DiIC18(5)) to track the cell surface during attachment and the initial stages of internalization. Visualizing the different stages of viral infection enables us to precisely measure the virion spectra using pump-probe spectroscopy at each stage. The preliminary data obtained from these experiments could be beneficial in assessing the sensitivity of pump-probe detection and optimizing label-free measurements. Improved detection could ultimately enable rapid screening of viruses in patient samples and support future studies aimed at developing viral diagnostics and therapeutics.

INVESTIGATING COVID-ASSOCIATED COAGULOPATHY (CAC) USING MUTANT VARIANTS OF SARS-COV-2 PROTEIN ORF8
Presenter(s): Udai Kapoor
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Michael Bachmann (College of Human Medicine)

Acutely ill COVID-19 patients as well as those with Long Covid suffer an increased risk of developing blood clots that lead to strokes, heart attacks, and other cardiovascular complications. While this COVID-associated clotting disorder (CAC) is still poorly understood and controversial in its origins, it is currently hypothesized to be an indirect effect of the hyperinflammation that SARS-CoV-2 infection triggers. However, our lab now has evidence for a direct effect by the virus, specifically the viral ORF8 protein: first, it interacts biochemically with a key regulatory clotting protein and second, when delivered into mice by intramuscular (i.m.) injection of ORF8 expression plasmid it triggers clotting and inflammation. Through this project, using mutant variants of the ORF8 protein, we aim to investigate the specific molecular and genetic determinants which lead ORF8 to directly contribute to CAC. Our results will help provide clues to the pathogenesis of the CAC and pave the way for the development of novel antiviral drugs, antibodies and vaccines to improve patient outcomes and public health in general.

QUORUM SENSING REGULATES VIBRIO CHOLERAE GROWTH IN A SELECTIVE ENVIRONMENT MIMICKING INFECTION
Presenter(s): Drew Johnson
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Alex Wessel (College of Veterinary Medicine), Christopher Waters (College of Osteopathic Medicine)

During its life cycle, the bacterial pathogen Vibrio cholerae must adapt and survive to many different environments including the small intestine. In order to examine how V. cholerae survives in selective environments, I serially passaged V. cholerae on the Vibrio-selective medium Thiosulfate Citrate Bile-Salts Sucrose (TCBS) agar. This bile salt containing medium induces stress in V. cholerae and partially mimics in vivo growth conditions. After 10 serial passages, 6 V. cholerae isolates were examined by whole genome sequencing. All isolates had evolved mutations in the transcription factor luxO (luxO-L104R), a central regulator in V. cholerae quorum sensing (QS). QS allows bacteria to regulate gene

expression in response to cell density, controlling behaviors like biofilm formation and virulence in the human pathogen Vibrio cholerae. To study the physiological impact of the luxO-L104R mutation, I regenerated this mutation in a WT V. cholerae strain. Using a bioluminescence reporter, I found that the luxO-L104R mutation locked the cells into a low-cell density QS state. Moreover, this mutant exhibited improved fitness on TCBS relative to the WT strain, demonstrating a link between QS and V. cholerae fitness in this selective condition. To understand how QS impacts TCBS fitness, I performed a transposon mutagenesis screen in a luxO-L104R background, selecting for mutants that return to a WT-like phenotype and mapping these transposon insertions on the V. cholerae genome. My initial results suggest that catabolite repression may be involved in the QS-driven fitness. My results demonstrate QS impacts growth on harsh environments, suggesting how detection and isolation using selective media may be influenced by bacterial communication systems.

BREAKING THE BRIDGE: HOW BACTERIAL CONTACT CONTROLS FUSOBACTERIUM NUCLEATUM AND ITS DISEASE POTENTIAL
Presenter(s): Sarah Hussain
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Jonathan Hardy (College of Human Medicine)

Fusobacterium nucleatum is a spindle-shaped Gram-negative oral anaerobic bacterium linked to periodontal disease. Previous biofilm studies suggest species-specific inhibition of F. nucleatum with a stronger inhibition by Streptococcus gordonii compared to Streptococcus mutans. It remains unclear whether these interactions are contact-dependent or mediated by environmental factors. Both streptococci acidified BHI broth after three days, whereas F. nucleatum did not. Despite this acidification, F. nucleatum exhibited growth in conditioned media from both species, as demonstrated by optical density measurements over time. Neutralization of conditioned media also supported growth of F. nucleatum in anaerobic liquid culture. Culture identity was confirmed by selective plating on vancomycin-containing agar, darkfield microscopy of cultures from both conditioned media, and Gram staining, which verified F. nucleatum morphology with no detectable streptococcal cells.

PCR TEMPLATES FOR A. BAUMANNII DETECTION IN WEST AFRICAN SURFACE WATER
Presenter(s): Connor Griffin
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Brett Etchebarne (College of Osteopathic Medicine), Zenggang Li (College of Osteopathic Medicine)

Given a sample of surface water from West African countries Niger and Burkina Faso, PCR primers were designed to verify the results of next-generation sequencing (using classical PCR techniques) for opportunistic pathogen Acinetobacter baumannii. Surface water samples tested positive using agarose gel electrophoresis and correlated with next-gen sequencing results.

THE ROLE OF ZINC AND MANGANESE ON PHOSPHODIESTERASES IN VIBRIO CHOLERAE
Presenter(s): Marissa Malleck
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Aathmaja Anandhi Rangarajan (College of Osteopathic Medicine), Christopher Waters (College of Osteopathic Medicine)

Cyclic di-GMP is a signaling molecule that regulates biofilm formation and motility and contributes to bacterial infection in Vibrio cholerae. Cyclic di-GMP is regulated by many enzymes, including diguanylate cyclases (DGCs), which synthesize cyclic di-GMP, and phosphodiesterases (PDEs) degrade intracellular levels of c-di-GMP. We have previously found that zinc binds to PDEs in the EAL domain. Several EAL phosphodiesterases are present in Vibrio cholerae, which collectively regulate intracellular zinc levels. We are investigating the role of zinc binding to 11 EALs found in V. cholerae. We are currently investigating the roles of other phosphodiesterases and the impact of zinc on their regulation influencing cyclic di-GMP levels. We are determining the role of EALs in cyclic di-GMP regulation through a mNeonGreen fluorescent biosensor that fluoresces when cyclic di-GMP is present in high levels in the cell. We plan to conduct biofilm and motility assays to determine the effect of EALs on phenotype. Our results highlight the importance of zinc as a signal in regulating cyclic di-GMP levels in V. cholerae.

INVESTIGATING INTERACTION BETWEEN SARS-COV-2 ORF8 AND THE IL-31 RECEPTOR COMPLEX
Presenter(s): Emilia Di Nardo, Julia Feuerborn
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Michael Bachmann (College of Human Medicine)

COVID-19 is associated with hyperinflammation and abnormal blood clotting in severely ill patients, but the viral mechanisms contributing to this pathology remain incompletely understood. Emerging evidence suggests that viral proteins may interact directly with host immune signaling pathways. The SARS-CoV-2 accessory protein ORF8 has protein sequence similarity with interleukin 17 (IL17) and been shown by others to bind to the IL17 receptors A and C and trigger their pro-inflammatory signaling pathways. Here we examine whether ORF8 can also bind to the interleukin-31 (IL-31) receptor complex, which consists of IL31R and the oncostatin M co-receptor (OSMR), since ORF8 is closer in sequence to IL13 than to IL17, suggesting a potential functional interaction. To test this hypothesis, we are cloning synthetic gene fragments encoding the IL31 receptor and the co-receptor OSMR as fusion proteins with split luciferase (NanoLuc) into mammalian expression vectors for expression in HEK 293T cells. We expect that adding IL31 or ORF8 to cells expressing the two engineered IL-31 receptor complex components and thus will bring together the split NanoLuc resulting in bioluminescence signaling. In addition, we are modeling the protein-protein interactions (PPI) between ORF8 and the IL-31 receptor complex using AlphaFold to analyze the molecular determinants of ORF8-ligand binding. The results will help clarify whether ORF8 contributes to IL-31 receptor signaling and inflammatory pathways that may underlie COVID-19-associated coagulopathy.

ENGINEERING LISTERIA AS A INTRACELLULAR QUASIORGANELLE FOR TARGETED CANCER THERAPY
Presenter(s): Tiffany Rennells
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Christopher Contag (College of Engineering)

Histiocytic sarcoma (HS) is a rare and aggressive malignancy of phagocytic immune cells including dendritic cells and macrophages. As a cancer derived from antigen-presenting cells (APCs), HS presents with diverse clinical presentation ranging from localized lesions to disseminated multi-organ infiltration of tumors. Consequently, current treatment strategies including surgery and chemotherapy have demonstrated limited and variable success, underscoring the need for targeted approaches. As HS cells are derived from APCs, they naturally uptake bacteria, and are an ideal candidate for bacteriotherapy. Listeria monocytogenes (Lm), a Gram-positive intracellular bacterium, preferentially accumulates in APCs and can serve as a vehicle for intracellular protein delivery. We utilize a quadruple attenuated intracellular Listeria strain (QUAIL), engineered to reduce virulence and eliminate extracellular growth while maintaining intracellular viability. QUAIL can be further modified to delivery tumor suppressor proteins such as p53 to restore apoptotic signaling, azurin to stabilize p53 and promote apoptosis, checkpoint blockade molecules such as anti-PD-L1 to enhance anti-tumor immunity, and STING agonists to activate innate immune pathways and promote immunogenic tumor clearance. To evaluate this platform, we assessed QUAIL uptake and intracellular persistence in canine HS cell lines using fluorescence analysis. Preliminary data demonstrate efficient intracellular delivery and measurable downstream effects of tumor suppressor proteins supporting its utility as a bacteriotherapy. Future experiments will include quantitative analysis utilizing RNA sequencing, IFN-β quantification, and CFU assays. We hypothesize that by simultaneously targeting multiple anti-tumor mechanisms via a single engineered Listeria vehicle, this platform will enhance systemic therapeutic efficacy and improve in vivo tumor clearance.

BACTIQUICK ENDOTOXIN TESTING: A RAPID WATER QUALITY ASSESSMENT TOOL
Presenter(s): Olivia Cardinell
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Joan Rose (College of Agriculture & Natural Resources), Nishita D'Souza (College of Agriculture & Natural Resources)

The safety of the public relies on timely and accurate recreational water quality monitoring. In Michigan, Colilert (C), a culture-based assay, is used to detect coliforms and Escherichia coli, with a closure threshold of 300 MPN/100 mL. Although reliable, this method requires trained personnel and 24 hours of incubation, delaying management decisions and potentially exposing the public to health risks. Bactiquick (BQ) is a rapid test (15 minutes) that detects gram-negative bacteria via endotoxin risk units (ERU) and may serve as a faster alternative. In this study, we evaluated BQ performance compared to Colilert using 39 samples collected across 8 sampling events from 5 sites (3 inland lakes and 2 Great Lakes beaches). Results were categorized as "risk" (BQ ≥44 ERU; Colilert ≥300 MPN/100 mL) or "no risk." Overall agreement between methods was 62% (24/39). For "no risk" samples, agreement was 100% (21/21). For "risk" samples, only 16.6% (3/18) showed agreement, while 83.3% (15/18) would have

resulted in BQ triggering a beach notification when Colilert would not. BQ demonstrated strong predictive value for low-risk samples, suggesting utility for identifying conditions when beaches can remain open. Additional sampling is needed to evaluate its performance under higher-risk conditions.

CHARACTERIZATION OF PIGMENTS FROM THE FUNGAL PATHOGEN COLLETOTRICHUM FIORINIAE
Presenter(s): Jack Bachand
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Timothy Miles (College of Agriculture & Natural Resources)

Colletotrichum spp. is a pathogen of a wide array of fruit crops around the world, posing major threats to food production. Colletotrichum fioriniae is the causal agent of anthracnose fruit rot, also known as ripe rot in blueberries. Blueberry growers can face yield losses of 10%-20% in the field and up to 100% post-harvest due to anthracnose fruit rot. There are gaps in the understanding of the role pigmentation plays within C. fioriniae. An objective of this project is to phenotype a historic collection of Michigan Colletotrichum isolates for pigmentation. The collection dates back to 1999 and includes isolates from multiple small fruit crops, including blueberry, strawberry, and cranberry. This research aims to clarify the role of pigmentation by examining whether it is associated with growth rate, host isolation, and collection date, and to determine whether pigmentation correlates with a fitness advantage.

VERIFYING E. COLI PREVALENCE IN AFRICAN WATER SOURCES USING OXFORD NANOPORE MINION SEQUENCING-GUIDED PCR TO EVALUATE ENVIRONMENTAL DIARRHEAL DISEASE
Presenter(s): Shrinitha Balraj
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Brett Etchebarne (College of Osteopathic Medicine), Zenggang Li (College of Osteopathic Medicine)

Investigating E. coli prevalence in African water sources helps build a deeper understanding of the onset and spread of diarrheal diseases. This project focuses on using Oxford Nanopore Minion sequencing-guided PCR to verify whether water samples from KPORE and KONGOU (two of the four tested regions in Africa from the MAMIWATA study) contain E. coli contamination. When designing the primers to test the samples, it was important to consider only the fragments in the purple regions of the IGV sequencing results, as this indicates that the DNA in these regions is preserved. This project utilized the Roche FastStart essential DNA Green Master Kit (REF 06 402 712 001) and gel electrophoresis methods to prepare and analyze the provided samples compared to known E. coli negative and E. coli positive samples. Primers 3 and 4 showed the clearest results, but all primers confirmed the presence of E. coli in the samples that were expected to be positive (133, 51, 80). It was insightful to discover a discrepancy from the sequencing results regarding sample 126. The gel electrophoresis results indicate that sample 126 is contaminated with E.coli, although the sequencing results were consistent with a negative E. coli sample. These results suggest that it is important that we regularly monitor water sources and maintain frequent communication with the public regarding contamination to best prevent the spread of

waterborne diarrheal disease. These results also show that Oxford Nanopore Minion sequencing-guided PCR is an effective method to discover pathogens from environmental samples.

COVID-19 ASSOCIATED CLOTTING DISORDER: ALPHAFOLD MODELING THE INTERACTION BETWEEN THE SARS-COV-2 PROTEIN ORF8 AND THE HOST METALLOPROTEASE ADAMTS13
Presenter(s): Maren Williams, Pauline Lor
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Michael Bachmann (College of Human Medicine)

A major cause of morbidity and mortality in severely ill acute and Long COVID patients is the COVID19-associated blood clotting disorder (CAC) that leads to excess heart attacks, strokes, and pulmonary embolisms. In these patients, one of several elevated clotting factors is the von Willebrand factor (VWF) whereas its antagonist, the protease ADAMTS13, is reduced. According to the currently favored "thromboinflammation" hypothesis CAC is an indirect effect of the hyperinflammation in high risk patients. In contrast, we have been hypothesizing that CAC is directly driven by the SARS-CoV-2 ORF8 protein. It was shown by others to interact with >40 host proteins, among them the interleukin 17 receptor A (IL17RA) and the host proteases ADAM9 and ADAMTS1. The latter two proteins are part of the same ADAM/ADAMTS family of metalloproteases, albeit on two different branches of the same tree connected only via the root sequence, the common denominator. Hence, it is plausible, if not likely, that ORF8 can interact with many, if not all ADAM/ADAMTS proteases. Supporting our idea, co-precipitation experiments showed a direct molecular interaction between the viral ORF8 protein and the host ADAMTS13 protease, a negative regulator of the clotting protein von Willebrand Factor. Here, we are modeling the protein-protein interaction (PPI) between ORF8 and the N-terminal half of ADAMTS13 using AlphaFold and FoldSeek to analyze the molecular determinants of ORF8-ligand binding and distinguish binding sites on the ORF8 protein for ADAM/ADAMTS proteases. This computational modeling will allow us to map ligand binding sites on the surface of the ORF8 protein and help us towards our goal of developing novel therapeutic interventions in severe COVID-19 cases that target ORF8.

MORPHOMETRIC ANALYSIS OF FOODBORNE BACTERIA
Presenter(s): Anja Beck
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Evangelyn Alocilja (College of Agriculture & Natural Resources)

Morphological characterization of foodborne pathogenic bacteria is critical for understanding their pathogenicity, survival mechanisms, and detection strategies. Morphology encompasses structural attributes such as cell shape, size, arrangement, and surface features, which are often linked to virulence and environmental resilience. For instance, rod-shaped bacteria like Salmonella and Escherichia coli exhibit flagella that enhance motility and facilitate colonization, while coccoid forms such as Listeria monocytogenes demonstrate adaptability under stress conditions. Morphological traits also influence biofilm formation, a key factor in persistence on food-contact surfaces and resistance to sanitization.

In this study, we used a 3D Laser Scanning Confocal Microscope to measure size and shape parameters, such as volume, surface area, perimeter, feret, and others of Klebsiella pneumoniae, Staphylococcus aureus, Listeria monocytogenes, Salmonella Enteritidis, and Escherichia coli. The morphological data showed that each set of bacteria has unique characteristics and each of the measurements within the bacteria can vary. These data will serve as a foundation for rapid identification and differentiation of species in diagnostic microbiology, complementing molecular and biochemical approaches. Understanding these structural characteristics aids in predicting bacterial behavior under varying environmental conditions, informing risk assessment and control strategies in food processing environments. Consequently, integrating morphological insights with genomic data enhances the development of targeted interventions to mitigate foodborne illnesses. This underscores the significance of morphology as a fundamental parameter in food safety research and public health protection.

PHAGE THERAPY AGAINST PSEUDOMONAS BIOFILMS FOR THE TREATMENT OF CYSTIC FIBROSIS INFECTIONS

Presenter(s): Alicia Schultz
Category: Microbiology, Immunology, and Infectious Disease
Mentor(s): Jonathan Hardy (College of Human Medicine)

Cystic fibrosis (CF) is a genetic disease caused by mutations in the CFTR gene that alter airway physiology and create conditions favorable for chronic bacterial infection. In the CF lung, pathogens like Pseudomonas aeruginosa establish persistent infections by forming biofilms that reduce antibiotic effectiveness and evade host immune responses. Genomic analyses have revealed extensive strain diversity and rapid genetic adaptation of P. aeruginosa within individual patients, contributing to biofilm stability, antibiotic resistance, and long-term persistence. Bacterial genomic variation plays a key role in biofilm-associated phenotypes, including altered metabolism, enhanced stress tolerance, and resistance mechanisms. This within-host strain diversity complicates treatment, as different bacterial subpopulations may respond differently to antibiotics. Bacteriophage therapy offers a potential strategy to address this challenge by targeting specific bacterial strains or genomic variants. Phages can disrupt biofilms through bacterial lysis and may be selected or engineered based on bacterial genomic profiles, enabling more precise and adaptable antimicrobial approaches. This poster examines the genetic basis of cystic fibrosis, the role of bacterial genomics and strain diversity in biofilm formation, and the potential of bacteriophage therapy as a targeted treatment for chronic CF lung infections. Integrating genomic data with phage-based therapies may improve strategies for managing persistent, biofilm-associated infections in cystic fibrosis.

Neuroscience

VISUAL SEARCH GUIDED BY DIFFERENT FEATURES: COMPARING COLOR VS. ORIENTATION
Presenter(s): Anahita Dhar
Category: Neuroscience
Mentor(s): Taosheng Liu (College of Social Science)

During visual search, color often shows stronger guidance benefits than orientation. Some previous findings have suggested that orientation guidance effect is weaker or even detrimental, although this may depend on the specific stimulus structure used. The present study aims to examine whether the guidance benefit of orientation can be enhanced when the search stimuli are designed to encourage such guidance. Participants completed a cued visual search task in which they reported whether the target (a rectangle with pointed ends) is present among distractors (rectangles with rounded ends). The discriminability between the target and distractors (i.e., the size of the ends) was designed to be low to encourage the usage of the cues. In the color-cue task, the target was either red or blue among heterogeneous distractor colors of the same orientation. In the orientation-cue task, the target was either vertical or horizontal among heterogeneous oblique orientations of the same color. In cued blocks, the target-defining feature was indicated at the beginning of each trial; in uncued blocks, both feature options (red and blue; vertical and horizontal) were provided. Preliminary results suggest that color cueing improves search performance by reducing response times relative to uncued trials. Importantly, orientation cueing also appears to provide a response time benefit. These findings suggest that orientation-based attention may be more effective than previously observed when stimulus structure leads to more difficult search. Further analysis will clarify the relative magnitude of these effects and their implications for differences in guiding power across feature dimensions.

COMPARING SUBSTANTIA NIGRA PARS COMPACTA NEUROTENSIN RECEPTOR-1-DOPAMINE AND NEUROTENSIN RECEPTOR-1-ONLY NEURONS ON WEIGHT LOSS BEHAVIORS
Presenter(s): Arnalda Zhao
Category: Neuroscience
Mentor(s): Gina Leinninger (College of Natural Science)

In the United States, obesity affects over 40% of adults and costs $173 billion yearly. Current treatments, like GLP-1 receptor agonists, are not effective for everyone. Therefore, there is a need for greater understanding of how neurosignaling pathways affect energy balance. Neurotensin (Nts) is a neuropeptide released by Nts neurons. It binds to Nts receptors, including Nts Receptor-1 (NtsR1). Dopamine (DA) is a neurotransmitter that affects motivated behavior, including food intake. The lateral hypothalamic area (LHA) is a region of the brain that contains many Nts neurons and releases Nts to other regions. The ventral tegmental area (VTA) is a region of the brain that contains many dopamine neurons that co-express NtsR1. Previous research has shown that activation of the LHA Nts to VTA NtsR1 pathway promotes weight loss in a DA-dependent manner. The substantia nigra pars compacta (SNc) is another region that receives Nts from the LHA and has been implicated in weight loss. Unlike the VTA,

whose NtsR1 neurons all co-express dopamine, one-third of the SNc NtsR1 neurons do not co-express DA. We will determine how the SNc NtsR1-DA and NtsR1-Only neurons differently contribute to weight loss behaviors. Using mouse models and intersectional genetics to chemogenetically activate either the SNc NtsR1-DA or NtsR1-Only neurons, we will use 1) metabolic cages to determine the effects of either neuronal population on energy expenditure and food intake, 2) operant responding for their effects on motivation for palatable foods, and 3) open field tests for their effects on locomotor activity.

IDENTIFYING REGULATORY GENES IN DANIO RERIO ENTERIC NERVOUS SYSTEM DEVELOPMENT
Presenter(s): Amanda Margo
Category: Neuroscience
Mentor(s): Julia Ganz (College of Natural Science)

The enteric nervous system (ENS) is a vast system of neurons and glia within the gastrointestinal tract that regulate motility, nutrient absorption, and immune response. Despite these critical roles, much of ENS development is still incompletely understood. By investigating the fundamental controls of enteric neural crest cell migration, proliferation, and differentiation in the ENS through functional analysis of regulatory genes, we aim to identify the molecular signals required for proper ENS development and maintenance. This study focuses on characterizing two of these genetic regulators to better understand the transition from progenitors to mature neurons. Previous research has pointed to the mycn transcription factor being critical in ENS development. This project investigates the developmental role of this transcription factor using a mycn deletion mutant in zebrafish. We are currently analyzing ENS phenotypes in homozygous mutant zebrafish larvae, anticipating that these knockouts will demonstrate a significant reduction in enteric neuronal density and confirm mycn's role in maintaining the ENS progenitor pool. Another proposed key transcription factor for ENS development is etv1. By knocking out a key enhancer of etv1 expressed in enteric neurons using CRISPR-editing, we are simulating a targeted knockout of the gene, determining its role in ENS development. This targeted approach allows us to observe the effects on ENS development without potential defects associated with whole-body knockouts. Together, these findings will clarify how specific regulatory networks coordinate the development of a functional nervous system, and aid the identification of genetic pathways that, when dysregulated, lead to functional gastrointestinal disorders.

EFFECTS OF CESAREAN BIRTH ON SOCIAL BEHAVIOR TOWARDS NOVEL SOCIAL STIMULI
Presenter(s): Noah Block
Category: Neuroscience
Mentor(s): Alexandra Castillo-Ruiz (College of Social Science)

Birth occurs during a critical period of brain remodeling, and departure from the natural birthing process may influence brain development. We previously reported that Cesarean-born mice show fewer (VP) neurons in the paraventricular nucleus of the hypothalamus (PVN) than vaginally-born mice. Because the VP system of the PVN is an important regulator of sociality, we hypothesize that a Cesarean birth alters social behavior. In support, we recently found that Cesarean birth reduces affiliative behavior between

sibling mice. Here we test whether this finding extends to unfamiliar mice. To this aim, we recorded behavior of adult vaginally and Cesarean-born mice of both sexes during the reciprocal social interaction test. Specifically, during this test, an experimental mouse was first habituated for 5 minutes to a novel arena. Then, an unfamiliar mouse of the same sex was placed in the arena for 5 minutes. Experimental mice were then returned to their home cages. We scored the duration and number of occurrences of affiliative (push-crawl, allogrooming, anogenital investigation, face-to-face sniffing, following), agonistic (fighting, mounting, chasing), and non-social (explore, self-grooming, digging) behaviors. We found that Cesarean-born mice showed reduced affiliative, push-crawl behavior. Together, our findings support the hypothesis that Cesarean birth alters social behavior. Because VP neurons of the PVN are also involved in stress and anxiety, and exposure to a novel arena can trigger those emotional states, we are currently analyzing behavior during the habituation phase of the test. We predict to find that Cesarean birth also alters stress and anxiety-like behaviors.

EFFECTS OF CESAREAN BIRTH ON ACTIVATION OF BRAIN REGIONS THAT REGULATE SOCIAL BEHAVIOR
Presenter(s): Keeley Stankus
Category: Neuroscience
Mentor(s): Alexandra Castillo-Ruiz (College of Social Science)

The brain undergoes immense reorganization around the time of birth. Therefore, divergence from the natural birthing process could alter neural development. Indeed, we previously reported that newborn Cesarean-born mice have more dying neurons in the paraventricular nucleus of the hypothalamus (PVN) than their vaginally-born counterparts. Since the PVN regulates sociality, here we aim to determine whether Cesarean birth affects the PVN's responsiveness to social stimulation. To this aim, we exposed adult vaginally and Cesarean-born mice of both sexes to the reciprocal social interaction test. Specifically, during this test, an experimental mouse was first habituated for 5 minutes to a neutral arena. Then, an unfamiliar mouse of the same sex was placed in the arena for 5 minutes. Experimental mice were then returned to their home cages and, 90 minutes later, their brains were collected for the immunohistochemical detection of the neural activation marker: Fos. We are currently processing the tissue for quantification of Fos positive cells in the PVN. In future work, we will co label cells in the PVN with Fos and neuropeptides known to modulate sociality (i.e., vasopressin, oxytocin) to assess whether neural activation in these cell groups differs based on birth mode. This work is of significance because Cesarean birthing is globally prevalent, and epidemiological studies suggest that Cesarean-born humans are more likely to be diagnosed with conditions characterized by strong social deficits, including autism.

HOW TO MAKE NEURONS GROW FAST
Presenter(s): Benjamin Nketsiah, Kaveri Nambiar, Talya Chakhachiro
Category: Neuroscience
Mentor(s): Kyle Miller (College of Natural Science)

Axonal elongation is critical for neural development and regeneration, yet its underlying mechanisms and potential for therapeutic enhancement remain unclear. Here, we develop a unified active fluid

model that links axonal outgrowth and cell crawling, processes that similarly operate through bulk cytoskeletal flow, adhesion dynamics, and force generation. The modeling shows axonal elongation rate depends on gradients in internal contractile forces, cytoskeletal viscosity, and substrate adhesion. It predicts that rapid extension is promoted by (i) reducing viscosity within the axon, (ii) increasing contractile activity in the growth cone transition zone, (iii) decreasing force generation along the axon shaft, and (iv) tuning adhesion to avoid either over-anchoring or poor attachment. These predictions are based on and supported by experimental measurements of neuronal morphology, bulk flow, and effects of modulating substrate geometry and adhesiveness on outgrowth. Together, these results provide a unified framework for understanding cell migration and axonal growth as variations of the same physical process. Beyond clarifying fundamental mechanisms, the model identifies pharmacological and molecular strategies-such as modulation of nonmuscle myosin II, Rap, Ran, and Rho family GTPases that may control outgrowth during development and accelerate it after injury.

BINGE EATING MRI
Presenter(s): Keaton Hill, Marina Ramiro de Assis Sousa Santos
Category: Neuroscience
Mentor(s): Alexander Johnson (College of Social Science)

In the current food landscape, many questions still arise on the mechanisms and causes for binge eating behavior. This is especially true within environments that promote foods that are high in enjoyment and low in nutrients. Our research set out to find specific brain regions that may play a role in whether a person is binge eating prone or binge eating resistant. To do this, we provided 20 rats with a dish of frosting for a controlled period of time over the span of two weeks. After the two weeks were concluded, the rats were separated into two groups. The binge eating prone group contained rats that consistently ate over the amount of frosting considered to be prone, but never resistant. The opposite goes for rats in the binge eating resistant group. An MRI was then used to determine any differences between the two groups. A significant change in synaptic connections was found between a brain region known as the red nucleus, located in the anterior midbrain. This research is important because it helps uncover some of the brain regions that may play a role in binge eating behavior, and could provide a new understanding of a biological role involved, opening new doors for future research in the field. Overall, our presentation will cover our findings of the red nucleus and how it may contribute to binge eating behavior.

EVALUATION OF THE PHYSIOLOGICAL STABILITY OF HEALTHY RATS DURING HIGH-THROUGHPUT PET/MR IMAGING USING CUSTOM MULTI-SUBJECT BEDS
Presenter(s): Nelli Gaspar
Category: Neuroscience
Mentor(s): Kurt Zinn (College of Veterinary Medicine), Kylie Smith (College of Human Medicine)

Reduced brain clearance is thought to contribute to neurological disease; however, practical noninvasive tools to evaluate these processes in living subjects remain limited. Combined positron emission tomography (PET) and magnetic resonance imaging (MRI) can measure biomarkers in vivo noninvasively,

but the high cost of PET/MRI is a barrier to developing neuroimaging methods. Custom high-throughput multi-rodent PET/MR imaging beds were developed to reduce this barrier. Respiration rate and body temperature were measured over 8 hours of PET/MRI (7T Bruker BioSpec with PET insert) across two sessions in healthy Fisher F344/NHsd rats (n=6 M, 5 F) to test whether subjects remain physiologically stable during high-throughput imaging. Measurements gathered on the SAII Model 1200 Small Animal Monitoring System were exported and aligned across animals and time points, then plotted against time since injection in GraphPad Prism. The impact of sex and time since injection on respiration rate and temperature was evaluated using two-way analysis of variance (ANOVA) on quality-controlled animal vitals datasets. A batch-processing pipeline for PET/MRI imaging data is in development and will be validated by benchmarking its output against previous datasets. This workflow will be applied to datasets from feasibility experiments evaluating imaging beds. These methods allow high-throughput PET/MRI tools to be used safely, accelerating identification of imaging biomarkers for brain waste clearance. Acknowledgement: The Michigan Translational Research and Commercialization Program funded the acquisition of the presented data through Grant Case-48166 of the 21st Century Jobs Trust Fund received through the MSF from the State of Michigan.

SOCIAL PREFERENCES IN A NEW RODENT MODEL, THE NILE GRASS RAT
Presenter(s): Lara Korkmaz
Category: Neuroscience
Mentor(s): Alexa Veenema (College of Social Science), Bridgette Weiss (College of Natural Science)

Much like humans, Nile grass rats (Arvicanthis niloticus) are diurnal and show biparental care. Although not much else is known about them, these traits separate them from common rodent model organisms and make them appealing for social behavioral research. To help determine their use as translational animal models, we conducted ten-minute three chamber tests to understand their preferences for social approach (novel rat vs. novel object), social novelty (novel vs. familiar rat), and opposite sex (same-sex vs. opposite-sex rat). We then analyzed these preferences as both averages across the whole duration of the test and then minute-by-minute to determine if they remained consistent over time. We also compared our findings to the more commonly used Wistar rats. Both species generally preferred novel rats in the social approach and the social novelty test, however male Nile grass rats did not show a novelty preference. Both species also tended to prefer opposite-sex rats in opposite-sex preference testing except female Wistar rats. The minute-by-minute data for social approach and opposite sex preference confirmed the 10-minute average while the minute-by-minute data for social novelty displayed no overall preference and thus went against the 10-minute average. Future directions could include additional behavioral testing coupled with brain manipulations to better understand the neural mechanisms underlying these behaviors. Overall, these findings show that Nile grass rats exhibit both similarities and differences in social preferences compared to Wistar rats that are important to inform their use as translational models.

DIETARY OBESITY ALTERS FEEDING BEHAVIOR CONTROLLED BY THE GASTRIC FEEDING SIGNAL GHRELIN
Presenter(s): Allison Doneth
Category: Neuroscience
Mentor(s): Alexander Johnson (College of Social Science)

Ghrelin, the only gastric signal that indicates hunger, has been shown to act on the ventral hippocampus (vHPC) and drive orexigenic behaviors through activation of its receptor, GHSR. In the current study, we examined whether feeding behavior controlled by GHSR-expressing cells in the vHPC, differs in mice resistant (diet resistant; DR) or vulnerable (diet induced obese; DIO) to weight gain on a high fat diet(HFD). We made use of GHSR-IRES-Cre mouse line that enabled use of Cre-dependent chemogenetic tools to infect GHSR-expressing cells in the vHPC, and activate these cells using the excitatory DREADD, hM3Dq. Following 8 week exposure to HFD, the bottom (DR) and top (DIO) quartile of weight gainers received stereotaxic surgery and administration of hM3Dq in the vHPC. When tested with standard laboratory chow, activation of GHSR-expressing vHPC neurons did not influence chow intake in DR mice. Surprisingly, however, this stimulation reduced HFD intake. These findings suggest that the ghrelin system works to reduce intake of energy dense foods in mice that are more resistant to diet-induced obesity. Meanwhile, inhibition of ghrelin-sensitive vHPC cells in DIO mice reduced chow feeding behavior only, with no effect on HFD intake. These latter findings may suggest that the ghrelin system may sway DIO mice that are vulnerable to weight gain away from more nutritive (laboratory chow) food choices. Overall, our studies highlightthe importance of considering how variability in weight gain is associated with prominent differences in how energetic signals like ghrelin may mediate food intake. Results begin to suggest that differing levels of sensitivity to ghrelin-induced hunger signals may play a key role in an individual's susceptibility to dietary obesity.

CHARACTERIZING OREXIN IMMUNOREACTIVITY IN A DIURNAL MODEL OF FAMILIAL NATURAL SHORT SLEEP (FNSS)
Presenter(s): Amy Liu
Category: Neuroscience
Mentor(s): Jamie Shi (College of Social Science), Lili Yan (College of Social Science)

Familial Natural Short Sleep (FNSS) is a heritable sleep phenotype in humans characterized by reduced sleep needs without experiencing cognitive, emotional, or physiological impairment associated with chronic sleep loss. Variations in the differentiated embryo chondrocyte gene 2 (Dec2) have been identified as a key genetic contributor to this FNSS phenotype. To understand the behavioral and cellular mechanisms underlying FNSS, we developed a Dec2 mutant rodent model using CRISPR-Cas9 genome editing in the Nile grass rats (Arvicanthis niloticus), a well-established diurnal species that closely aligns with the human circadian rhythms. To characterize the functional consequences of the Dec2 mutation, we combined behavioral monitoring with neurochemical analyses. In-cage locomotor activity was continuously monitored for Dec2 mutant and wild type (WT) grass rats. Brain sections were processed using immunocytochemistry to visualize orexinergic neurons in the lateral hypothalamus (LH), and the major orexin projecting sites that are critical for arousal and sleep-wake regulation. Orexin positive cell

counts and immunoreactivity intensity were quantified in Dec2 mutants and WT littermates. We hypothesize that Dec2 mutant grass rats will show increased an orexin neuron number, enhanced orexin immunoreactivity in the LH, or increased terminal density in downstream target regions, such as the dorsal raphe nucleus (DRN), tuberomammillary nucleus (TMN), or Locus coeruleus (LC), compared to WT controls. Understanding the basic mechanisms of FNSS will provide a valuable foundation for understanding sleep homeostasis in short sleep and individual variability in sleep need, with potential implications for sleep and arousal-related disorders.

DID NEURONS EVOLVE ONCE OR TWICE?
Presenter(s): Avalyn Waddell
Category: Neuroscience
Mentor(s): Kyle Miller (College of Natural Science)

While it was long thought the first metazoan was a sponge-like animal, recent advances in molecular phylogeny now suggest Comb Jellies evolved first. Noting that sponges lack neurons, raises the question if neurons evolved independently in Comb Jellies and bilaterians, such as humans or if sponges lost the ability to create neurons. In support of neurons evolving independently, neuronal specification genes in the Acheate Scute family were missing in the first sequenced genomes, which provided about 80% coverage. In the past several years, 8 or 9 ctenaphore genomes have been sequenced, and currently there is a wealth of unmined genomic data. To help address the question of whether neurons evolved once or twice we have used a list of 108 ASC genes from insects to search the new sequenced genome. This involved conducting a tBlastn search, where protein sequences were used to search genomic nucleotide sequences. In total we found x hits. Hits were retrieved, aligned and phylogeny was analyzed using Bash and Python (coding terminals) and phylogenetic software at the website SHOOT.bio was used for constructing phylogenetic trees and finding orthologs in model organisms. In brief we found roughly a dozen bHLH, including direct orthologs to bilaterian ASC orthologs across Ctenophora.

EXPLORING THE RELATIONSHIP BETWEEN INDIVIDUAL DIFFERENCES IN SUSCEPTIBILITY TO MUSICAL GROOVE & MOTOR-CORTICAL EXCITABILITY
Presenter(s): Shrinidhi Pola
Category: Neuroscience
Mentor(s): Celeste Uhl (College of Social Science), J McAuley (College of Social Science)

The experience of groove describes a person's urge to move in response to music. Differing levels of groove can be experienced while listening to music. Previous work using transcranial magnetic stimulation (TMS) suggests that high groove excerpts lead to more excitability in the motor cortex. However, there are large individual differences in the extent to which individuals have the urge to move to music. One such difference is a person's susceptibility to groove to music. Some individuals can't help but move to music while othersare impervious to its effects. The current study has 2 goals. We first developed a survey that measures an individual's susceptibility to groove (STG). We then plan to examine the relationship between individuals' STG and motor thresholds using TMS. We predict that

higher susceptibility to groove will be associated with lower threshold values (greater motor-cortical excitability). TMS will be administered over the primary motor cortex to elicit a motor evoked potential (MEP) from the right hand (observable as a small twitch). Stimulator output intensitywill be adjusted until a threshold is obtained (5 of 10 pulses elicit MEPs exceeding 50 μV). Thenparticipants will complete multiple surveys including STG questionnaires and assessments of pleasure and urge to move for various musical clips. Susceptibility to groove scores and threshold values will be correlated. TMS studies of groove and movement may advance understanding of motor dysfunction and music-based therapeutic interventions.

MICROGLIAL EPIGENETIC REMODELING IN AUTISM: LINKING RISK FACTORS TO BRAIN
Presenter(s): Ishitha Teluguntla
Category: Neuroscience
Mentor(s): Yuen Gao (College of Osteopathic Medicine)

Autism spectrum disorder develops through a combination of genetic susceptibility and early life environmental exposures. Microglia, the brain's resident immune cells, play a critical role in shaping the developing nervous system. During early development they help refine brain circuits by pruning excess synapses, supporting myelination, and maintaining immune balance. Because microglia are highly sensitive to inflammatory signals and metabolic changes they may act as a key link between early environmental stress and long-term brain function. Emerging research suggests that epigenetic mechanisms like biological processes that regulate gene activity without changing DNA sequence, control how microglia mature and respond to stress. These mechanisms include DNA methylation and histone modification which influence when and how genes are expressed. Environmental risk factors such as maternal immune activation, microbiome disruption, and toxic exposures may alter these epigenetic programs during critical developmental windows. In parallel, ASD-associated genes involved in chromatin remodeling, including KMT2C for example, may increase vulnerability by altering gene regulation in microglia. Together, genetic and environmental influences may converge on microglial epigenetic regulation, disrupting normal synaptic pruning and altering the balance of neural circuits. Understanding how early-life factors shape microglial development provides insight into how diverse risk factors can lead to similar changes in brain connectivity in ASD and may inform future strategies for early detection and provide a framework for understanding how early biological processes shape neurodevelopment outcomes.

OPPOSING EFFECTS OF ACTIN DISRUPTION ON CNS AND PNS NEURONS
Presenter(s): Benjamin Domzalski, Michal Rut, Rachel Zhai, Sethmi Madawala
Category: Neuroscience
Mentor(s): Kyle Miller (College of Natural Science)

The mechanism underlying axonal elongation remains unknown. Understanding it is crucial, as currently, there are no effective treatments for spinal cord or brain injuries. While one may expect that all neurons elongate using the same fundamental mechanism, recent studies reveal a contrast in flow between

neurons in the central nervous system (CNS) and the peripheral nervous system (PNS). Within cortical neurons from the brain (CNS), the primary tracks for transport-called microtubules-flow in bulk toward the cell body. In contrast, microtubules along the axon in sensory neurons from the peripheral nervous system flow forward in bulk away from the cell body. To better understand the molecules that mediate bulk flow in the retrograde and anterograde directions, we grew chick sensory and cortical neurons labeled with markers for mitochondria and microtubules. We then added the actin drugs, Latrunculin and Cytochalasin D, which inhibit assembly by respectively sequestering free G-actin or blocking the plus ends of actin filaments. We found that inhibition of actin assembly with Cytochalasin led to a rapid burst of outgrowth in cortical neurons and resulted in a slowing of bulk retrograde flow. In turn, inhibition of actin assembly in sensory neurons blocked growth and led to a dramatic bulk retraction of internal components and thinning of the axon. These experiments indicate that the mechanics of axonal elongation differ dramatically between CNS and PNS neurons, which in part may help explain the difficulty with promoting neuronal regeneration.

DISSECTING THE FUNCTION OF CORTICOTHALAMIC CIRCUITRY THROUGH PRECISE SPATIAL AND TEMPORAL CONTROL
Presenter(s): Mya Sebek
Category: Neuroscience
Mentor(s): Lea Ratz (College of Osteopathic Medicine), Shane Crandall (College of Osteopathic Medicine)

Nearly all sensory signals enter the neocortex through the thalamus. In return, the neocortex sends a massive projection back to the thalamus that is important for modulating thalamic activity. Layer 6 (L6) corticothalamic (CT) projection neurons have been shown to both enhance and suppress thalamic excitability and sensory throughput. However, the synaptic circuit mechanisms underlying the suppressive and enhancing effects remain unclear and are likely to depend on both the spatial and temporal properties of the CT projection. Here, we take advantage of the remarkable somatotopic organization of the mouse whisker primary somatosensory cortex (S1) and intrinsic signal optical imaging (ISOI) to precisely target Cre-dependent adeno-associated viruses (AAV) encoding Channelrhodopsin-2 (ChR2) to specific cortical (barrel) columns to temporally control the activity of a small population of spatially defined L6 CT projection neurons. This powerful approach, combined with in-vitro electrophysiological recordings, enables new circuit-level studies investigating the spatial and temporal influence of the cortex on sensory processing in the thalamus. Ultimately, our study could provide new insights into the functional organization of the CT pathway and how it shapes processing in the sensory thalamus through both excitation and suppression in space and time.

IS NEUROTENSIN RECEPTOR-2 UBIQUITOUSLY EXPRESSED IN ASTROCYTES IN BRAIN REGIONS IMPLICATED IN FEEDING AND PAIN?
Presenter(s): Anna Reschke
Category: Neuroscience
Mentor(s): Gina Leinninger (College of Natural Science)

The peptide Neurotensin (Nts) binds to Neurotensin Receptor-1 (NtsR1) and Neurotensin Receptor-2 (NtsR2) in the brain. Nts signaling via NtsR1 suppresses feeding and pain, but the role of Nts-NtsR2 is unclear. Previous work predominantly focused on Nts-mediated effects on neurons, which express NtsR1, but we found that NtsR2 is primarily expressed by the brain's most abundant glial cell type: astrocytes. Recent work suggests that subgroups of astrocytes mediate distinct physiology, such as feeding and pain processing. Whether NtsR2 is expressed by all astrocytes, or only subsets of them in the brain is unknown; knowing this is vital to understanding where and how Nts-NtsR2 is implicated in feeding and pain. We hypothesized that a specific subpopulation of astrocytes within brain regions that modulate feeding and/or pain will express NtsR2. To test this, we collected brains from NtsR2Cre-GCaMP-Td-tomato mice, in which Cre is expressed in all NtsR2 expressing cells and drives expression of Td tomato (red-fluorescent protein). Brains were immunolabeled for s100B (astrocyte marker) with a green-fluorescent tag. Fluorescence microscopy was used to collect images of s100B and tdTomato in regions implicated in Nts-mediated feeding and/or pain responses, specifically the lateral preoptic area (LPO), ventral tegmental area (VTA), Substantia Nigra pars compacta (SNc), and the periaqueductal gray (PAG). Quantification of all s100B astrocytes and the proportion that co-express tdTomato (NtsR2) revealed whether NtsR2 is ubiquitously expressed. These data will help guide future research revealing the cell type and brain areas enriched in NtsR2 that might be druggable-targets to reduce feeding and/or pain.

FEASIBILITY OF PREHOSPITAL EEG FOR EARLY NEUROLOGICAL DECISION-MAKING USING MACHINE LEARNING
Presenter(s): Anyla Clerk, Gul Efsan Ozbekoglu, Tatyana Chism
Category: Neuroscience
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

Rapid identification of neurological abnormalities in time-sensitive and resource-limited settings remains a major challenge in clinical care. Portable electroencephalography (EEG) systems offer a noninvasive means of capturing neural activity, but real-world deployment requires confirmation that clinically relevant information is preserved under reduced data resolution and environmental interference. This study evaluates the feasibility of machine learning-based classification of EEG data associated with neurological conditions when subjected to downsampling and simulated noise. EEG recordings from individuals with neurological pathology and healthy controls were preprocessed and harmonized to ensure consistency across datasets. Channel-wise statistical features, including measures of central tendency and variability, were extracted from the EEG signals. A Random Forest classifier was trained on full-resolution, noise-free data to establish baseline performance, with evaluation conducted using stratified train-test splits, confusion matrices, and receiver operating characteristic (ROC) analysis. To

approximate conditions encountered in prehospital and emergency care settings, EEG signals were subsequently downsampled and augmented with noise designed to reflect motion artifacts and electrical interference common during ambulance transport. The trained model was then applied to these degraded datasets to assess robustness and classification performance under increasingly adverse conditions. The persistence of discriminative neural patterns under downsampled and noisy conditions suggests that portable EEG retains meaningful information despite environmental constraints. These findings support the potential use of prehospital EEG as a rapid decision-support tool to expedite triage for time-sensitive neurological emergencies, facilitating earlier alignment with appropriate advanced care and potentially reducing delays to definitive treatment.

BRAIN STRUCTURAL CONNECTIVITY OF FIBROMYALGIA SUBJECTS
Presenter(s): Brianna Yu, Ellery Curtis, Rylee Miller
Category: Neuroscience
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

Fibromyalgia (FM) is an idiopathic chronic pain syndrome, mostly found in women. This condition is characterized by increased sensitivity to somatosensory nociception, as well as sleep disorders, stiffness, fatigue, anxiety, and depression. This research compares two datasets from a study of 20 subjects with FM and a control group of 20 without it. A previous study focused on the functional connectivity of different brain regions before and after listening to music or pink noise, and its analgesic effects. Resting state functional connectivity was found to increase for the FM group compared to the control group in the angular gyrus, posterior cingulate cortex, and precuneus; and decreased in the amygdala and middle frontal gyrus. With another dataset provided by that previous study, this research used diffusion-weighted imaging (DWI)-a non-invasive imaging technique that maps the microscopic movement of water molecules-to find significant differences in the FM and control group's structural connectivity. DWI data from OpenNeuro was imported into DSI Studio and parameter data was exported. After that, relationships between the functional connectivity and structural connectivity were drawn. The DWI findings included the PCC, parahippocampal gyrus, and dorsomedial prefrontal cortex, which are components of the Default Mode Network (DMN) and medial temporal subsystem. These structural abnormalities map directly onto the same emotional-memory-self processing circuit as the functional connectivity results of the previous study. This suggests that the FM patients may have DMN microstructural abnormalities that underlie the altered functional connectivity observed in music-induced analgesia.

EFFECTS OF KMT2C DEFICIENCY ON FEAR CONDITIONING AND FREEZING BEHAVIOR IN MICE
Presenter(s): Eva Sclabassi, Sophie Peret
Category: Neuroscience
Mentor(s): Yuen Gao (College of Osteopathic Medicine)

KMT2C is a chromatin-modifying gene implicated in neurodevelopmental disorders, including autism spectrum disorder, but its role in fear learning and memory remains poorly characterized. In this study,

we examined how loss of KMT2C affects behavioral responses during a classical fear conditioning paradigm in mice. Male and female KMT2C knockout (KO) and wild-type (WT) mice underwent a standard foot-shock fear conditioning protocol. Freezing behavior, a widely used index of fear memory, was quantified following three shock presentations using automated video-tracking software. Post-shock freezing durations were analyzed at multiple time points to assess immediate fear acquisition. Across animals, KMT2C knockout mice exhibited higher average post-shock freezing compared to wild-type controls, indicating enhanced or prolonged fear responses following aversive conditioning. While variability was observed across individuals and sexes, the overall trend suggested that disruption of KMT2C alters behavioral reactivity to fear-inducing stimuli. These findings support a role for KMT2C in regulating fear-related neural circuits and behavioral responses to stress. Given the involvement of KMT2C in neurodevelopmental disorders, altered fear processing may represent a contributing mechanism linking chromatin dysregulation to behavioral phenotypes. Future work will examine contextual memory retention and neural correlates of these behavioral differences.

EFFECTS OF CESAREAN BIRTH ON SOCIAL BEHAVIOR AND ASSOCIATED NEURAL SUBSTRATES
Presenter(s): Holly Pringle
Category: Neuroscience
Mentor(s): Alexandra Castillo-Ruiz (College of Social Science)

We previously reported that Cesarean-born adult mice have fewer vasopressin (VP) neurons in the paraventricular nucleus of the hypothalamus (PVN) than their vaginally-born counterparts. Because the VP system of the PVN regulates sociality, here we used a naturalistic approach to test the hypothesis that Cesarean birth alters social behavior. Specifically, we recorded natural, in-cage behavior of adult mouse dyads of the same sex and birth mode (vaginal or Cesarean) for two hours during the early morning and night. Social (huddling, allogrooming) and non-social behaviors (locomotion, nest-building, rearing, drinking, eating, self-grooming) were scored every 2 minutes for each mouse in the dyad. As expected, there was an effect of birth mode on social behavior but in a sex and time dependent manner with Cesarean-born male mice huddling less at night than males born vaginally. Cesarean birth also increased locomotion and nest-building. Remarkably, these are all behaviors regulated by the VP system of the PVN. Because these results suggest that Cesarean birth functionally affects the VP system of the PVN, we next quantified VP innervation of brain regions linked to the altered behaviors via immunohistochemical detection of VP fibers. Preliminary assessment of one such brain region: the bed nucleus of the stria terminalis, which regulates social recognition and contextual awareness, reveals no effect of birth mode on its innervation. We are currently continuing our quantification of other brain regions, including the medial preoptic area, which has been shown to be involved in nest building.

FEEDING EXPERIMENTATION DEVICE 3 ENHANCING EFFICIENCY AND ACCURACY OF DATA
Presenter(s): Ian Render Flores
Category: Neuroscience
Mentor(s): Gina Leinninger (College of Natural Science), Katie Thompson (College of Natural Science)

Feeding is an essential behavior mediated by the brain but is still incompletely understood. It is often studied in mice since experimenters can modulate specific neurons and then measure if/how it alters feeding behavior. Mice can be placed in special cages metabolic cages to measure their feeding but this environment change causes stress that changes feeding patterns. Alternatively, food intake can be hand-measured in home cages, but this requires experimenters to interrupt the cage multiple times per day to weigh food, which causes stress and impact feeding. Hand-weighing food is also prone to experimental error. I hypothesized that using the Feeding Experimentation Device 3 (FED3), developed by the Kravitz lab, can overcome these issues by non-invasively measuring mouse feeding in home cages across multiple days. The FED3 is a battery-operated device with two nose-pokes and a food pellet delivery window that fits within a mouse cage. The FED3 can be programmed to deliver a food pellet each time a mouse pokes its nose in a port (free feeding) or to require a specific number of nose pokes to earn a pellet (a common paradigm to assess motivated behavior). The FED3 device records each time a pellet is released and eaten down to the second, allowing for temporal, quantitative feeding tracking without an experimenter having to interrupt the cage. I tested FED3s to measure mouse chow intake across multiple days to assess its usefulness. These findings suggest that using FED3s improves the quality and ease of feeding studies.

BIOLOGICAL PATHWAYS AND SENSORY MEANING IN AUTISM: A HUMANISTIC SYNTHESIS ACROSS SCIENCE AND EXPERIENCE
Presenter(s): Nadine Shetiah
Category: Neuroscience
Mentor(s): Ariel Cascio (College of Human Medicine)

This medical humanities project explores how autism is represented across scientific, clinical, and lived-experience perspectives, focusing on sensory and developmental models. Autistic people describe their experiences in terms of perception, sensory intensity, and adaptive regulation, rather than deficits. Biological models emphasize mechanisms like sensory processing, neural circuits, and genetic pathways. Social models emphasize development, interaction, and the meaning of sensory differences in everyday life. By highlighting how autistic people interpret sensory experiences, this work contributes to a more resilient and human centered understanding of neurodiversity within health humanities. This project compares, integrates, and synthesizes how diverse fields and actors - especially autistic people themselves - define and describe a key autistic trait: neurodivergent sensory perception. It begins with a scoping review of current literature, including biological and social models and theories of autism. The literature review examines animal behavior paradigms used to operationalize autistic sensory perception, such as valproic acid rat models and FMR1 and Shank3 knockout mice. This review also analyzes social science theories of autism and studies of autistic people's perspectives. Biological findings prioritize important measurable outputs. Lived perspectives emphasize context, function, and

internal experience. This project examines where and how animal models of autism fall short of useful for understanding lived experience, and if and how published animal model research considers lived experience perspectives. This cross-level synthesis offers guidance for improving the design of behavioral assays, interpreting animal findings, and developing clinical approaches that align more closely with autistic perspectives and take a non-deficit approach.

EXPLORING SEX DIFFERENCES ASSOCIATED WITH PROTEINS, PARTICULARLY NTS AND VGAT, IN THE LATERAL HYPOTHALAMIC AREA
Presenter(s): Grace Eliya
Category: Neuroscience
Mentor(s): Gina Leinninger (College of Natural Science), Raluca Bugescu (College of Natural Science)

The lateral hypothalamic area (LHA) is a region of the hypothalamus traditionally recognized as the "feeding center" of the brain, containing neuronal populations defined by distinct neurochemical markers, neurotensin (Nts) being among them. LHA Nts neurons are a specialized subset of neurons that among other things, reduce food intake, and promote energy expenditure, acting as a crucial regulator of energy balance. LHA Nts neurons come in a number of varieties. Previous work published in the Leinninger Lab elucidates that most LHA Nts neurons contain vGAT and are GABAergic. Additionally, The NIDDK reports variations between men and women in overweigh, obesity and severe obesity. In light of this we wanted to explore whether there were sex differences in LHA Nts. Historically, due to a lack of reliable antibodies that label Nts there have been limited ways to investigate Nts in the brain. RNAscope, a highly sensitive and specific multiplex RNA in situ hybridization technology, has made detecting and quantifying Nts RNA possible in tissue sections. For the experiment, we perfused wildtype mice (5 females and 5 males). We then labeled Nts and VGAT using RNAscope and quantified the number of cells expressing each protein. We confirmed that most LHA Nts neurons are GABAergic. Most Nts cells also expressed vGAT. We observed that there was a striking difference in the number of puncta labeling Nts cells. We created guidelines to distinguish between low and high density cells to explore differences between male versus female mice in low of high density Nts cells.

BEHAVIORAL ALTERATIONS IN A NON-TRANSGENIC DROSOPHILA MODEL OF ALZHEIMER'S DISEASE ARE AMELIORATED BY THERAPEUTIC CANDIDATES
Presenter(s): Diya Patel, Morgan Kulczycki
Category: Neuroscience
Mentor(s): Leila Nourani (College of Natural Science), Min Kuo (College of Osteopathic Medicine)

Alzheimer's disease (AD) is the leading cause of dementia worldwide with prevalence continuing to rise annually1, 2. Two key biomolecular hallmarks of AD are abnormally phosphorylated tau (p-tau) and amyloid-β plaque accumulation ?. Although both are defining features, the spatiotemporal distribution of p-tau correlates stronger with cognitive decline and neuronal injury 3. Drosophila Melanogaster serves as a powerful in vivo model organism for studying AD and related neurodegenerative diseases. Its short lifespan, combined with recently developed whole-brain connectome mapping techniques,

enables detailed analysis of neurodegenerative processes across both cellular and behavioral levels?. However, many current Drosophila AD fly models depend on transgenic overexpression of tau (wild-type or mutant) which does not fully replicate tau hyperphosphorylation, a key pathological feature of AD ?, ?. To address this limitation and better model disease-relevant mechanisms, the Kuo lab has developed a non-transgenic in-cibo (Latin: "in food") Drosophila model. In this system, oral administration of p-tau-expressing E. coli induces AD-like pathological features, including an age-related alteration of sleep-wake patterns. Notably, treatment with small-molecule compounds C9F and C13H noticeably prevented age-dependent behavioral changes; C9F effectively ameliorating these changes. Behavioral impairments were evaluated using negative geotaxis (climbing) assays to evaluate locomotor function, along with the Longitudinal Activity Monitoring (LAM25H) and Drosophila Activity Monitor (DAM) technology to characterize sleep activity patterns. With AD cases projected to triple worldwide by 2050[1], this non-transgenic model serves as a capable framework for future drug screening endeavors and the investigation of AD.

Nutrition & Food Science

COMPARISON OF FERULIC ACID EXTRACTION METHODS IN CORN AND RYE SPENT GRAIN
Presenter(s): Madeline Benson
Category: Nutrition and Food Science
Mentor(s): Nicole Shriner (College of Engineering)

Ferulic acid is a commonly found phenol in many plant sources, and it is used across industries. In the fermented beverage industry, specifically spirit production, cereal grains introduced during the mash stage contain ferulic acid, which contributes to the final flavor profile. During mashing, a small portion of the phenolic acids present are freed, but the majority remain bonded to the cell walls of grain cells. The methods of freeing ferulic acid from spent grains, including microwave assisted extraction and liquid-liquid extraction, are utilized in different industries. This study will compare the effectiveness of traditional extraction and microwave assisted extraction for use in further studies. Traditionally, extraction of ferulic acid from spent grains involves alkaline hydrolysis through the addition of NaOH, followed by re-acidification by HCl. Liquid-liquid extraction effectively isolates ferulic acid in solution from grain using ethyl acetate; however, it is a time-intensive process. Instead, microwave assisted extraction can be performed on spent grain samples using a basic aqueous solution such as ethanol. Hold times between 10 and 20 minutes will be investigated with varying temperatures. The effectiveness of microwave-assisted extraction, a highly efficient process, is used to determine the usability of microwave-assisted extraction in free-ferulic acid optimization studies.

EVALUATING THE IMPACT OF PRODUCT STRUCTURE ON SALMONELLA RESISTANCE IN APPLES AND MANGOES

Presenter(s): Emma Bingham
Category: Nutrition and Food Science
Mentor(s): Ian Hildebrandt (College of Agriculture & Natural Resources)

Commercial fruit products must meet food safety regulatory requirements to protect public health, although pathogen survival across fruit varieties and structures is yet to be characterized. The purpose of this study was to evaluate Salmonella lethality during isothermal treatments of sliced or blended apples and mangoes. Locally sourced apples and mangoes were washed, cored, peeled (mangoes only), sliced (5 mm, 10-15 g per slice), and inoculated with 0.5 mL of a 6-serovar Salmonella cocktail on each side, allowing 15 min for inoculum absorption in between. For the intact method, inoculated slices were cut into disks (~ 0.9 g each) and placed in sealed aluminum test cells for treatment. For the nonintact method, ~ 6 inoculated slices were blended in a small-scale kitchen chopper in four ten-second intervals, then a portion (~ 1 g) was scooped into each test cell. Treatments were conducted at 60°C, in which sampling occurred at 4 time after achieving isothermal conditions. Treated samples were cooled, serially diluted with 0.1% peptone, plated on differential/non-selective media, incubated (48 h, 37ºC), and enumerated. Initial inoculation levels were not significantly different across intact and non-intact apples and mangoes ($P>0.05$). Fruit structure significantly impacted Salmonella inactivation, with higher lethality observed in nonintact samples (t-test, $P<0.05$). For intact slices, 0.29 and 2.79 log reductions were achieved after 1.7 min for apple and mangoes, respectively, compared to 3.54 and > 5.5 log reductions for their blended counterparts. Overall, findings from this study provide insights into Salmonella behavior in different fruit matrices.

DOMAIN-ADAPTIVE HYPERSPECTRAL MICROSCOPY FOR CLASSIFICATION OF MAJOR FOODBORNE PATHOGENS ACROSS ILLUMINATION CONDITIONS

Presenter(s): Gillian Kuehnle
Category: Nutrition and Food Science
Mentor(s): Bosoon Park (College of Agriculture & Natural Resources), Jiyoon Yi (College of Agriculture & Natural Resources), Meili Papa (College of Agriculture & Natural Resources)

Hyperspectral microscope imaging is a promising rapid method for artificial intelligence (AI)-enabled pathogen classification, yet laboratory dataset variability limits model generalizability. This study aims to develop an AI-enabled hyperspectral microscopy framework with domain adaptation for robust classification of major foodborne pathogens across illumination conditions. Five bacteria (Listeria monocytogenes, Listeria innocua, Salmonella Enteritidis, Salmonella Typhimurium, and Escherichia coli O157:H7) were cultured at 32°C for 16 h, washed, and resuspended in deionized water. Then, 2-µL suspension was pipetted onto a glass slide, air-dried, rehydrated, with three slides prepared per biological triplicate. Non-overlapping regions were imaged using a darkfield microscope with 100x objective under tungsten halogen and metal halide illumination, with a total of 500 hypercubes collected. Hypercubes were reduced by principal component analysis to composite images and used to train a convolutional neural network with adversarial domain adaptation, with halogen images as the

source domain and metal halide images as the target domain. Model performance was evaluated on a held-out target dataset using classification accuracy. Feature visualization using t-distributed stochastic neighbor embedding (t-SNE) was used to support interpretation of learned feature separation. Models trained with adversarial domain adaptation achieved higher cross-illumination accuracy than baseline models, significantly improving performance from approximately 39% to 82% on a held-out target dataset ($n=225$, $p<0.05$). Feature visualization using t-SNE showed tighter clustering of bacterial classes after domain adaptation. These findings demonstrate that AI-enabled hyperspectral microscopy models trained under lower-cost imaging conditions can generalize to higher-quality systems, supporting consistent pathogen classification for food safety applications.

IMPACT OF CLEANING AND SANITATION ON SALMONELLA ADHESION ON STAINLESS STEEL SURFACES FOR MULTIPLE FOOD POWDERS

Presenter(s): Hannah Moore
Category: Nutrition and Food Science
Mentor(s): Ian Hildebrandt (College of Agriculture & Natural Resources)

Salmonella is the primary pathogen of concern in low-moisture foods and processing environments. Salmonella's ability on powder particles to adhere to processing equipment surfaces is poorly understood, with impact of food composition and appropriate cleaning/sanitation practices remaining a major gap. This study is designed to evaluate 6 food powders to determine the impact of dry brush cleaning and UV sanitation on Salmonella adhesion to stainless steel surfaces. Animal-based (egg white, whey protein, whole milk) and plant-based powders (almond, cocoa, coconut) were tested. Powders (100 g) were inoculated with an agar-grown 6-serovar Salmonella cocktail (1 mL), then hand massaged to distribute inoculum throughout the sample. A custom-built, triboelectric powder coating device was used to fully coat stainless steel coupons. Coupons were brushed (10 strokes/cardinal direction) until visibly clean, then UV-treated for 20 minutes. All coupon samples were combined with peptone water and massaged. Samples were serially diluted, plated on differential agar, incubated (37°C, 48 h) and survivors enumerated. ANOVA ($\alpha = 0.05$) was used to evaluate the impact of powder type on Salmonella adhesion and subsequent removal via cleaning/sanitation. For coated coupons, significantly ($p< 0.05$) more Salmonella was present for animal-based powders than plant-based. Once cleaned, Salmonella adhering to the coupons ranged from 0.87-3.00 log CFU/cm2. No significant differences in efficacy of UV treatment were observed between powder categories. Additional data are needed to quantify the impact of food composition on cleaning/sanitation. Results demonstrate a need to consider the food powder when determining cleaning/sanitation for reducing Salmonella populations on processing equipment.

SEASONAL VARIATION IN FORAGE OMEGA-3 AND OMEGA-6 FATTY ACIDS AND MONTHLY VARIATION IN BEEF FATTY ACID RATIOS
Presenter(s): Natalie Haynes, Reaghan White
Category: Nutrition and Food Science
Mentor(s): Jenifer Fenton (College of Agriculture & Natural Resources), Lauren Moccio (College of Agriculture & Natural Resources)

Grass-finished beef is valued for its favorable omega-3 to omega-6 fatty acid ratio. Seasonal variation in forage fatty acid composition may influence beef lipid profiles during the finishing period, a consideration of growing relevance as consumers make product choices based on nutritional quality and environmental factors. This study aims to assess monthly changes in forage omega-3 and omega-6 fatty acid and their relationship to beef fatty acid ratios. In a two-year trial, 120 steers 60 per year were randomly assigned to one of four dietary finishing regimens. These distinct feeding groups supplemented biodiverse pasture-based and conventional feeding diets. Feed samples were collected every two weeks, obtaining ribeye samples when steers reached 18-20 months of age. Forage samples were analyzed for proximate composition, soil characteristics, and prepared for fatty acid and metabolomics analysis. By integrating forage, soil, and beef analysis, this design enables comparison to the relationship of how seasonal and feeding system differences in forage composition relate to beef lipid profiles, providing insight into determinants of nutritional quality. This study will provide insight into how seasonal variation in forage fatty acid composition relates to beef lipid profiles, with implications for pasture-based finishing practices and nutritional quality.

COMPARISON OF MONTH-BY-MONTH PASTURE FORAGE SPECIES COMPOSITION AND IMPLICATIONS ON BEEF NUTRIENT PROFILE
Presenter(s): Cade Truemner, Christian Pickens, Juliet Zink
Category: Nutrition and Food Science
Mentor(s): Jenifer Fenton (College of Agriculture & Natural Resources), Lauren Moccio (College of Agriculture & Natural Resources)

In spite of grass-finished beef's rising popularity, there is limited consumer visibility into farm management practices despite the known effects of available forage on the nutrient profile of beef leading up to slaughter. Consequently, forage species variation across producers and the discrepancies between pasture composition month-to-month pre-slaughter should be taken into consideration. Our objective is to understand how forage composition changes across the season and the effects that it has on beef. The focus of the study will be on month-to-month changes, species types, and the nutrient profiles of specific species present. To investigate this, we will focus on the forage composition that was available for grazing, using analysis of the nutrient profile of beef to consider outcomes for the cattle. There is evidence that forage quality in pastures can affect the nutritional profile and overall weight of the cattle. Preliminary investigation suggests that the cattle who consumed more legume-rich forage over grass-rich forage in the months prior to slaughter will have a better phenolic content and higher fat content. Significant results could indicate that the composition of forage could be an important variable in determining the outcome of beef composition. Studying pasture composition across the season is

crucial for populating the grass-finished database: exploring the contribution of different forage species to the nutritional profile of beef informs farming practices such as field seeding and cattle grazing rotation that could transform regenerative agriculture.

QUANTIFYING TRANSFER OF SALMONELLA AND SHIGA TOXIN-PRODUCING ESCHERICHIA COLI ON WHEAT GRAIN DURING TEMPERING
Presenter(s): Lydia LeClair
Category: Nutrition and Food Science
Mentor(s): Teresa Bergholz (College of Agriculture & Natural Resources)

Salmonella and Shiga toxin-producing Escherichia coli (STEC) are two major bacterial pathogens responsible for outbreaks linked to wheat flour. The subsequent addition of moisture during grain tempering may facilitate the movement of the pathogens, contaminating previously uncontaminated kernels during processing. This study aims to quantify the potential for cross-contamination during wheat tempering. For both pathogens, 5 strains of each were streaked onto Luria Bertani agar supplemented with rifampicin (LBr) and incubated at 37 °C. Lawn cultures were harvested and transferred to Butterfield's buffer to create an inoculum. Soft white wheat was inoculated and equilibrated for 48 hrs before tempering. After equilibration, 55 g quantities each of the inoculated white wheat and uninoculated hard red wheat were combined with 5.2 mL of water to achieve a 4% increase in moisture content and tempered. After 16.5 hrs tempering, kernels were separated by color, diluted with Butterfield's buffer, homogenized, and plated onto LBr to enumerate cross-contamination. Log reduction was calculated from pre- and post-tempering pathogen counts. Reductions from the initial inoculation level of 4.1 ± 0.3 log CFU/g for Salmonella and STEC ranged from 1.73 ± 0.13 and 1.89 ± 0.25 CFU/g, respectively. Pathogen transfer was quantified by comparison of pre- and post-tempering pathogen levels on each color of wheat, expressed as the percentage of total recovered cells present on previously uninoculated grain. Transfer of Salmonella and STEC ranged from 4-34% and 22-46%. These results demonstrate that the potential for pathogen transfer during wheat tempering is important for the development of microbial risk assessments of Salmonella and STEC on wheat grain

THE EFFECT OF GROWTH-RESTRICTION ON EXERCISE EFFICIENCY IN MICE
Presenter(s): Ally Nathan, Deedee Hernandez, Isabella Yu
Category: Nutrition and Food Science
Mentor(s): David Ferguson (College of Education), Michael Kim (College of Education)

Post natal growth restriction (PNGR) is associated with chronic disease. Exercise efficiency reduces chronic disease. Exercise efficiency has not been evaluated in PNGR mice. Therefore, two weeks prior to birth, mouse dams were randomly assigned to either a low protein diet (8%) or a normal protein diet (20%). Pups born to the normal protein dams were cross fostered to a different normal protein dam (control) or a low protein dam (PNGR). After 21 days, all offspring were weaned to a healthy normal protein diet. On PN 71, mice completed a VO2 max test. The mice were given a week of rest before PN 78 where they were then tested on a treadmill at 30% , 60% and 100% of their previous VO2max test

values. Efficiency was calculated as maximal Work divided by oxygen consumption. An analysis of variance was used to compare the results with the main effects being diet (control or PNGR), sex (male or female), or exercise intensity (30, 60 or 100%). If significant, a Tukey's HSD post hoc test was run. PNGR males (0.976 ± 0.344 joules/ml/kg/min) were less efficient ($p<0.05$) than CON males (1.192 ± 0.330 joules/ml/kg/min) at 30% and 60% of their maximal running values. There was no sex effect in females and no difference with CON and PNGR at maximal intensity. PNGR males had a decrease in their efficiency during submaximal efforts ($p<0.05$) but had no effect on maximal intensities. PNGR males displayed signs of impaired cardiovascular function.

EFFECTS OF MILLING TECHNOLOGY AND PRETREATMENT ON PARTICLE SIZE AND PROTEIN
Presenter(s): Saamia Hasan
Category: Nutrition and Food Science
Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources)

Pulse flours are increasingly used as functional, protein-rich ingredients, but product performance is strongly influenced by processing conditions that affect particle size and composition. In a prior focus group study, consumers identified texture as the primary barrier to pulse-based products, followed by taste, while nutrition, particularly high protein, was recognized as a key benefit. To support the development of pulse ingredients with improved sensory-relevant properties, this study evaluated the effects of cultivar (pinto beans, navy beans, kabuli chickpeas), milling type (hammer, lab hammer, stone, compression-decompression, and roller), and pretreatment (raw, roasting at 110°C for 60 min, and infrared heating at 200°C for 7 min with turning every 2 min) on flour particle size distribution and protein content. Flours were produced under each processing condition and characterized for particle size (D10, D50, D90) and protein concentration. Data were analyzed using factorial models to test main effects and interactions among cultivar, pretreatment, and milling type. Particle size was primarily driven by milling technology, with compression-decompression milling producing the finest particle size distributions; pretreatment effects varied by cultivar. Protein concentration showed moderate variation across conditions, with the largest differences associated with cultivar and milling type. Overall, these results identify processing combinations that enable targeted control of particle size while maintaining protein levels, supporting optimized pulse flour production for food applications.

IMPROVING MICHIGAN HOP AND BEER AROMA AND FLAVOR USING A BIOSTIMULANT
Presenter(s): Simon Specter, Zoey Zienski
Category: Nutrition and Food Science
Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources), Nicole Shriner (College of Engineering)

Terpenes are key compounds in beer flavor and aroma. Hops have been used in the production of beer for their terpene and other aroma volatiles for thousands of years. With Michigan being the fourth largest hop producing state in the U.S., the quality of hop harvest is of key interest and is directly affected by its concentration of terpenes and other flavor compounds. As methyl jasmonate (MejA) has

been used to increase terpene production in other plants such as spruce trees, it was hypothesized that the application of MejA to hops would increase their terpene production in the following harvest. In year two of this study, three different treatments of MejA were formulated alongside three control hops to analyze the resulting hop aroma volatile profile and alpha and beta acid concentrations. A beer was brewed with each MejA treatment and control for 117 untrained consumers to rank subsets of hop samples' aroma and beer samples' hop flavor intensity. Consumers were then asked to "Rate All That Apply" on each hop and beer sample individually to describe their overall aroma and flavor. In addition, they were asked to rate the bitterness, astringency, and hoppiness intensity for each beer sample. Preliminary results concluded that once-treated MeJA hops only proved to be significantly higher in hop aroma intensity but overall, there was no significant difference in hop flavor intensity in the beer, possibly due to low quantities of added hops. Also, only astringency and spicy aroma showed significant differences between samples.

DIETARY PATTERNS AND GUT MICROBIOME DIFFERENCES AMONG MICHIGAN CHILDREN AGED 1-5 YEARS BY FIBER INTAKE ADEQUACY
Presenter(s): Amar Hamdan
Category: Nutrition and Food Science
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

Adequate fiber intake during early childhood is essential for digestive health, glycemic regulation, and the establishment of healthy dietary patterns, and it also plays a key role in shaping the gut microbiome. While prior research has shown that most young children do not meet recommended fiber intake levels, less is known about how overall dietary composition and gut microbiome characteristics differ between children who do and do not meet these recommendations. This study builds on earlier findings by using a larger dataset and shifting the focus from fiber intake alone to the dietary patterns and microbiome differences associated with fiber adequacy. Using an expanded cohort of Michigan children aged 1-5 years, caregiver-reported dietary questionnaires were analyzed to estimate daily fiber intake using the PhenX Fiber Intake protocol. Serving sizes were adjusted to reflect age-appropriate portions using averaged intake data from the National Health and Nutrition Examination Survey (NHANES) 2017-2020 pre-pandemic cycles. Children were grouped based on whether they met age-specific fiber intake recommendations, and differences in intake across food groups were compared. Gut microbiome profiles were also examined to identify differences in microbial composition associated with regards to fiber intake adequacy. This comparative approach helps identify dietary patterns and microbiome characteristics that differ between children with adequate and inadequate fiber intake. By examining differences in food group consumption and gut microbiome profiles between these groups, the findings may help inform caregiver guidance and nutritional strategies aimed at improving fiber intake, and gut health among Michigan Children.

ANALYSIS OF BLACK BEAN COLORANT LONGEVITY IN SUGAR COOKIES
Presenter(s): Maureen Merritt
Category: Nutrition and Food Science
Mentor(s): Jose Alexis Hernandez (College of Agriculture & Natural Resources), Winter Graham (College of Agriculture & Natural Resources)

This study investigates the efficacy and longevity of extracted colorants made from black bean hulls in cookies, in comparison to artificially colored cookies. The objective was to find the best method for making a bean colorant, then incorporating it into sugar cookies to see which had the longest, and strongest color payoff. Initially, experiments began with processing the black beans to remove and separate the hulls. The first color extraction was conducted to confirm the most successful method. Then it was theorized that pH adjustment might affect the color payoff in the final baked cookie, as cookies with no pH adjustment had no color. It was found that decreasing the pH made a more heat-stable colorant when added to the cookie dough and baked. After narrowing down which pH adjustment produced the strongest color, heat testing was conducted on the colorants alone to see if it could strengthen the color of the cookies further. Once the most successful method was found, the sample sizes were scaled up and experiments were conducted on the longevity of the colorant in different storage conditions. Overall, the tests found that a combination of a decreased pH, and reduced colorant gave the cookies the highest color intensity. Ongoing experiments are still being conducted to see if the color lasts longer, or as long as cookies made with an artificial colorant.

IMPACT OF EARLY-LIFE EXPOSURE ON THE GUT MICROBIOME OF YOUNG CHILDREN: A SUBSTUDY OF THE PRENATAL STRESS STUDY
Presenter(s): Alyssa Cosio
Category: Nutrition and Food Science
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

There are many microbes that comprise the gut microbiome. Some microbes are harmful and pathogenic while others are beneficial. Recently, interest in the developing gut microbiome has been on the rise but there is limited research on the child gut microbiome. This study aims to identify how the existence of parental asthma, childhood hydration status, and childhood food consumption impacts the composition of gut microbiomes in children aged 3-5 years. Participants collected stool samples at home and mailed them in along with completed questionnaires. This study consists of self-reported questionnaire data (n=35) and microbial data through the amplification of the V4 region of the 16S rRNA gene (n=29). Rstudio analysis will be performed to investigate alpha and beta diversity between participant gut microbiomes. We will investigate associations between specific variables and the diversity and composition of the child gut microbiome.This study is important because the early gut microbiome is crucial in immune functionality, risk of disease, and other long-term health outcomes from childhood to adulthood.

ENHANCING CAMPYLOBACTER JEJUNI RECOVERY FOR DETECTION THROUGH MAGNETIC FLOCCULATION
Presenter(s): Finnian James
Category: Nutrition and Food Science
Mentor(s): Anthony James Franco (College of Agriculture & Natural Resources), Evangelyn Alocilja (College of Agriculture & Natural Resources)

Campylobacter jejuni is a leading global bacterial cause of foodborne illnesses. Approximately 1.5 million Americans contract a Campylobacter-related illness annually, leading to an economic cost of up to $6.8 billion annually. Rapid detection plays a crucial role in controlling the spread of such infections. One of the challenges in detecting Campylobacter is the lengthy and cumbersome detection process. This study presents a novel approach to speed up and enhance the recovery of C. jejuni from samples by implementing magnetic flocculation. The process involves using chitosan to flocculate glycan-coated magnetic nanoparticles (gMNPs) and C. jejuni cells into magnetic flocs, which a magnet can easily recover. The recovered cells were subsequently detected by culturing and gold nanoparticle-based DNA detection. Flocculation increased the recovery of C. jejuni across a range of concentrations spanning several orders of magnitude compared to non-flocculated samples. Recovered C. jejuni was successfully detected by both culture and nano-biosensor methods. The recovery process can take as little as 30 minutes, significantly shortening the analysis time. Ongoing experiments focus on optimizing the experimental conditions and validating them in more complex matrices. This approach offers a cost-effective and rapid means of preparing samples for C. jejuni detection in various matrices.

FACTORS ASSOCIATED WITH CONSENT FOR HAIR DATA COLLECTION AMONG PRESCHOOLERS
Presenter(s): Megan Bozung
Category: Nutrition and Food Science
Mentor(s): Jiying Ling (College of Nursing)

Hair sampling has become an increasingly used method for assessing chronic stress in young children. Despite its growing popularity, caregivers may be hesitant to hair sampling due to various concerns. The purpose of this study was to identify factors associated with caregivers' (parents or legal guardians) consent or non-consent for child hair sampling. Participants included 307 caregiver-child dyads (330 children, 309 caregivers). Overall, 236 caregivers (71.7%) consented to their child hair sampling. Descriptive statistics were used to characterize the sample, and chi-square tests and independent t-tests were conducted to compare consenting and non-consenting families. Consent status was not statistically associated with demographic characteristics, including preschooler age, sex, race/ethnicity, caregiver age, marital status, education level, or household size. However, caregiver employment status was significantly correlated with consent. Unemployed caregivers were more likely to consent to hair sampling than those who were employed part-time or full-time ($p=0.042$). Caregivers who consented reported higher levels of preschooler emotional and behavioral concerns, including externalized behaviors (i.e., explosive behaviors, attention problems, aggression), internalized problems (i.e., anxiety/somatic problems), sadness, and anger (all $ps<0.05$), as well as greater parent-child conflict ($p=0.029$). Additionally, consenting caregivers reported greater use of coping strategies, especially

avoidant/withdrawal behaviors and venting (ps<0.05). These findings suggest that consent for preschool hair sampling is more correlated with psychosocial and behavioral factors than demographic characteristics. Understanding these factors may help researchers better inform caregivers and increase participation rate toward hair sampling in future studies.

EXPERIENCES OF NEW COMMUNITY GARDENERS OVER MULTIPLE GARDENING SEASONS
Presenter(s): Kiera Curran, Sophia Waldie
Category: Nutrition and Food Science
Mentor(s): Katherine Alaimo (College of Agriculture & Natural Resources), Veronica Wirth (College of Agriculture & Natural Resources)

Introduction: Community gardening provides a unique green space in which gardeners of varying experience have the opportunity to grow their own produce in an urban setting. While there is extensive research regarding the health and social benefits of community gardening, few studies have tracked changes in community gardeners' experiences from season to season. Our study investigated the experiences of new community gardeners over the span of three gardening seasons. Methods: We analyzed qualitative interviews conducted with a subset of new community gardeners participating in a randomized controlled trial of community gardening that continued gardening past their first season (n = 7 second season, n = 3 second and third season). Transcripts were transcribed, coded, and themes were analyzed using standardized displays. Participants' experiences were grouped into themes of community, leadership, diversity, physical activity, and diet. Results: Social conditions in the garden affected participants' motivation to continue gardening in the community garden; some participants who experienced limited social interaction decided to garden at home instead. Social relationships that were formed within the garden in the first season deepened in following seasons; some family members who gardened together became closer in the second season. Many participants changed their diet in their first seaons and maintained these changes throughout their second and third seasons. Many participants also increased their physical activity in their first season and maintained it throughout following seasons. Conclusion: This study demonstrated that participation in community gardening across multiple seasons had positive outcomes related to social, mental, and physical well-being.

CONSUMER PERCEPTION AND ANALYTICAL MEASUREMENTS OF SWEETNESS, FLAVOR, AND OVERALL LIKING OF BLUEBERRIES TREATED WITH PLANT GROWTH REGULATORS
Presenter(s): Anusha Pandya, Cora Garling, Giselle Torres
Category: Nutrition and Food Science
Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources), Faith Zillinger (College of Agriculture & Natural Resources)

Blueberries are a nutritious fruit rich in antioxidants, which support overall health. However, previous studies show blueberries having low uniformity in their sensory characteristics, leading to poor sensory and consumer experiences. This study investigated whether plant growth regulators (PGRs), hypothesized to promote aroma volatile production, can improve these aspects. We tested three PGRs:

1-aminocyclopropane-1-carboxylate (ACC), abscisic acid (ABA), and methyl jasmonate (MeJA). ACC and ABA promote fruit ripening, while MeJA simulates plant stress pathways. These treatments may upregulate production of volatile organic compounds (VOCs), like terpenes and esters, which are hypothesized to increase sweetness and consumer acceptance. Four blueberry cultivars, two northern highbush (grown in Michigan) and two southern highbush (grown in Florida), underwent sensory and physiochemical testing. One blueberry variety was stored for 1 week and retested to evaluate quality changes over storage. Sensory testing utilized ≥55 semi-trained panelists, who rated appearance, flavor, texture and overall liking, as well as flavor, sweetness, sourness, firmness, and juiciness intensity in replicate. Physicochemical measurements included mass, compression and puncture force measurements of individual berries (n=20), after which berries were blended by replicate and underwent total soluble solid and titratable acidity measurements. Testing showed that PGR treatment had little effect on altering consumer liking. Cultivar and storage time-point were the main drivers of altered consumer perception. Treatment effects on VOCs were significant and depended on cultivar. PGRs may be a strategy to increase key flavor-enhancing aroma volatiles, although further research is needed to establish the sensory impacts of these biochemical changes.

CONSUMER PERCEPTIONS AND PREFERENCES FOR EGG PRODUCTION SYSTEMS
Presenter(s): Angela Lumaj
Category: Nutrition and Food Science
Mentor(s): Julianna Adams (College of Agriculture & Natural Resources)

Eggs are widely consumed across the United States and readily available through several production systems such as conventional, cage-free, and pasture-raised. Despite the growing variety of egg options, consumers often have an unclear understanding of how specific egg attributes include nutrition, sustainability, and animal welfare to vary between production systems. The objective of this survey is to analyze egg consumption behaviors, consumer knowledge and attitudes on various production systems, and typical purchasing preferences. Attitude toward egg quality, yolk color, and production systems will also be measured using a Likert-scale. Conjoint analysis was incorporated to determine real world purchasing decisions regarding price, eggs type and production systems. MaxDiff scaling evaluated purchasing priorities to rank importance of key attributes such as price, animal welfare, sustainability, etc. Preliminary findings are expected to identify trade-offs between price and perceived attributes, along with gaps between consumer perceptions and evidence regarding egg nutrition to production systems. The results of this study may help fill gaps in understanding of egg nutrients how consumers perceived the role of eggs and egg-derived nutrients in human health.

DEVELOPING NOVEL PRODUCTS USING FERMENTED DRIED BEANS
Presenter(s): Iris Sandoval
Category: Nutrition and Food Science
Mentor(s): Sharon Hooper (College of Agriculture & Natural Resources)

Pulses make up a great deal of the world's vegetable consumption, as well as being a major protein source for people with plant-based diets. Michigan is second in the country in terms of dry bean production. Though the United States does not rank highly in bean consumption per capita, the market still remains open for new products to hit the shelves.

Additional interest comes from the growing trend towards fermented foods, especially as it pertains to the gut microbiome. The market for fermented foods in the United States continues to grow as consumers become increasingly aware of the health benefits associated with them. Though fermentation has been used as a food processing technique for millennia, research has continued to reveal new associated benefits. The biochemical processing increases nutritional value through the creation of organic compounds such as polyphenols, organic acids, and flavonoids. Fermented foods do not necessarily provide living microbial cultures but may be sources of prebiotics- ingredients that aid in the growth of microbes in the gut microbiome. The fermentation of pulses is not a novel concept, as many cultures across the world have their own examples of ingredients or food items that fit the category. However, fermented pulse flours remain a relatively unexplored area of potential innovation. The objective of this study is to evaluate the viability of foods produced with fermented raw pulse flours. Testing will be done to determine the organoleptic properties of the flours themselves before moving on to creation of new food products.

MATERNAL EARLY-PREGNANCY DIET QUALITY AND MARKERS OF REPRODUCTIVE SYSTEM DEVELOPMENT IN NEWBORN BABIES
Presenter(s): Annmarie Murphy
Category: Nutrition and Food Science
Mentor(s): Maria Cinzori (College of Agriculture & Natural Resources), Rita Strakovsky (College of Agriculture & Natural Resources)

In adults, high quality diets are important for reproductive health. The reproductive system develops in utero, but the roles of maternal diet in reproductive system development are poorly understood. Anogenital distance (AGD) is a hormonally-mediated marker of reproductive system development. Therefore, we evaluated associations of early-pregnancy maternal diet quality with AGD at birth and in infancy. Pregnant women (n=489) from a prospective pregnancy and birth cohort (I-KIDS), completed a three-month food frequency questionnaire at median 13 weeks gestation. We calculated the Alternative Healthy Eating Index (AHEI)-2010, excluding alcohol (maximum 100 points). In newborn and 5-month-old infants, AGDShort (females: anus-to-fourchette; males: anusto-scrotum) and AGDLong (females: anus-to-clitoris; males: anus-to-penis) were divided by body length (m) to create an anogenital index (AGI). We evaluated covariate-adjusted associations of maternal AHEI-2010 scores and 10 individual dietary components with newborn and 5-month AGI using generalized linear mixed models. While maternal diet

quality was not associated with AGI in female babies at birth, higher consumption of whole grains and nuts/legumes individually was associated with shorter AGILong at birth. Conversely, maternal diet quality overall was associated with longer AGILong in female babies at 5-months of age, driven by higher consumption of vegetables and polyunsaturated fatty acids, but lower consumption of sugar sweetened beverages. Associations of maternal diet quality with AGI in male babies were inconsistent. Maternal diet quality in pregnancy may be critical for the development of the reproductive system, but additional studies are needed to understand the long-term implication for reproductive health.

INTRODUCING DUCK EGGS INTO THE PASTURE-RAISING SCHEME: HOW NUTRIENT DENSITY VARIES IN MUSCOVY DUCK VS. CHICKEN EGGS FROM THE SAME PASTURE-RAISED SYSTEM
Presenter(s): Faith Guidry, Kanon Nishijima
Category: Nutrition and Food Science
Mentor(s): Jenifer Fenton (College of Agriculture & Natural Resources)

Consumer interest in pasture-raised products is rising due to their emphasis on beneficial animal-environment interactions. Animals with access to biodiverse pastures have the potential to enhance nutrient profiles and quality, highlighting the need for poultry farmers to understand how diet, seasonal, and environmental changes can optimize nutrient outcomes of animal products. The Muscovy duck is a popular backyard poultry species for their foraging ability, heat tolerance, and disease resistance. Further research is needed to compare nutritional profiles between duck and chicken eggs under identical circumstances to determine potential advantages. The objective of this research is to characterize these eggs produced from the same pasture-raised system. Twelve egg samples, pooled to form six replicate samples, were collected from Muscovy ducks and chickens over the course of a week from a central Michigan farm in September 2024 and March 2025. Total phenolic and carotenoid concentrations were analyzed colorimetrically, and fatty acid profiles were determined using gas chromatography-mass spectrometry. In March 2025, a significantly darker yolk color ($p < 0.01$), higher beta-carotene ($p < 0.01$) and total carotenoid content ($p < 0.01$) were observed in the chickens compared to the ducks. Duck eggs exhibited a significantly lower total n-6:n-3 ratio across collection dates ($p < 0.01$); a lower, 4:1 ratio is considered favorable for human health. The findings reveal species-level differences in the nutrient density of pasture-raised eggs. Understanding these differences will not only assist producers in effectively positioning duck and chicken egg within regenerative agriculture markets but inform future research as well.

THE HIDDEN COST OF SUSTAINABLE PACKAGING: HOW RESTRICTING FLEXIBLE PLASTIC PACKAGING RAISES FOOD PRICES AND ACCESS BARRIERS
Presenter(s): Kaitlyn Volpi
Category: Nutrition and Food Science
Mentor(s): Monireh Mahmoudi (College of Agriculture & Natural Resources)

Across the United States, states are increasingly adopting Extended Producer Responsibility (EPR) laws and packaging regulations aimed at reducing environmental waste. Many of these policies target non-

recyclable materials, including flexible plastic packaging, which is widely used for common grocery items due to its low cost, lightweight nature, strong barrier properties, and functional features such as resealability and portion control. While these regulations are intended to improve environmental outcomes, they may have unintended consequences for food affordability, shelf life, and access-particularly in food deserts, where households already face constraints related to income, transportation, and storage. This project examines how the availability and design of flexible packaging differ across urban and rural food deserts, and how these differences may influence food access and consumer experience in underserved communities. By focusing on packaging as an often-overlooked component of food access, the study aims to identify potential disparities and trade-offs associated with packaging substitution policies. Data was collected through an online survey developed in Qualtrics and administered via the Prolific platform. The survey targeted residents living in food desert zip codes nationwide, with approximately 500 respondents from each food desert type, yielding a total sample of about 1000 participants. This sample size allowed estimation of key proportions with an approximate ±10% margin of error at the 95% confidence level, sufficient to identify meaningful differences across community types.

NATURAL COLOR EXTRACTION FROM BLACK BEAN HULLS
Presenter(s): Samantha Berenson
Category: Nutrition and Food Science
Mentor(s): Jeffrey Swada (College of Agriculture & Natural Resources), Winter Graham (College of Agriculture & Natural Resources)

The food landscape is ever-changing and trending towards a more sustainable, natural system. With this sustainable initiative and strong public push, it would be reasonable to believe that natural colors are desired in the market. However, the shift to natural food colorants is not as easy as it seems. My research project plans on investigating the stability of pigments extracted from black bean hulls. The driving factor for color extraction is pH. More acidic solutions yield red and pink pigments that are the most stable. More basic solutions extract blues and purples that are very unstable. I hope to extract the most vibrant blue and purple pigments while maintaining their longevity.

DETERMINATION OF PRIMARY ODORANTS FOR THE CAPTURE AND REPRODUCTION OF SMELLS
Presenter(s): Jonas Ahonen
Category: Nutrition and Food Science
Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources)

While modern technology allows for the capture and reproduction of visuals and audio, there is no method to record and replay smells. The lack of technology for replication of smells has blocked advances in olfaction that limits progress in human applications. The additive nature of color combinations allowed for the creation of primary colors, a phenomenon that could occur in olfaction. This research hypothesizes a set of primary odors that can be used to create reconstructions of primary odors of noticeable difference. Models to determine primary odors tested 3 methods of odor selection

and 4 methods of assembly for a wide range of odor set sizes from as few as 4 to as many as 200 primaries. The highest performing models will be selected for consumer sensory trials for further model improvement.

Pharmacology & Toxicology

PRO-INFLAMMATORY CHANGES OF IMMUNE POPULATIONS IN C57BL6J MOUSE MESENTERIC PERIVASCULAR ADIPOSE TISSUE IN RESPONSE TO HIGH FAT DIET
Presenter(s): Jackson Ruffner
Category: Pharmacology and Toxicology
Mentor(s): Cheryl Rockwell (College of Human Medicine)

Obesity affects over 40% of adults in the United States and is a major risk factor for metabolic diseases, including hypertension. This condition is associated with chronic low-grade inflammation in adipose tissue, which contributes to disease progression. Perivascular adipose tissue (PVAT) surrounding mesenteric resistance arteries plays an important role in vascular regulation and is disrupted by high-fat diet (HFD)-induced obesity. However, the immune composition of mesenteric PVAT (mPVAT) remains poorly understood. We tested the hypothesis that HFD increases inflammation in mPVAT by altering immune cell composition. Male and female C57BL/6J mice were fed a control diet (CON; 10% kcal from fat) or HFD (60% kcal from fat) for 5 or 10 weeks (n = 6 per group). mPVAT was excised, dissociated into single-cell suspensions, antibody-labeled for immune markers, and analyzed by flow cytometry. Groups were compared using t-tests with Welch's correction ($\alpha = 0.05$). After 5 weeks of HFD, male mPVAT showed increased total immune cells, elevated macrophages and Ly6C (high) monocytes, and reduced CD8 T cells. Dendritic cells were decreased in both sexes at this timepoint. After 10 weeks of HFD, male mPVAT exhibited decreased B cells and eosinophils with increased macrophages, while females showed increased total immune cells with elevated monocytes and CD4 T cells. Natural killer/natural killer T cells were reduced in both sexes at 10 weeks. These findings indicate time and sex-dependent pro-inflammatory immune changes in mPVAT that may contribute to obesity-associated vascular dysfunction and hypertension.

OPTIMIZATION OF THROMBIN GENERATION ASSAYS IN MOUSE MODELS FOR DRUG AND DISEASE EVALUATION
Presenter(s): Jack Hannan, James Kowalewski
Category: Pharmacology and Toxicology
Mentor(s): Adam Lauver (College of Veterinary Medicine), Barbara Towns-Christian (College of Veterinary Medicine)

Thrombin generation assays (TGA) provide a comprehensive assessment of global hemostasis by monitoring the balance between pro- and anti-coagulant forces over time. This protocol outlines a cost-effective data analysis pipeline using standard spreadsheet software as an alternative to proprietary evaluation tools, ensuring high-quality, reproducible results for cardiovascular and hematological

research. The assay utilizes a standardized fluorogenic method for measuring thrombin generation in mouse platelet-poor plasma (PPP) and platelet-rich plasma (PRP)using the Technothrombin TGA kit. To overcome the challenges of small sample volumes and high procoagulant activity typical of mouse plasma, the protocol utilizes plasma dilution and various trigger reagents. Our methodology covers the complete workflow, including precise plasma preparation via centrifugation, kinetic plate reader optimization, and a dual-stage measurement process involving calibration and sample analysis. By tracking the cleavage of a fluorogenic substrate, the assay generates a kinetic thrombin curve characterized by four primary parameters of lag time, time to peak, peak thrombin concentration, and endogenous thrombin potential (ETP). This protocol ensures high-quality, reproducible results for cardiovascular and hematological research.

IMPACTS OF ACTIVATING NON-NEURONAL TRPV1-EXPRESSING CELLS IN THE BLADDER
Presenter(s): Ryan Chackunkal
Category: Pharmacology and Toxicology
Mentor(s): Marlene Masino (College of Natural Science), Nathan Tykocki (College of Osteopathic Medicine)

Transient receptor potential vanilloid type 1 (TRPV1) channels are involved in bladder sensory signaling, but the functional role of non-neuronal TRPV1-expressing cells and potential sex differences remain unclear. We hypothesize that activation of non-neuronal TRPV1-expressing cells will increase bladder contractility, while inhibition of TRPV1 signaling will reduce contractile responses. TRPV1-expressing cells will be investigated using a "Designer Receptor Exclusively Activated by Designer Drugs" (DREADD) model. DREADDs are engineered receptors specifically activated by the inert drug clozapine-N-oxide (CNO). Our mouse model expresses a Gq-DREADD in all cells that express TRPV1 receptors. We propose to examine how TRPV1-expressing cells contribute to bladder contractility using organ bath experiments. Bladders from male and female TRPV1-DREADD mice will be mounted in organ baths to measure contractile responses. These results will be compared to experiments using the TRPV1 receptor antagonist capsazepine and the TRPV1 receptor agonist capsaicin to assess TRPV1-specific effects as well. Lastly, contractile responses will be compared between males and females. If these predictions are confirmed, the results will demonstrate that TRPV1-expressing non-neuronal cells play a functional role in regulating bladder contractility. Identifying these mechanisms may improve our understanding of bladder sensory signaling and could reveal potential targets for treating bladder dysfunction, including sex-specific differences in bladder physiology.

PRIMARY INSIGHTS INTO INFANTILE NEUROAXONAL DYSTROPHY FROM CAENORHABDITIS ELEGANS
Presenter(s): Aiden Callahan
Category: Pharmacology and Toxicology
Mentor(s): Fatemeh Yousefsaber (College of Natural Science)

Infantile Neuroaxonal Dystrophy is a rare neurodegenerative disease with an expected lifespan of ten years. The condition is caused by a variety of mutations on the gene PLA2G6-a gene responsible for

coding a phospholipase enzyme involved in the lipid metabolism necessary to maintain the nervous system and cell membranes. Because of the genetic complexity of INAD, there is no existing cure for the disease. To contribute to efforts to better understand the disorder, we utilized Caenorhabditis elegans as a model organism to investigate how a knockout (KO) of the ipla-2 gene-a homolog of the human gene PLA2G6- effected nematode phenotype. In this study, we compared ipla-2 KO nematodes to N2 wild-type nematodes through a lifespan and locomotion assay. Lifespan was passed through survival analysis; locomotion was assessed through measuring sinusoidal wave frequency. Our hypothesis was that the N2 worms would have a longer lifespan and a higher movement frequency compared to the ipla-2 KO strain. Our results illustrated the N2 strain had a longer lifespan and a higher sinusoidal frequency than the ipla-2 KO strain. Additionally, the N2 nematodes were shorter in body length than the ipla-2 KO nematodes. These findings suggest the loss of PLA2G6 function may contribute to the neurological and cellular pathology present in INAD. Essentially, this work helps elucidate the function of biological functions of PLA2G6 and its relevance to the disease mechanisms underlying INAD.

IDENTIFICATION OF VTA NMS EXPRESSION AND ROLE IN MORPHINE BEHAVIORS
Presenter(s): Abby Cheng, Katie McGrath
Category: Pharmacology and Toxicology
Mentor(s): Michelle Mazei-Robison (College of Natural Science)

Roughly 48 million Americans suffer from addiction. By studying the neurobiological mechanisms that underlie opioid use disorder we hope to better uncover novel therapeutics. The ventral tegmental area (VTA) is critical for reward processing, and linked to addiction. Our lab identified VTA neuromedin S (NMS)-expressing cells as a candidate of study for morphine behaviors. We found chronic morphine administration in mice increases VTA NMS expression in dopaminergic (DA) neurons, and NMS-expressing neurons of the VTA have a role in morphine behaviors. To further investigate the role of NMS on morphine behaviors, we've generated mice to knockout NMS from DA neurons (NMS-DA KO mice). First, we're validating the NMS-DA KO mice using RT-PCR to assess NMS expression in mice that received 7 days of intraperitoneal injections of either saline or morphine (15 mg/kg). I have isolated RNA from VTA and nucleus accumbens (NAc) and am performing RT-PCR to assess gene expression. I've confirmed molecular signatures of repeated morphine treatment (increased gene expression of Sgk1 in the NAc) and expect wild-type mice treated with morphine to exhibit an increase in NMS expression in the VTA and the effect will be absent in NMS-DA KO mice. We also predict NMS-DA KO mice will have reduced morphine reward. I'm assessing this using the conditioned place preference test where wild-type and NMS DA KO mice receive daily pairings of saline and morphine in contextually distinct environments. Together, these data will provide a better understanding of the role of VTA NMS on morphine behaviors.

TUMORIGENIC POTENTIAL OF PERFLUOROHEXANESULFONIC ACID (PFHXS)
Presenter(s): Ananya Ramanan, Laika Tanveer
Category: Pharmacology and Toxicology
Mentor(s): Brad Upham (College of Human Medicine)

Loss of communication between neighboring cells is an essential aspect of tumor development. One of the primary mechanisms that allows cells to exchange regulatory signals is through gap junction channels. These membrane structures form small pores that permit the passage of signaling molecules (≤ 1 kDa) between adjacent cells, helping coordinate pathways that regulate gene expression, growth, and differentiation in tissues. Disruption of gap junctional intercellular communication (GJIC) is a common feature across many signaling pathways associated with tumor promotion. Therefore, evaluating how environmental chemicals affect GJIC can provide an early indication of their tumorigenic potential. Per- and polyfluoroalkyl substances (PFAS) are a class of persistent environmental contaminants often referred to as "forever chemicals" because of their resistance to degradation and widespread accumulation in ecosystems and human populations. In this study, we investigate the effects of perfluorohexane sulfonic acid (PFHxSA) on GJIC using a bipotent rat liver epithelial stem cell line. Intercellular communication will be measured using the scalpel load-dye transfer assay, which allows visualization of dye movement between connected cells as an indicator of functional gap junction channels. Experiments will evaluate whether PFHxSA exposure alters gap junction activity and will characterize the dose- and time-dependent responses of GJIC to this compound. To further understand the mechanisms involved, signaling pathway inhibitors will be used to determine which molecular pathways contribute to PFHxSA-induced changes in gap junction function. In addition, several natural products will be screened for their ability to prevent or reverse PFHxSA-mediated disruption of GJIC. Together, these studies aim to clarify the potential role of PFHxSA in tumor promotion and explore possible chemopreventive strategies to counteract its effects.

HARNESSING EXTRACELLULAR VESICLES FOR STABILIZED AND FUNCTIONAL IL-10 DELIVERY IN MACROPHAGE IMMUNOMODULATION
Presenter(s): Hayden Hartwig, Sadhana Kilangodi
Category: Pharmacology and Toxicology
Mentor(s): Masamitsu Kanada (College of Human Medicine)

Extracellular vesicles (EVs) are gaining recognition as promising therapeutic carriers for immune modulation. We investigated the potential of EVs derived from HEK293FT cells to stabilize and deliver interleukin-10 (IL-10), a key anti-inflammatory cytokine. Using minicircle (MC) DNA vectors, we achieved IL-10 overexpression and efficient incorporation into filter-isolated small EVs (F-sEVs), resulting in superior stability compared to free recombinant IL-10. Detailed biophysical and functional analyses revealed that IL-10+ F-sEVs contain both monomeric and oligomeric IL-10 on their external surface and encapsulated within vesicles. Size-based fractionation of IL-10+large EVs (lEVs), small EVs (UC-sEVs), and non-vesicular extracellular particles (NVEPs) revealed IL-10 presence across all fractions, predominantly in monomeric form. Anion exchange chromatography successfully enriched IL-10+ exosomes that efficiently associated with both IL-10 monomers and oligomers. IL-10+ F-sEVs suppressed inflammatory

cytokine expression in pro-inflammatory macrophages (two-to 14-fold more effectively than naïve F-sEVs) without inducing anti-inflammatory repolarization. However, detailed analysis of IL-10-loaded EV subpopulations revealed that anti-inflammatory activity was distributed across multiple fractions. Moreover, naïve F-sEVs derived from non-transfected cells also exhibited anti-inflammatory effects, suggesting that endogenous EV cargo contributes to their immunomodulatory activity and complicates attribution of effects specifically to IL-10. These findings highlight the therapeutic potential of EVs while emphasizing the need to disentangle contributions of engineered cytokines from endogenous vesicular components.

EXAMINING PYROPTOSIS AS A MECHANISM OF CELL DEATH FROM ACUTE CUTANEOUS NITROGEN MUSTARD EXPOSURE

Presenter(s): Zach Kelly
Category: Pharmacology and Toxicology
Mentor(s): Andrew Roney (College of Osteopathic Medicine), Ashten Stambersky (College of Osteopathic Medicine), Neera Tewari-Singh (College of Osteopathic Medicine)

Sulfur mustard (SM) is a chemical agent known to cause significant cellular damage, especially to the skin. It remains a potential chemical threat, yet its complete effects on cellular death mechanisms are poorly understood. Our lab has shown the presence of an inflammatory response following cutaneous exposure to nitrogen mustard (NM), a chemical agent similar to sulfur mustard (SM) that is safer for laboratory use. Pyroptosis is a pro-inflammatory form of cell death characterized by membrane pore formation. The mechanism is mediated via activation of NOD-like receptor family pyrin domain containing 3 (NLRP3) which activates caspase-1. Caspase-1 then produces Gasdermin-D N-terminus which forms membrane pores. It also activates pro-inflammatory mediators IL-18 and IL-1β, which are released through Gasdermin-D membrane pores along with other cellular contents. Published studies have reported increased expression of pyroptosis markers in NM induced inflammation. This led to our hypothesis that pyroptosis is a cell death mechanism induced by cutaneous NM exposure. Hence, the objective of the study was to examine if pyroptosis-related genes were significantly upregulated in skin following NM exposure. Groups of male C57BL/6 mice (n=5) were exposed to NM (1 mg) or acetone vehicle via topical application to shaved dorsal skin then euthanized at various time points post-exposure (1 day, 3 days, and 8 days). Collected skin was analyzed for increased expression of pyroptotic genes (NLRP3, Caspase-1, and IL-18) via qPCR. Our results showed a significant increase in expression of pyroptosis related genes 1 day post exposure, indicating that pyroptosis is involved in NM induced skin injury.

IN THE ZONE: A TRANSCRIPTOMICS APPROACH TO UNDERSTANDING ZONE-SELECTIVE FATTY LIVER DISEASE
Presenter(s): Ashley Gilbert
Category: Pharmacology and Toxicology
Mentor(s): Rance Nault (College of Veterinary Medicine)

Metabolic dysfunction-associated steatotic liver disease (MASLD) is a growing public health concern across the United States. In clinical cases and rodent models, MASLD has been shown to develop in a zone-selective manner relating to the centrilobular and periportal regions, however the underlying mechanisms behind this zone-selectiveness are unknown. This study tests our hypothesis that zone-selective steatosis is driven by distinct mechanisms either disrupting peroxisomal ß-oxidation pathway or repression of rate limiting enzymes in the OCM pathway. Bulk RNA sequencing (RNAseq) was performed on livers from two toxicant and two diet-induced steatosis models. Male C57BL/6J mice were treated with 0.3 or 1 mg/kg/day PFOS in drinking water or fed a high fat (GAN) diet to model centrilobular steatosis. To model periportal steatosis, mice were gavaged with 3 or 10 µg/kg 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) or fed a methionine-choline deficient (MCD) diet. Gene expression analysis found 844 unique differentially expressed genes (DEGs) common to both periportal steatosis models, and 43 unique DEGs common to both centrilobular steatosis models. Gene set enrichment analysis (GSEA) found induction of ß-oxidation pathway genes in the centrilobular models, while the portal models showed overall repression. Furthermore, the genes Acaa1b and Inmt showed induction in the central models and repression in the portal models, representing putative markers of zone-selective steatosis. Our findings suggest differences in disruption of the ß-oxidation pathway between models of periportal and centrilobular steatosis, and repression of metabolic pathways reliant on OCM, reflect a putative distinguishing signature for zone-selective steatosis induced by either toxicants or dietary factors.

TUMORIGENIC POTENTIAL OF HEXAFLUOROPROPYLENE OXIDE DIMER ACID (GENX)
Presenter(s): Landen Taber, Sachi Zalpuri
Category: Pharmacology and Toxicology
Mentor(s): Brad Upham (College of Human Medicine)

A key characteristic of tumor cells is their lack of communication with surrounding cells. A major pathway of intercellular communication is through gap junction channels. Gap junctions are small porous protein structures in the cell membrane that allow the intercellular passage of small cell signaling molecules (≤ 1 kDa) between cells that co-regulate signal transduction pathways controlling gene expression in developing tissues. Although there are numerous signal transduction pathways that can lead to cancer phenotypes, all these pathways require the dysregulation of gap junctional intercellular communication (GJIC). Thus, assessment of GJIC in response to environmental toxicants is an excellent first step to assess for potential tumorigenicity. Our focus is determining effects of per- and polyfluoroalkyl substances (PFAS) on GJIC. PFAS, "forever chemicals", pose significant adverse health effects around the globe. More specifically, we will focus on determining the effect of hexafluoropropylene oxide dimer acid (GenX) on GJIC on a bipotent rat liver epithelial stem cell line. GJIC

is assessed using the scalpel load-dye transfer assay. Our preliminary data indicates that GenX closes gap junction channels. Further experiments will determine the dose and time of response to GenX. We will also determine the underlying mechanisms by which GenX closes gap junction channels by using signaling pathway inhibitors. Additionally, we will screen several natural products that could potentially prevent or reverse the effects of GenX on GJIC. These data will contribute to a better understanding of GenX toxicity relative to cancer and potentially provide chemopreventive strategies with natural products.

OPTIMIZING TRANSFECTION BASED PLASMID DNA LOADING INTO EXTRACELLULAR VESICLES
Presenter(s): Nayeema Siraj
Category: Pharmacology and Toxicology
Mentor(s): Masako Harada (College of Engineering)

Extracellular Vesicles (EVs) are naturally secreted, membrane-bound nanoparticles that mediate intercellular communication by transporting proteins, nucleic acids, and other biomolecules. Their intrinsic biocompatibility, low immunogenicity, and capacity for surface and cargo engineering make them promising therapeutic delivery vehicles. However, efficient loading of therapeutic cargo is a major challenge, particularly for transfection-based loading strategies. This project aimed to optimize EV cargo loading by investigating the effect of transfection incubation and EV collection timing on DNA encapsulation efficiency. HEK-293T cells were transiently transfected with plasmid DNA using polyethyleneimine (PEI), followed by EV collection at defined time intervals. Varied transfection incubation times (4, 6, and 24 hours) and EV collection times (24 or 48 hours) were tested, generating six experimental conditions. Isolated EVs were characterized using nanoparticle tracking analysis, transmission electron microscopy, and Western blotting, confirming preserved vesicle structure, size (~150-200 nm), and EV-specific markers. Quantitative PCR analysis following DNase I treatment was used to quantify DNA protected within the EV lumen. Although longer incubation increased total EV yield, lower time points resulted in a statistically significant increase in DNA copies per EV. This work addresses a key limitation in EV engineering by identifying transfection incubation and EV collection time points that enhance plasmid DNA encapsulation efficiency within EVs.

EVALUATION OF CLOPIDOGREL'S EFFECTS ON BLOOD-BRAIN BARRIER INTEGRITY AND COGNITION IN HYPERTENSIVE MICE
Presenter(s): Lucie Hranacova
Category: Pharmacology and Toxicology
Mentor(s): Adam Lauver (College of Veterinary Medicine), Afolashade Onunkun (College of Osteopathic Medicine)

Antiplatelet therapy with P2Y12 antagonists, such as clopidogrel, is widely used to prevent arterial thrombosis, but it is associated with an increased risk of intracranial bleeding, traditionally attributed solely to platelet inhibition. Our lab identified cerebrovascular effects of clopidogrel independent of P2Y12, showing it increases blood brain barrier (BBB) permeability in hypertensive mice independent of

platelet P2Y12 inhibition. Because hypertension increases risk for cerebrovascular injury and BBB dysfunction, clopidogrel may directly impair cerebrovascular barrier integrity in susceptible populations. The mechanism by which clopidogrel increases BBB permeability is unknown. BBB integrity is maintained by tight junction (TJ) proteins. Although our previous studies show clopidogrel does not reduce their overall abundance, barrier dysfunction may result from altered localization rather than degradation. We therefore hypothesize that clopidogrel disrupts BBB integrity by promoting mislocalization of TJ proteins within the cerebrovascular endothelium. BBB disruption has been shown to precede the development of cognitive deficits in hypertensive mice. Therefore, we further hypothesize that clopidogrel-induced BBB dysfunction will exacerbate cognitive impairment in this model. To test these hypotheses, wild-type mice will be implanted with angiotensin II pumps to induce hypertension and treated with clopidogrel or vehicle for two weeks. At the end of the two-week treatment period, spontaneous alternation in the Y maze will be used to assess higher cognitive function. Mice will then be euthanized, and their brains collected for histological analyses of TJ protein localization. We expect that clopidogrel treatment will cause mislocalization of TJ proteins and worsen cognitive impairment in angiotensin II-induced hypertensive mice.

PURINERGIC RECEPTOR ACTIVATION CONSTRICTS URINARY BLADDER ARTERIOLES IN FEMALES
Presenter(s): Stav Okanin
Category: Pharmacology and Toxicology
Mentor(s): Nathan Tykocki (College of Osteopathic Medicine)

Bladder dysfunction has a major impact on quality of life for many people, yet few effective treatments are available. Previous studies show that changes in blood flow affect bladder function, yet bladder vascular function is largely unexplored. During filling, the bladder releases many vasoactive compounds, including the purine ATP. Thus, purinergic signaling is a possible modulator of bladder blood flow. In male mice, the P2X receptor agonist α,β-MeATP (100 nM) constricts urinary bladder arterioles, and this constriction is blocked by the P2X inhibitor PPADS (10 μM). However, it is unknown if this occurs in vessels from female mice. We tested the hypothesis that α,β-MeATP constricts urinary bladder arterioles in female mice, and this constriction is blocked by PPADS. Urinary bladder arterioles from 10 to 16-week-old C57Bl/6 female mice were cannulated for pressure myography. Constriction to the adrenergic agonist phenylephrine (1μM) and dilation to the muscarinic receptor agonist carbachol (1μM) was used to confirm vessel viability. Constriction to α,β-MeATP (100 nM) was measured before and after PPADS (10 uM). As hypothesized, α,β-MeATP significantly constricted urinary bladder arterioles (41.77 ± 3.39%), and this constriction was blocked by PPADS (9.42 ± 2.70%). This suggests that the constriction to α,β-MeATP in female mice is also due to activation of P2X receptors. Future experiments will determine which purinergic receptors arepresent in the bladder arterioles in females. We will then use selective purinergic receptor inhibitors to determine which P2X receptor causes the constriction.

TUMORIGENIC POTENTIAL OF TRICLOSAN, A HOUSEHOLD ANTIMICROBIAL INGREDIENT, AND CHEMOPREVENTION BY RESVERATROL
Presenter(s): Jaden Reji
Category: Pharmacology and Toxicology
Mentor(s): Brad Upham (College of Human Medicine), Caroline Baidoon (College of Veterinary Medicine)

Triclosan is an antimicrobial agent that was a common ingredient in many household products. Recently triclosan has been implicated in adverse health effects such as immune suppression and liver cancer and has since been banned by the Food and Drug Administration in 2016. However, it remains in a multitude of household items and is a tremendous public health concern. Considering that triclosan has been linked to liver cancer, there is a need to understand the underlying mechanisms of action. Cancer cells have long been characterized as cells that lose their ability to regulate growth through contact inhibition and lack the ability to terminally differentiate, which implies a breakdown in one of the communicating mechanisms. In particular, the dysregulation of gap junctional intercellular communication (GJIC) is one hallmark characteristic of cancer. Thus, we determined the effects of triclosan on GJIC in a bipotent epithelial stem cell line derived from F344 rats using the scalpel load dye transfer assay. Triclosan inhibited GJIC in a dose- and time-dependent manner, and time-recovery analyses demonstrating rapid inhibition and partial restoration of GJIC following toxicant removal, implicating that triclosan can contribute to the cancer process by dysregulating GJIC. Triclosan dysregulated GJIC through a phosphatidylcholine-specific phospholipase C-dependent mechanism. The natural products resveratrol and quebecol mitigated the adverse effects of triclosan on GJIC. In conclusion, our in vitro results indicate that triclosan is a potential tumor promoter and natural products, specifically resveratrol and quebecol, can potentially prevent adverse health effects.

MORPHOLOGICAL EFFECTS OF DDA EXPOSURE DURING EMBRYONIC DEVELOPMENT STAGES IN ZEBRAFISH
Presenter(s): Emma Andrechek
Category: Pharmacology and Toxicology
Mentor(s): Alanis Torres Berrios (College of Veterinary Medicine), Karilyn Sant (College of Veterinary Medicine), Katelyn Polemi (College of Veterinary Medicine)

Before its ban, people readily used the pesticide dichlorodiphenyltrichloroethane (DDT) to exterminate pests and control malaria and typhus outbreaks. The book Silent Spring, written by Rachel Carson, raised awareness on environmental concerns relating to DDT, sparking a movement for environmental safety. Previous studies show that presence of 2,2-bis[4-chlorophenyl]acetic acid (DDA), the only water-soluble byproduct of the 46 DDT+ metabolites, in urine and blood samples indicates prior exposure to DDT. Additional research has found DDT+ metabolites in water and sediment samples from contaminated areas. We expect exposure to DDA to have similar effects as DDT exposure, although it remains understudied. By exposing zebrafish embryos to a range of concentrations of DDA, we hypothesize that DDA will cause morphological malformations in zebrafish embryos similar to those caused by DDT, such as pericardial edema, yolk sac edema, spinal curvature, stunted growth, and jaw deformities. We

observed embryonic zebrafish of the wild-type AB strain for morphological malformations after daily exposure to DDA at concentrations of 0 (DMSO 0.01%), 0.5, 5, or 50 uM respectively. We also recorded hatching and mortality rates. By comparing the DDA-exposed embryos to the DMSO-exposed embryos, we expect to see an increase in morphological malformations among the DDA-exposed groups. Ultimately, this study aims to examine the occurrence and significance of morphological malformations when we expose embryonic zebrafish to DDA during developmental stages. We are investigating the broader impacts of DDA and its potential synergistic effects with DDT.

DIABETIC KKAY MICE, BUT NOT NONDIABETIC C57BL/6 MICE, DEVELOP FIBRINOUS, EOSINOPHILIC AND PROGRESSIVE PNEUMONIA AFTER REPEATED INHALATION EXPOSURES TO OZONE

Presenter(s): Panchalee Mahavithana

Category: Pharmacology and Toxicology

Mentor(s): Jack Harkema (College of Veterinary Medicine), James Wagner (College of Veterinary Medicine), Ryan Lewandowski (College of Veterinary Medicine)

Ozone is a secondary air pollutant and the primary gaseous component in photochemical smog. Diabetics are particularly susceptible to the harmful effects of air pollution, though the pathological basis of this susceptibility is not fully known. In the present study, we elucidated the toxicant-induced histopathology in the lungs of male diabetic KKAy mice and nondiabetic C57BL/6 mice repeatedly exposed by inhalation to 0 or 1 ppm ozone for 4, 8, or 12 consecutive weekdays, 4h/day. One day after the last daily exposure, left lung lobes were harvested, formalin fixed and subsequently processed for light microscopic examination and quantitative analysis. Tissue sections were immunohistochemically stained for markers of tissue injury (fibrinous exudate), inflammation (eosinophils), and remodeling (type 2 alveolar epithelial cell hyperplasia and interstitial fibrotic collagen). Exposure-related multi-focal lung lesions were in centriacinar regions of the lung in both strains of mice. C57BL/6 lungs, however, had minimal, nonprogressive lesions, while KKAy lungs had severe and progressive lesions that involved centriacinar regions as well as more distal alveolar parenchyma. Toxicant-related histopathology in diabetic mice consisted of alveolar epithelial necrosis, fibrinous exudate, hemorrhage, eosinophilic alveolitis, hyperplasia of type 2 alveolar epithelial cells and early interstitial fibrosis. Alveolar densities of fibrin, eosinophils, type 2 alveolar epithelial cells and interstitial collagen were all significantly greater in diabetic KKAy mice compared to nondiabetic C57BL/6 mice. These results suggest that individuals with diabetes may be particularly susceptible to pulmonary injury, inflammation and remodeling after repeatedly exposures to elevated airborne levels of ozone.

EXPLORING GLS INHIBITION AS A METABOLIC THERAPY FOR PLATINUM-RESISTANT OVARIAN CANCER
Presenter(s): Vrinda Khullar
Category: Pharmacology and Toxicology
Mentor(s): Adriana Ponton Almodovar (College of Natural Science), Sachi Horibata (College of Human Medicine)

Ovarian cancer presents a profound challenge due to its often-late detection and high mortality rates. One of the pressing issues in treating ovarian cancer is chemoresistance, which diminishes the effectiveness of chemotherapy. Our laboratory identified GPT2 (Glutamic-Pyruvate Transaminase 2) as a potential contributor to this resistance. GPT2 is an enzyme that catalyzes the conversion of glutamate and pyruvate to α-ketoglutarate and alanine. This is a critical enzymatic reaction in the glutaminolysis pathway, which cancer cells utilize for growth and survival. We recently showed that platinum-resistant ovarian cancer cells have increased glutamine-driven oxidative phosphorylation and higher GPT2 expression. The knockout of GPT2 reduced metabolic activity, decreased colony growth, and restored cisplatin sensitivity. Building on these findings, our current work explores whether pharmacologic targeting of the glutaminolysis pathway through glutaminase (GLS) inhibitors, including BPTES and CB-839, can similarly disrupt glutamine utilization and enhance therapeutic response. Overall, these findings would provide insights into new potential therapeutic agents to combat platinum-resistant ovarian cancer.

DEVELOPING A GUT PERMEABILITY ASSAY TO EVALUATE COLONIC TOXICITY OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) IN CAENORHABDITIS ELEGANS
Presenter(s): Jillian Luczkowski
Category: Pharmacology and Toxicology
Mentor(s): Tian (Autumn) Qiu (College of Natural Science)

Exposures to per- and polyfluoroalkyl substances (PFAS) in the environment can induce a variety of toxic responses from exposed organisms. Factors like molecular weight and molecular class have shown that these factors can influence mechanisms of toxicity. Previous reports showed that gut inflammation and permeability is associated with PFAS exposure. However, the large structural diversity of PFAS (e.g., chain length, headgroups) makes it challenging to perform colonic toxicity analysis on rodent animals which are time- and resource-consuming. Developing alternative, cost- and labor-effective approaches using non-rodent models is thus a critical approach to enable fast and wide evaluation of PFAS colonic toxicity. C. elegans is an established model organism offering advantages including conserved genetic homology with mammals (60%-80%), characterizable phenotypes, ease in culture, and has been used as a high-throughput screening model for toxicology research. Here, we use C. elegans as a model organism to develop a high-throughput assay for evaluating the intestinal toxicity of various PFAS. Colonic toxicity was evaluated using a FluoroSmurf assay, which utilizes two dyes to assess intestinal barrier permeability through microscopy imaging and evaluation. The assay was tested to determine the optimal C. elegans paralyzing agent and best liquid media to conduct the assay in. FluoroSmurf assay was used to evaluate the toxicity outcome of fluorinated surfactants against the endogenous lipid lipopolysaccharide (LPS)

which commonly triggers colonic inflammation in mammalian systems. In this presentation, I will show the results of FluoroSmurf assay from optimization experiments and LPS and PFAS exposure.

TOPICAL OMAVELOXOLONE MITIGATES CORNEAL DAMAGE FOLLOWING CHLOROPICRIN EXPOSURE
Presenter(s): Peter Chu
Category: Pharmacology and Toxicology
Mentor(s): Neera Tewari-Singh (College of Osteopathic Medicine)

Chloropicrin (CP) is a highly reactive organic chemical threat agent that is widely used as a soil fumigant/pesticide in agriculture. Due to its strong irritant properties, its potential intentional, accidental, or occupational exposure poses a significant chemical hazard, particularly to the eyes. The cornea, being the most exposed and sensitive to ocular tissue, is especially vulnerable to CP-induced toxicity. Despite these risks, there remains a critical gap in effective therapeutic interventions capable of preventing or mitigating CP-induced ocular injury. Previous studies have documented that CP-induced corneal pathology is driven by oxidative stress and inflammation. Nuclear Factor Erythroid 2-Related Factor 2 (Nrf2) pathway is a known regulator of oxidative stress and inflammation. Omaveloxolone (RTA 408) is a synthetic triterpenoid and FDA-approved potent activator of the Nrf2 antioxidant pathway, which has shown effects in reducing oxidative stress and inflammation across various tissue injury models. Given CP's indicative mechanisms of toxicity, RTA represents a potential candidate for therapeutic intervention. This study aims to assess the protective potential of RTA 408 in preventing ocular injury from CP exposure in a mouse model. Male BALC/c mice (n=5/group; 6-8 weeks old) were exposed to CP vapor (2.5% CP for 1 minute) using a vapor cap on the right eye, with the left eye serving as the control. 30 minutes before exposure, mice were treated with RTA (0.1%). Treatment was administered topically twice daily. Clinical features of ocular injury, including corneal ulceration, were evaluated over a 24-hour period. Our results showed that RTA pre-treatment reduced the severity of corneal ulceration by 66.18% at 6 hours and 26.96% at 24 hours post-exposure in CP-exposed eyes, indicating that RTA could be a potential therapeutic candidate for ocular injury caused by CP exposure. In addition, this study establishes a foundational model for evaluating countermeasures against CP-induced ocular toxicity. Further studies are exploring the effect of RTA treatments on other histopathological and molecular markers of CP-induced corneal injuries. The outcomes will contribute to understanding the mechanisms of CP-induced corneal injury and identify viabletargets for treating chemical ocular exposures.

MATRIX MATTERS: CONTROLLING SONIC HEDGEHOG SIGNALING IN A MICRO-ENGINEERED PALATE SYSTEM
Presenter(s): Amritha Yelleti
Category: Pharmacology and Toxicology
Mentor(s): Brian Johnson (College of Veterinary Medicine)

Orofacial clefts are highly prevalent birth defects. However, their etiology is not well understood due to complexities of orofacial development and limited experimental models available. The Sonic Hedgehog

signaling (SHH) pathway plays a major role in mediating cell interaction when epithelial cells diffuse into the extracellular matrix to bind to mesenchymal cell receptors. Mutations, exposure to environmental toxins, and biochemical imbalance can lead to palate malformations. To evaluate disruptions during morphogenesis, a 3D microphysiological model (MPM) was developed. These models were fabricated from 96-well plates milled using CNC technology. Mesenchymal 3T3 SHH light II reporter cells were suspended within a thiol-modified hyaluronic acid hydrogel (Hystem-C) and placed into the wells. GMSM-K RFP epithelial cells were added into each well's side channels as a negative control, while GMSM-K SHH cells expressing SHH were added to some side channels as the manipulated variable. Mechanics of the hydrogel were altered based on the cross-linkers ratio (Extralink:Glycosil) (1:4 and 1:6). SHH signaling activity was measured using luciferin-based bioluminescent imaging. To validate pathway responsiveness, the pharmacological treatments SAG (agonist) and Vismodegib (antagonist) were applied. Across multiple trials, SHH signaling was observed in >80% of wells. Softer hydrogel matrices exhibited greater cell diffusion and stronger SHH signaling than stiffer matrices. Additionally, the SAG treatment increased signaling, while the Vismodegib treatment decreased signaling compared to the controls, confirming effective pathway modulation. These results demonstrate that this reproducible microphysiological model provides a quantitative platform for studying SHH-mediated orofacial development and evaluating factors that disrupt craniofacial morphogenesis.

PHARMACOKINETIC CHARACTERIZATION OF POSITIVE CONTROL COMPOUNDS FOR EVALUATING DRUG-INDUCED HYPERTENSION
Presenter(s): Avery VandenBussche
Category: Pharmacology and Toxicology
Mentor(s): Adam Lauver (College of Veterinary Medicine)

Drug-induced hypertension is a major safety concern in drug development, as the risk of adverse cardiovascular events increases with elevated blood pressure. In response, the FDA's 2022 draft clinical guidance outlined recommendations for assessing drug-induced pressor effects, identifying rofecoxib and torcetrapib as positive control compounds due to their well-characterized pharmacokinetic (PK) and safety profiles at lower doses. Characterizing the ADME of these compounds in preclinical models is essential for understanding systemic exposure and biological variability. This study evaluated the pharmacokinetics of rofecoxib and torcetrapib in rats using noncompartmental analysis (NCA), hypothesizing that clinically relevant oral doses would yield measurable systemic exposure with sex-based differences in PK parameters. A PK study was conducted using eight Sprague-Dawley rats (four male, four female). Animals received torcetrapib (100 mg/kg, oral), followed by a one-week washout period and subsequent rofecoxib administration (10 mg/kg, oral). Venous blood samples were collected at baseline and 0.5, 1, 2, 4, 8, and 24 hours post-dose. Plasma concentrations were quantified using LC-MS, and NCA parameters, including Cmax, Tmax, AUC, and elimination half-life (t_), were calculated using Phoenix® WinNonlin. Rofecoxib concentration-time data showed sex-based differences in Cmax, AUC, and t1/2, closely aligning with reported literature. Tmax and t1/2 were consistent with literature, whereas Cmax was approximately 10-fold higher than reported. Torcetrapib concentration-time data shows no significant sex-based differences in exposure parameters, despite published increases in

female exposure. These findings demonstrate measurable systemic exposure at clinically relevant doses and highlight biological variability in PK behavior, supporting future studies evaluating exposure-dependent hypertensive risk.

Physical Sciences

HIGH VOLTAGE CAGE FOR RADIUM EDM
Presenter(s): Ryan Tanzer
Category: Physical Sciences
Mentor(s): Jaideep Singh (Facility for Rare Isotope Beams)

My work at Spinlab focuses on assisting with the design of a new high voltage cage for the Radium Electric Dipole Moment (RaEDM) experiment. In this experiment, laser cooled radium atoms are confined in an optical trap located between two high voltage electrodes. The atoms are spin polarized and allowed to precess in combined electric and magnetic fields, and the resulting spin precession frequency is measured using laser probing. A permanent EDM would appear as a small shift in the precession frequency when the direction of the electric field is reversed. In earlier stages of the apparatus, the electric field system operated with high voltage supplies around 15 kV. While this configuration demonstrated the basic measurement technique and allowed the experiment to run successfully, stronger electric fields are required in order to significantly improve the sensitivity of the measurement. Previous measurements of the EDM of the Radium 225 atom achieved a sensitivity on the order of 10^-23 e*cm. With a new setup at 60 kV, we hope to achieve a sensitivity of 3 orders of magnitude better than our last measurement. In order to accomplish this however, we needed to buy new parts for most things within the electrical cage, as not much that we used in the past experiment is rated for 60 kV. With this in mind, we needed to redesign the entire setup to both conform to Argonne National Lab requirements for space, along with Facility for Rare Isotope Beams (FRIB) requirements on electrical safety.

RECONSTRUCTION OF PROTON-ALPHA COINCIDENCES IN THE GADGET-II DETECTOR
Presenter(s): Bhavya Jain
Category: Physical Sciences
Mentor(s): Christopher Wrede (College of Natural Science), Tyler Wheeler (College of Natural Science)

Explosive astrophysical environments such as Type I X-ray bursts are governed by nuclear reaction pathways that determine how matter escapes the hot CNO cycle and proceeds toward heavier nuclei. A key quantity in modeling Type I X-ray bursts is the 15O(α, γ)19Ne reaction rate. Constraining this reaction rate requires the experimental determination of the alpha-particle branching ratio from the astrophysically relevant 4.03 MeV state in 19Ne. To address this, an experimental campaign was performed using the GADGET-II Time Projection Chamber with a 20Mg beam to populate the 4.03 MeV 19Ne state and detect 20Mg(βpα) events. A major analysis challenge is reliably distinguishing between

single-proton and proton-alpha coincidence events, as their signatures can overlap in detector observables such as range-versus-energy (RvE) distributions, making simple selection cuts insufficient for isolating rare coincidences. In this work, we apply and extend a Markov Chain Monte Carlo (MCMC) fitting framework to reconstruct the energy sharing between decay particles on an event-by-event basis. The method provides a physics-informed probabilistic test of competing decay hypotheses. It enables reconstruction of the proton-alpha energy partition, which serves as a consistency check for identifying true proton-alpha decays and rejecting background or misidentified tracks. To validate and benchmark the approach, we analyze data from a complementary 21Mg beam, whose decay scheme contains a well-known proton-alpha channel that provides a controlled sample for testing the method. Finally, we compare the MCMC-based reconstruction with convolutional neural network classifiers previously used for rapid event identification, highlighting the trade-offs between physical interpretability and computational efficiency.

PROGRESS TOWARDS A SINGLE ATOM MICROSCOPE FOR NUCLEAR ASTROPHYSICS
Presenter(s): Ellie Summerfield
Category: Physical Sciences
Mentor(s): Jaideep Singh (Facility for Rare Isotope Beams), Karina Martirosova (College of Natural Science)

The Single Atom Microscope technique involves the capture and detection of recoiling reaction products inside of a cryogenically frozen noble gas film in order to study low yield nuclear reactions that are relevant to nuclear astrophysics. The prototype Single Atom Microscope (pSAM) is a detector that is designed to be efficient, selective and sensitive at the single atom level. Our first and proof of principle measurement is the 84Kr(p,?)85Rb reaction, which plays a role in the p-process in stars. This reaction requires the study of the optical properties of Rb atoms embedded inside of thin Krypton films. We have made a preliminary measurement of the absolute laser induced fluorescence cross section of Rb in solid Kr at a variety of sample temperatures. This quantity allows one to estimate the single atom fluorescence light yield, a key parameter that must be optimized by designing a sufficiently efficient light collection optical system. We will describe our findings and our plans to demonstrate single atom detection sensitivity on the path to a first measurement of a nuclear reaction cross section. This work is supported by the U.S. National Science Foundation under grant number #1654610 and #2412951 and by the Department of Energy National Nuclear Security Administration through the Nuclear Science and Security Consortium under Award Number DE-NA0003996.

CONTROLLING COPOLYMER SEQUENCE USING NOVEL PHOTOSWITCHABLE N-HETEROCYCLIC OLEFINS
Presenter(s): Kristen D'Anna
Category: Physical Sciences
Mentor(s): Melanie Chiu (College of Natural Science)

Controlling monomer sequence in synthetic polymers remains a significant challenge compared to

nature's precision in systems such as DNA. This project investigates a light-driven approach using photoswitchable polymerization agents that reversibly toggle between isomeric states, each selectively polymerizing different monomers. My research focuses on the synthesis and characterization of novel photoswitchable N-Heterocyclic olefins designed to evaluate how substitution of an additional phenyl group changes the electronics of the molecule and therefore its catalytic activity.

OBTAINING PRIMARY MELT COMPOSITION FROM OLIVINE-HOSTED MELT INCLUSIONS IN ETENDEKA PICRITES.
Presenter(s): Paige Sakorafos
Category: Physical Sciences
Mentor(s): Tyrone Rooney (College of Natural Science)

The Etendeka province flood basalt was a precursor event to the separation of Africa and South America and is an example of the known correlation between continental flood basalts and continental rifting. The composition of magmas erupted in the province can probe mantle processes but obtaining a primary melt composition can be challenging. Once extracted from the mantle, magmas rapidly differentiate through fractionation, assimilation, and mixing processes. Olivine-hosted melt inclusions provide a potential solution to this problem as they represent small volumes of melt that were trapped early in the differentiation process. Twenty samples that were collected from the Etendeka region are being examined for olivine-hosted melt inclusions, which will then be analyzed for primary melt composition. The initial work for this project has involved cutting and crushing the samples containing olivine, and developing an epoxy-based crystal mounting procedure for the grains to be placed in. Currently I am chipping and picking the sample material for the olivine-hosted melt inclusions, and mounting those inclusions using the epoxy-based procedure I developed. Next steps will be to analyze their composition with our LA ICP-MS.

DOES CYGNUS X-3 EMIT GAMMA-RAY FLARES AT TEV ENERGIES?
Presenter(s): Sean Furnas
Category: Physical Sciences
Mentor(s): Mehr U Nisa (College of Natural Science)

Cygnus X-3, a well-known highly active X-ray binary, was recently identified as a source of variable frequency TeV to PeV γ-ray flares by the Large High Altitude Air Shower Observatory (LHAASO). Prior to LHAASO's study, Cygnus X-3 was not known to emit in high energy ranges by other various TeV+ detectors. HAWC is a ground-based, wide field-of-view, very-high-energy (VHE) Cherenkov detector that is sensitive to γ-rays with energies from 300 GeV to beyond 100 TeV. In this study, maps of the VHE sky from 2015 to 2020, taken using HAWC, were used to search for TeV flares in the Cygnus Superbubble star forming region, with a specific interest in the transient behavior of Cygnus X-3.

COMPUTATION AND OPTIMIZATION OF MOLECULAR STATES FOR CAVITY-MOLECULE COUPLING SIMULATIONS
Presenter(s): Eddie Hutton, Gavin Culver
Category: Physical Sciences
Mentor(s): Angela Wilson (College of Natural Science)

Inside highly reflective nanostructures known as optical cavities, the confinement of light enhances the coupling between light and molecules, offering a transformative route for controlling chemical reactions and for developing new quantum technologies. Theoretical modeling of these systems uses real-time dynamics methods which rely on a set of precomputed molecular states. Molecular electronic states are computed via electronic structure theory, where each state is defined by a unique energy and spatial charge distribution. However, the exponential increase in computational cost and complexity for larger molecular systems necessitates a reduction in the required state space. By systematically truncating high-energy molecular states, we evaluate the minimum threshold for obtaining accurate results for the coupled cavity-molecule system. Our analysis covers molecular systems ranging in size and complexity from H2 with 3 states to CH2O with 13,860 states. Our results indicate that for many molecular systems, chemical accuracy can be obtained by using less than 1% of states. The molecular states were computed using open-source quantum chemistry software on high-performance computing clusters. To extend our methods to heavy elements and molecular spin states, relativistic effects are incorporated. These results will help to develop more efficient simulations of complex cavity-molecule interactions.

ALPHA-SPECTROPIC IDENTIFICATION OF TH-224 PRODUCED BY U-238 FRAGMENTATION
Presenter(s): Jessica Norwood
Category: Physical Sciences
Mentor(s): Chandana Sumithrarachchi (Facility for Rare Isotope Beams)

Identification of Th-224 produced by uranium after stopping and extraction from the Advanced Cryogenic Stopper (ACGS) is very difficult due to the production of a large number of isotopes, charge states and chemical molecular formation in the gas cell. Thorium isotopes are produced at FRIB via fragmentation of a U-238 beam and in-pinch onto a carbon target. The produced isotopes are separated at AIRES (Advanced Rare Isotope Separator) and delivered to the ACGS for conducting precision measurement and reaccelerated experiments. This study focuses on developing a reliable method for accurately identifying Th-224 after the advance of ACGS at FRIB using alpha spectroscopy. Th-224 undergoes alpha-decay by emitting different energies of alpha particles and produces a sequence of daughter nuclei that also emit alpha particles. The difficulty of analyzing alpha spectrum comes from the contribution of all alpha particles emitted by the Th-224 decay chain, alpha emitting contaminants in the beam and molecules of alpha emitting isotopes. This results in closely spaced alpha energies and background contributions that complicate peak separation and isotope assignment. In addition, gas-cell chemistry influences isotope transport and configuration, further complicating identification. The beam extracted out of ACGS after selecting a mass to charge ratio was stopped in a foil and the emitted alpha particles were detected using the surface barrier detector. Spectra were collected for different Thorium molecules and their charge states. Alpha spectra were simulated based on the decay information and

compared with observed spectra to identify the Th-224 beam by demonstrating consistency in peak energies and decay-chains. This methodology provides a reliable framework for rare-isotope identification using gas-cell processing and can be applied beyond Th-224 to identify other alpha-emitting isotopes produced in fragmentation experiments.

GEOCHEMICAL GROUPING AND FC MODELING OF THE ETENDEKA LARGE IGNEOUS PROVINCE!
Presenter(s): Thomas Libecco
Category: Physical Sciences
Mentor(s): Tyrone Rooney (College of Natural Science)

Dike swarms are feeders of continental flood basalts, and preserve the most primitive magmas of these massive volcanic events. Typically, such primitive mafic basalts represent probes of the mantle source of the continental flood basalt province. However, the geochemical signatures of dikes in the Etendeka province of Namibia exhibit contamination with crustal materials. The wide diversity of dike geochemical composition reflects therefore complex source and contamination vectors that must be disambiguated prior to using such magmas as probes of the mantle source. In this presentation we first categorize newly collected samples into distinct groups based upon existing regional data. We then assess which samples have most experienced crustal interaction and undertake a thermodynamic model to simulate the degree of interaction between the crust and magma. These data will constrain the degree of crustal assimilation experienced by the different magma groups and permit selection of the groups with the least contamination potential.

MODELING GAMMA-RAY DETECTION OF CAESAR FOR INVARIANT-MASS SPECTRIOSCOPY
Presenter(s): Emad Shahjahan
Category: Physical Sciences
Mentor(s): Aldric Revel (Facility for Rare Isotope Beams)

A key method to investigate nuclear structure is to study an excited state containing excess energy that is released as it decays toward its ground state (gamma-ray emission) or toward another nucleus (particle emission). The excitation energy of the excited state can be reconstructed from the combined energies of these emitted particles. At the Facility for Rare Isotope Beams (FRIB), the Modular Neutron Array (MoNA) collaboration specializes in the study of neutron-unbound states using the invariant mass technique. In our experiments, emitted neutrons are detected using the MoNA detector system, which allows for momentum and kinetic energy determination. Gamma rays from the same events are detected using the CAESAR detector. However, CAESAR does not have 100% detection efficiency, meaning that some gamma-rays escape its acceptance or deposit incomplete energy. This incomplete detection leads to an error in the determination of the nucleus's true excitation energy. Because of this, accurately quantifying both the number and energy of gamma rays is essential for understanding nuclear structure and decay pathways. To address this, we use a simulation that models gamma-ray emission while incorporating the known efficiency limitations of CAESAR. By comparing the simulation output with experimental data, we benchmark and refine the model to ensure it reproduces observed results.

Once validated, this simulation allows for more precise reconstruction of excitation energies in past and future experiments.

COOLING FLOWS AND THE PHOENIX CLUSTER
Presenter(s): Jacob Evans
Category: Physical Sciences
Mentor(s): Benjamin Wibking (College of Natural Science)

Galaxy clusters are the largest known self-gravitating objects in the universe, containing hundreds of galaxies along with diffuse gas that often accretes toward the Brightest Cluster Galaxy at the center. Observations show that, unlike most clusters, the Phoenix Cluster exhibits strong cooling of intracluster gas toward its core. We show that a cooling flow model with spherical symmetry and constant mass accretion accurately reproduces the entropy profile of the Phoenix Cluster. The model was tested both with and without heating, which was introduced by modifying the cooling time equation with a parameterized factor that could control both the radius and strength of the heating effect. These parameters, along with the mass accretion value, were then tested via Markov Chain Monte Carlo (MCMC) to find solution profiles. The inclusion of heating improves the agreement with observations slightly as measured by χ^2, however the heating parameters are not well constrained by the data.

IMPROVED SEPARATION OF THE HIGGS BOSON SIGNAL FROM BACKGROUND IN THE HIGH TRANSVERSE MOMENTUM IN THE DIPHOTON CHANNEL
Presenter(s): Nityaansh Parekh
Category: Physical Sciences
Mentor(s): Joey Huston (College of Natural Science)

The diphoton decay channel of the Higgs boson provides a clean experimental signature despite its small branching ratio. At high Higgs transverse momenta, the signal-to-background ratio improves considerably, though with lower statistics. This phenomenological study aims to enhance the separation of the Higgs signal from the diphoton background in this high pT regime using event-level observables. Using Monte Carlo samples enriched in high pT events, we examine variables such as the ratio of the leading to sub-leading photon transverse momenta and the diphoton invariant mass to assign event by event probabilities for being signal-like or background-like. In the longer term, this approach may be used to help distinguish between different Higgs production modes including gluon-gluon fusion (ggF), vector-boson fusion (VBF), and associated production (VH/ttH), providing a foundation for machine learning based approaches for high pT Higgs studies.

MACHINE LEARNING APPLIED TO ISOTOPE SEPARATION WITH THE SWEEPER EXPERIMENTAL SETUP
Presenter(s): Weston Borodin
Category: Physical Sciences
Mentor(s): Aldric Revel (Facility for Rare Isotope Beams)

The MoNA collaboration specialize in measuring neutron unbound states (decaying by neutron emission) at FRIB using the invariant-mass technique. One key ingredient is the characterization of the fragment resulting from the decay (mass and momentum). In a MoNA experiment, the fragment trajectories after decay are deflected by the Sweeper magnet toward a set of detectors to measure positions, angles, energy loss, and time of flight. The proton number (Z) is determined using the fragment energy loss. However, we want to be able to find the mass (A) of the particle to achieve isotopic separation. Historically, the mass separation was achieved in an empirical way using 2D corrections. To find the mass in a more robust and efficient way, I developed a machine learning classification code using parameters (positions, angles, time of flight) obtained using a Geant4 simulation for given isotopes. This new method will be compared to the empirical method and additional ones investigated by other group members. Based on this comparative analysis, this method has the potential to be used for any future MoNA experiments and analysis performed at FRIB.

EVALUATION OF A BINARY MATRIX MIXTURE FOR MALDI-TOF MASS SPECTROMETRY IMAGING OF TISSUE SAMPLES
Presenter(s): Hyungseo Choe
Category: Physical Sciences
Mentor(s): Tian (Autumn) Qiu (College of Natural Science)

The lipidome plays a critical role in the human body, as lipids are essential compounds of cell membranes and are associated with many human diseases. Mass spectrometry imaging (MSI) is a widely used analytical method to visualize the spatial location and distribution of compounds in biological tissues and help identify disease states associated with lipid composition. Matrix-assisted laser desorption/ionization mass spectrometry (MALDI-MS) is a common MSI technique that offers in situ analysis, allowing for fast and sensitive screening and label-free imaging. MALDI imaging involves matrix application, laser desorption, molecular ionization, and detection, which are then used to generate a spatial distribution of target molecules. In this study, the evaluation of a novel 9-aminoacridine : N-(1-naphthyl) ethylenediamine dihydrochloride (9AA:NEDC) binary matrix mixture will be done to prepare for MALDI-based mass spectrometry imaging. Since matrix selection is a critical step for MALDI imaging, porcine gelatin was used to test the reproducibility of different spraying conditions of the novel binary mixture. Bright-field microscopy was applied to examine crystal morphology across the gelatin sections to assess spraying deposition reproducibility. Preliminary microscopic imaging showed similar crystal morphology of 1:1 9AA:NEDC binary matrix mixture under different spraying conditions. Future work will apply the novel 9AA:NEDC binary matrix to mouse brain tissues and compare it to common individual matrices.

IMPLICIT METHOD FOR DIMENSIONALITY REDUCTION
Presenter(s): Daniel Shiu
Category: Physical Sciences
Mentor(s): Filomena Nunes (Facility for Rare Isotope Beams), Pablo Giuliani (Facility for Rare Isotope Beams)

Phenomenological nuclear optical potentials for reaction calculations can improve predictability and performance through Bayesian optimization and uncertainty quantification methods. However, these Bayesian approaches require up to thousands to millions of model evaluations. This large number of evaluations leads to a larger number of computational tasks, impacting overall progress. To account for this, emulators (or surrogate models) have been developed to speed up calculations. One such approach for nuclear reactions is the Reduced Order Scattering Emulator (ROSE) which produces a reduced basis for involved wavefunctions and produces their coefficients using the Galerkin projection. While ROSE is an efficient method for dealing with specific types of models, it requires an appreciable effort to construct, in particular to deal with the Non-Affine operators involved in optical potentials. Extending the ROSE framework to other types of reactions will require even more effort due to how the Galerkin projections are built. Because of this, we explore an implicit equation learning method as an alternative to replace the Galerkin approach for calculating the reduced basis coefficients. We have currently applied this implicit equation method for a two parameter space problem, reproducing similar results to ROSE. Our future aim is to extend the Implicit method to more complex systems to allow for the constructions of the emulators needed to apply Bayesian approaches to nuclear reaction modeling.

ASSESSING THE EFFICACY OF NEWLY ADAPTED NOVEL ELEMENT SEPARATION METHODS AT MICHIGAN STATE UNIVERSITY
Presenter(s): Makenzie Zimmer
Category: Physical Sciences
Mentor(s): Tyrone Rooney (College of Natural Science), William Aspinwall (College of Natural Science)

Radioactive isotopes are important geologic tracers because they inform us about the origins of surface rocks. Isotopes are used for this because unlike trace elements, isotopes do not significantly partition during igneous processes. Accurate measurement of these radioactive isotopes requires complete chemical isolation of the target elements. In our lab, previous element separation procedures have not been able to isolate target elements at the necessary purity. To overcome this limitation, we collaborated with New Mexico State University to implement more effective separation techniques that have now been carried out. After acquiring method-specific calibrations/calibration curves, separation of the desired isotopes can then be achieved utilizing our in-lab ICP-MS. Separation is achieved through a process of digestion followed by elution. During digestion, the sample of rock chips is treated to a series of hydrofluoric, hydrochloric, and nitric acid dissolutions until the rock chips are fully dissolved. The dissolved sample is then processed through glass chromatographic columns filled with ion-exchange resin. Different elements have different affinities to the resin, causing them to elute at differing but predictable element-specific rates. With the obtained calibrations, we will be able to isolate the target

elements at high purity. This method will provide in-house capability for isotope separation, expanding the laboratory's capacity for isotope research to better aid existing geochemical analyses.

MAGNETOHYDRODYNAMIC PRECIPITATION
Presenter(s): Doruk Yaldiz
Category: Physical Sciences
Mentor(s): Gerard Voit (College of Natural Science)

Circumgalactic gas around massive galaxies generally has a volume-filling component-an atmosphere-with a temperature determined by the potential-well depth of the galaxy's halo. If the atmosphere is near hydrostatic equilibrium and is stable to convection, then it can remain nearly homogeneous, as long as it is not too dense. But if its density is great enough, it becomes prone to producing a rain of cold clouds that fall toward the galaxy's center and accrete onto its central black hole. Here we explain how relatively weak magnetic fields enhance a galactic atmosphere's tendency to produce cold clouds and how the cold gas becomes organized into vertically elongated, highly magnetized filaments descending at sub-Keplerian speeds. It is intended to complement recent numerical simulations of the process and to serve as a guide to interpreting both simulations and observations of the filamentary gas in hot galactic atmospheres.

DEVELOPMENT OF A NEW MODULAR NEUTRON ARRAY SIMULATION PACKAGE
Presenter(s): Amelia Bittner
Category: Physical Sciences
Mentor(s): Aldric Revel (Facility for Rare Isotope Beams), Nicolas Dronchi (Facility for Rare Isotope Beams)

The MoNA collaboration is specializing in the study of phenomena arising in neutron-rich nuclei at the Facility for Rare Isotope Beams (FRIB) by performing neutron invariant-mass experiments. In such experiments, neutron detection is crucial and interpretation of the recorded data requires the use of reliable simulation taking into account the detector response. In the past three months, I have been working on the implementation of the Modular Neutron Array (MoNA) in the "nptool" framework, based on the Geant4 simulation software. I have created a simulation for the MoNA detector that can be added to the simulation of any past and future MoNA experiments performed at FRIB. The code simulates neutrons impinging on the MoNA detector and their subsequent interaction in order to generate simulated data sets in a similar format as data recorded during experiments. The simulation has been benchmarked and validated using MoNA experimental data. In the future, this will become the standard simulation used by the MoNA collaboration.

INVESTIGATING RARE ISOTOPES THROUGH GAMMA-RAY SPECTROSCOPY AND SIMULATION AT ARIS
Presenter(s): Sophia Delinois
Category: Physical Sciences
Mentor(s): Mallory Smith (Facility for Rare Isotope Beams)

The Facility for Rare Isotope Beams (FRIB) enables the discovery of new, rare isotopes. Over a thousand unexplored rare isotopes are predicted to exist. However, their short lifetimes and low production rates make experimental characterization challenging. FRIB uses projectile fragmentation and fission to produce rare isotopes. Creating and characterizing these new isotopes requires the separation of fragments to purify and identify rare isotope beams sufficiently for study. The Advanced Rare Isotope Separator (ARIS) at FRIB achieves accurate particle identification and determines the rate, purity, and energy of the isotopes within each beam. One approach is to use gamma-ray spectroscopy. Gamma-ray transitions emitted from isomeric states enable unambiguous isotope identification. At the focal plane of ARIS, isotopes are stopped in an implant detector, and coincident gamma-rays are measured with a single-crystal germanium detector. A new germanium detector was recently commissioned and characterized using Geant4 simulations to model detector geometry, optimize experimental configurations, and study gamma-ray interactions within the detection system. In this work, simulation parameters are varied, detector response is fully characterized, the accuracy and efficiency of measurements are improved, and systematic effects are better understood. These improvements will allow for the reliable quantification of isomeric and ground-state populations within the beam.

MICROSTRUCTURAL ANALYSIS OF WINTER GLOVES USING SEM AND EDS
Presenter(s): Sasha Chip
Category: Physical Sciences
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Winter gloves have been around since ancient Egyptian times, serving as protection against harsh environmental conditions. Although the design is standard, modern gloves vary in performance, which raises the question of what determines the most effective product. This research study will analyze several types of gloves, including water resistant and thermal insulated gloves. The composition and microstructure were examined by Scanning Electron Microscopy (SEM) along with Energy Dispersive Spectroscopy (EDS). These methods are expected to reveal how material composition and fiber structure affect overall performance in water resistance and heat retention.

CALIBRATION OF A HIGH-PURITY GERMANIUM DETECTOR FOR GAMMA-RAY SPECTROSCOPY IN TYPE I X-RAY BURST REACTION STUDIES
Presenter(s): Hang Su
Category: Physical Sciences
Mentor(s): Christopher Wrede (College of Natural Science)

Germanium detectors are widely used in nuclear physics experiments for their excellent energy resolution in gamma-ray spectroscopy. In this experiment, the germanium detector array DeGAi was used to measure the gamma-ray energy spectrum associated with 20Mg beta decay as part of an experiment to determine the alpha-particle branching ratio of an astrophysically important nuclear excited state in 19Ne. The extracted branching ratio contributes to a more accurate determination of the 15O(alpha,gamma)19Ne reaction rate, which will serve as an input parameter for hydrodynamic models of Type-I X-ray Bursts on accreting neutron stars. These models are used to predict the resulting burst light curves and improve our understanding of nuclear processes in extreme astrophysical environments. Accurate calibration of the detector system is a critical step in obtaining reliable gamma-ray intensity measurements. To achieve this, standard gamma-ray calibration sources, including 60Co and 152Eu, were used due to their well-known gamma-ray energies and emission intensities. In this project, the calibration data was analyzed resulting in the construction of an efficiency curve for each detector crystal across a wide energy range. In addition to experimental calibration, Monte-Carlo simulations were performed in a separate but complementary project to model the detector response and geometry. The simulated spectra were compared with the measured detector data to validate the accuracy of the simulations so they can be applied to the specific gamma rays measured in 20Mg decay. This combined experimental and computational approach ensures a well-characterized detector system and improves the accuracy of the extracted gamma-ray intensities extracted.

SCORPIONATES: HARNESSING RADIATION FOR THE FUTURE
Presenter(s): Tommy Martin
Category: Physical Sciences
Mentor(s): Alyssa Gaiser (Facility for Rare Isotope Beams), Julia Kraft (College of Natural Science)

Scorpionates are boro-imidazole ligands that are used to crystallize various types of metals. This study goes in-depth on multiple synthesis procedures as well as applications. Radiochemical applications are a major interest due to scorpionates simplifying the separation and extraction process of lanthanide and actinide series metals for use in lab. Scorpionates coordinated with lanthanide and actinide metals are able to be crystallized, marking a breakthrough in a radioactive metal crystallization.

DEVELOPMENT OF SOLID HARVESTING METHODOLOGY FOR ZN-62 AT FRIB FOR APPLICATIONS IN RADIOPHARMACY
Presenter(s): Alexa Annika Calderon, Vaughn House
Category: Physical Sciences
Mentor(s): Ferris Bissen (College of Natural Science), Katharina Domnanich (Facility for Rare Isotope Beams)

The Isotope Harvesting Program at the Facility for Rare Isotope Beams (FRIB) captures radionuclides produced as byproducts during linear accelerator operations. This process provides researchers with access to radioisotopes that are otherwise difficult to obtain through conventional production methods, enabling expanded production of radionuclides which are applicable across multiple research areas. Harvested isotopes can achieve high isotopic purity, which is suitable for radiopharmaceutical development, including Positron Emission Tomography (PET) imaging. Solid isotope harvesting at FRIB employs a series of metal foils positioned to intercept a purified fragment beam containing the radionuclide of interest. These foils capture the desired radionuclide, enabling targeted investigation of specific isotopes after separation from its carrier foil. This project investigates the development of a solid-harvesting methodology for Zn-62 (t_ = 9.2 h), a promising radionuclide for PET imaging applications. A primary Zn-64 beam was fragmented and separated to produce Zn-62, which was subsequently collected on copper foils. The foils were dissolved in hydrochloric acid, and Zn-62 was separated from copper impurities using anion exchange chromatography, yielding a product with high specific activity. To evaluate radiolabeling performance, DOTA and NOTA chelators were complexed with Zn-62. Chelation efficiency was assessed using thin-layer chromatography. Results demonstrated greater binding affinity for NOTA-based chelation, suggesting improved stability for potential PET imaging applications. These findings support the continued development of Zn-62 based radiopharmaceuticals and establish a methodological foundation for solid-harvesting isotope production at FRIB.

GEOMETRIC OPTIMIZATION OF HIGH-TEMPERATURE EFFUSION SYSTEMS FOR SHORT-LIVED ISOTOPES
Presenter(s): Guilherme Roda
Category: Physical Sciences
Mentor(s): Antonio Camargo Villari (Facility for Rare Isotope Beams)

Effusive transport strongly influences the extraction efficiency of short-lived isotopes in high-temperature solid-stopper ion-source systems. In the SOL project at the Facility for Rare Isotope Beams (FRIB), neutral atoms released from a heated stopper must travel through a transfer tube and reach an ion source before radioactive decay occurs. In this work, we investigate the influence of system geometry and surface interactions on the effusion efficiency using test-particle Monte Carlo simulations performed with MolFlow+ under molecular-flow conditions. Cylindrical and conical diffusion chambers with equal volume were compared while systematically varying the radius of the transfer tube. The simulations provide estimates of the mean delay time and the average number of particle-wall collisions for isotopes with half-lives between 0.25 and 10 s at a temperature of 2000 K. The results show that the transport dynamics are primarily governed by the radius of the transfer tube, while the detailed chamber geometry has little impact on the global transport properties. A linearly expanding tube geometry was

also investigated and yields intermediate transport behavior between narrow and wide constant-radius tubes. By combining simulated flight times with adsorption data, effusion efficiencies were estimated for representative tracers in a tantalum matrix. The results demonstrate that adsorption properties strongly influence the achievable efficiency, with predicted efficiencies ranging from below 1% for strongly adsorbing species to above 90% for weakly adsorbing tracers at favorable geometries. These results provide guidance for optimizing high-temperature effusion systems for rare-isotope production.

DETERMINING THE EFFECTIVENESS OF METAL CORROSION TREATMENT THROUGH SEM AND EDS
Presenter(s): Mohannad Al-Ostaz
Category: Physical Sciences
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Metal corrosion presents a significant obstacle within design, providing a threat to the integrity and longevity of machinery. Multiple means of treatment have emerged as time has passed providing a way to remove corrosion, but what do these treatments actually do to metal? This project aims to investigate compositional and topographical changes within selected metals as they corrode and how different treatment plans affect metal. This is achieved through various Scanning Electron Microscopy (SEM) and Energy Dispersion Spectroscopy (EDS) images taken of the metal throughout the corrosion process and after treatment. Revealing various changes that occur before and after being treated allowing for the effectiveness of the selected treatment plans to be determined.

OPTIMIZING POISSON-EQUATION SOLVER FOR NUCLEAR COLLISION SIMULATIONS USING FFT
Presenter(s): Zach Nolff
Category: Physical Sciences
Mentor(s): Pawel Danielewicz (College of Natural Science)

Nuclear collisions happen on incredibly small time scales, leaving experimenters with the before and after of a collision, and no information about what happened during the collision. In order to do meaningful science, we seek to develop models that not only explain established experimental results, but also make testable predictions. Nuclear collisions done at FRIB rely heavily on transport theories which are used to develop simulations that allow comparison between experiment and theory. This research focuses on a small aspect of those simulations concerned with solving Poisson's equation for electrostatic potential at each time step of the collision process. Here, we solve Poisson's equation using a Fast Fourier Transform approach applied to the integral of charge density times Green's function over all space. By storing charge density and Green's function in arrays, we can invoke the convolution theorem to solve the integral much faster than by brute force. Despite the incredible speed, FFT convolution assumes periodic boundary conditions rather than the true free space boundary conditions. A new source of error that must be dealt with is contributions to the potential from infinite imaginary copies of the computational domain in each direction. Since potential goes as 1/r, this contribution is small, but can be drastically reduced by embedding the charge in a larger box with no charge density.

Green's function array can be built on this larger grid and the same convolution can be performed, but only the physical region will be extracted at the end.

THE EFFECT OF PARTICLE RESOLUTION ON DEBRIS OUTCOMES IN TERRESTRIAL PLANET FORMATION SIMULATIONS
Presenter(s): Mark Pais
Category: Physical Sciences
Mentor(s): Seth Jacobson (College of Natural Science)

Many terrestrial planet formation models exist that are able to produce solar system analogs with accurate planet masses and orbital configurations, but they often represent collisions between planetary embryos, which are large growing bodies roughly the size of the Moon to Mars, in an unrealistic way. Previous works often assume that all collisions conserve mass and momentum, merging bodies into a single remnant and neglecting the possibility of debris production. In the limited number of studies that include debris, it is often represented with too few, overly massive particles, making it difficult to accurately follow its long term evolution. However, impact generated debris can influence dynamical evolution, redistribute mass, and leave potentially observable signatures within the solar system. Understanding what happens to this debris is therefore important for building a more physically accurate picture of terrestrial planet formation. In this work, I explore a range of debris particle resolutions using the N body integrator SyMBA with a sophisticated collision model that generates and tracks impact debris. By systematically increasing the number of debris particles produced per collision, I determine the resolution at which the evolution of debris converges and becomes sufficiently resolved to support reliable claims about its dynamical behavior during terrestrial planet formation. By identifying the resolution required to accurately capture debris evolution, this work improves how giant impacts are modeled in terrestrial planet formation simulations and provides stronger constraints on the role of impact generated debris in shaping emerging planetary systems.

DYNAMICAL INSTABILITIES AND PLANETARY ENGULFMENT IN EXTRASOLAR SYSTEMS
Presenter(s): Evelyn Meyersieck
Category: Physical Sciences
Mentor(s): Seth Jacobson (College of Natural Science)

Young planetary systems are often dynamically unstable, resulting in ejections, planetary collisions, and planetary engulfment by the host star. During engulfment, the planet is destroyed and its constituent atoms are mixed into the stellar atmosphere, potentially leaving detectable chemical signatures, most notably Lithium which otherwise has typically been depleted earlier in stellar evolution. Understanding the frequency and conditions under which these events occur gives insight on observed stellar chemical abundance and system history. Using the Rebound astrophysical N-body integrator, we simulate the dynamics of formed planetary systems prior to, during, and after numerical instability. Our experiments vary the fundamental parameters describing the initial planetary architectures as a primary independent variable. We monitor the progress and final outcomes to track the evolution of surviving planets and

identify engulfment events and their properties. These results will provide a statistical study of the history of engulfment across planetary systems and quantitative results to a hypothesis that is qualitatively well established: that instabilities in planetary systems can leave traceable chemical signatures within the host star. Investigating how dynamical instabilities among forming extrasolar planets inject material into the host star will give a new lens to study internal planet composition, whose material is otherwise inaccessible once destroyed and dispersed within the host star during engulfment.

PLANETESIMAL FORMATION FROM PEBBLE CLOUD COLLAPSE: EFFECTS OF ROTATION AND SIZE DISTRIBUTION
Presenter(s): Vaibhav Chhajed
Category: Physical Sciences
Mentor(s): Jackson Barnes (College of Natural Science), Seth Jacobson (College of Natural Science)

Planetesimals, the building blocks of planets, form from the gravitational collapse of pebble clouds in protoplanetary disks. This project investigates how the initial size distribution and rotation rate of these pebble clouds influence the physical properties of the resulting planetesimals, such as their shapes, densities, and tendency to form binary systems. Using the N-body simulation code PKDGRAV with self-gravity and soft sphere discrete element method (SSDEM), we simulate both monodisperse and polydisperse pebble clouds under varying rotational conditions. Our results show that monodisperse clouds tend to form more compact, spherical, and denser bodies, while polydisperse clouds lead to more irregular and less dense planetesimals due to internal packing variation. Additionally, faster rotation favors binary formation and body flattening, while slower spin rates promote more spheroidal shapes. These findings provide new insights into early planet formation and may help explain the observed properties of asteroids and Kuiper Belt objects. This research was conducted under the guidance of Dr. Seth Jacobson and Jackson Barnes.

SEM SPIDER SILK MICROSTRUCTURES
Presenter(s): Josh Petkoff
Category: Physical Sciences
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Relative to their size, spiderwebs are known for being very strong and structurally sound. In order to better understand how spiderwebs can withstand so much force, they will be compared to the structure of silk fibers. With the help of the Scanning Electron Microscope, both a spiderweb and a silk fiber will be compared on a structural level. The differences between the two will then be examined, so that the structural components that make the spiderweb so much stronger can be identified. Once the results from the microscope are revealed, I will look for differences between the web and the silk. I will then look for previous findings that can help me better explain the causes of the strength disparity between the two fibers.

PHYSICAL AND DYNAMICAL PROPERTIES OF BINARY ASTEROID POPULATIONS
Presenter(s): Purvi Garg
Category: Physical Sciences
Mentor(s): Seth Jacobson (College of Natural Science)

My research focuses on the angular momentum properties and dynamical evolution of binary asteroid systems. Binary asteroids are pairs of small bodies that orbit each other and provide important constraints on the internal structure and formation processes of asteroids. In this work, I compile a reproducible dataset of known binary asteroid systems and compute their total angular momentum, including both orbital and rotational components. Angular momentum is a key conserved quantity that governs binary formation through rotational fission and controls the subsequent orbital and spin evolution of these systems. Specifically, my research examines population-level trends in angular momentum and compares them with theoretical predictions from rotational fission and binary evolution models. This work aims to connect theoretical models of binary asteroid formation with observational data and improve constraints on the physical properties and evolutionary pathways of small-body systems in the solar system.

SYSTEMATIC ANALYSIS OF QUADRUPOLE-OCTUPOLE VIBRATIONS IN XENON AND BARIUM ISOTOPIC CHAINS
Presenter(s): Henry Martin
Category: Physical Sciences
Mentor(s): Vladimir Zelevinsky (College of Natural Science)

The systematics of low-lying octupole collectivity in even-even nuclei provide an excellent method for analyzing quadrupole-octupole coupling and shell effects in medium-mass systems. This work investigates the evolution of the lowest octupole excitation energy and the corresponding electric octupole transition strength in the xenon (Z = 54) and barium (Z=56) isotopic chains. Using the phenomenological framework developed by Metlay et. al. 1995 and Mueller et. al. 2006, a model of octupole excitation energy and electric octupole transition strength using a small number of global parameters was produced, including proximity to the neutron shell closure at N = 82. The examination indicates a weakening of octupole collectivity with increasing neutron number. The researchers posit that this is driven mainly by reduced quadrupole softness and shell-closure effects, especially as one approaches full closure at N = 82. Comparisons between the Xe and Ba chains provide some insight into the role of the proton number in enhancing octupole transition strengths, but more experimental characterizations of Ba isotopes need to be conducted before a definitive statement can be made. These results show that the systematics of octupole excitations in Xe and Ba isotopes can be understood as a consequence of collective quadrupole-octupole coupling, while being somewhat affected by shell structure. The results provide a framework for interpreting octupole collectivity in the medium-mass region and a starting place for further research.

USING MARTIAN REGOLITH ANALOGUES FOR RESEARCHING AGRICULTURE ON MARS
Presenter(s): John Eichholz
Category: Physical Sciences
Mentor(s): Michael Velbel (College of Natural Science)

Space exploration has entered a period of accelerated expansion, with plans for humans to land on Mars as soon as the 2030s. However, solid plans for cultivating plants on Martian soil for long-term human settlement have not been made. Using Mars regolith analogues and existing research into Martian regolith from past rover missions, this project investigates the potential of Martian regolith for long-term agriculture. By chemically analyzing samples of Martian regolith for elements typically used in fertilizer (such as N, P, K) and elements that could harm crop production, the possibility of Martian agriculture can be better understood and plans can be made to fix discrepancies in Martian regolith to increase fertility. Using analogues from Earth can expedite this research and be used to develop methods for use on real Martian soil. This research is being done in preparation for the Martian Moons eXploration (MMX) sample return mission conducted by Japan Aerospace Exploration Agency, in which physical samples from the Martian moon Phobos will be collected and returned for detailed analysis in labs on Earth. These samples are valuable as current theories suggest Phobos contains Martian regolith, either through the accumulation of material ejected from Mars due to meteorite impacts or the formation of Phobos from ejected material entirely after a massive impact. The MMX mission could be the first successful sample return of Martian regolith. Using this sample, the practicality of in-situ resource utilization for agriculture in Martian soil will be determined.

FROM ATOMS TO STARS: THE NUCLEAR HEART OF THE COSMOS
Presenter(s): Suzanna VanDop
Category: Physical Sciences
Mentor(s): Grigor Sargsyan (Facility for Rare Isotope Beams)

The synthesis of elements in stars depends strongly on the structure of atomic nuclei and the nuclear reactions that occur in astrophysical environments. Isotopes of magnesium and aluminum contribute to nuclear reactions that influence the abundance of elements in stars. In this project, we investigate the nuclear structure of 26Mg and 27Al using shell model calculations to study their energy levels and angular momentum configurations. The predicted energy spectra are then used to simulate nuclear reactions that happen in stellar environments. By comparing our theoretical predictions with the available experimental data, we evaluate the accuracy of the shell model and apply it to energies far beyond the current experimental capabilities. This, in turn, allows us to refine our understanding of the nuclear processes that drive stellar nucleosynthesis. This work was conducted at the Facility for Rare Isotope Beams (FRIB), and calculations were performed using a state-of-the-art shell model code on high-performance supercomputers at MSU's Institute for Cyber-Enabled Research (ICER).

IMPLEMENTATION OF SHIELDING TUBE INTO THE ACTIVE TARGET TIME PROJECTION CHAMBER
Presenter(s): Claire Ardelean
Category: Physical Sciences
Mentor(s): Wolfgang Mittig (Facility for Rare Isotope Beams)

For two years I have been designing, constructing, testing, and implementing a shielded gas holding tube that is implemented into the beam line at the Facility for Rare Isotope Beams. The tube is useful to our ATTPC (Active Target Time Projection Chamber) group as we use extremely expensive gasses in our experiments. The tube allows us to fill a small volume with the expensive gas while shielding the beam going through the tube from the surrounding magnetic field.

MODELLING THE PERTURBATION OF THE CONTINENTAL GEOTHERM DURING THE BREAKUP OF PANGEA (SOUTH ATLANTIC).
Presenter(s): Peter Mastriano
Category: Physical Sciences
Mentor(s): Tyrone Rooney (College of Natural Science)

The breakup of Pangea in the South Atlantic coincided with continental rifting and eruption of the Paraná-Etendeka flood basalt province ca. 134-132 Ma. The combined forces of an ascending mantle plume and continental rift thinned the continental lithosphere, with implications for the regional geotherm. Modeled lithospheric geothermal perturbations during rifting can evaluate plume-driven versus plate-driven thinning mechanisms. Using a 1-D advection-diffusion model, we calculate melt generation as a function of lithospheric thinning rates from GPlates reconstructions of South Atlantic rifting. Unlike previous studies using Gaussian functions to approximate extension rates, our approach directly incorporates plate velocities from kinematic reconstructions (Heine et al., 2013). We test the model across multiple mantle potential temperatures using petrological constraints from Thompson et al. (2001). Testing temperatures of 1400-1600°C shows plausible melt thicknesses compared to regional magmatic stratigraphy. Critically, at temperatures below 1400°C, plate-driven simulations do not match observed melt generation. These results support a mantle plume's role in South Atlantic breakup, with implications for post-rift magmatic sequences found offshore as seaward dipping reflectors. Future work will examine implications for magma thickness calculations from seismic studies along the margin.

TOWARDS THE TOTAL SYNTHESIS OF (+)-NAPYRADIOMYCIN A1
Presenter(s): Matthew Ochoa
Category: Physical Sciences
Mentor(s): Babak Borhan (College of Natural Science)

(+)-Napyradiomycin A1 has been identified as a potent antibiotic and anticancer agent but remains a challenging synthetic target due to the presence of chiral halogenated centers. The first total synthesis of racemic (±)-Napyradiomycin A1 was completed in 2002, achieving a 6% yield over a longest linear sequence of 16 steps. The first enantioselective total synthesis was reported seven years later for (−)-

Napyradiomycin A1, delivering a total yield of 1.3 mg over 15 steps. However, (+)-Napyradiomycin A1 has remained an elusive target, with the only enantioselective synthesis accomplished through a bioenzymatic pathway. The specific goal of this project is to develop a gram-scale synthesis of (+)-Napyradiomycin A1. The forward synthesis highlights the synthetic utility of an asymmetric halo-functionalization previously explored to access a key intermediate and a known natural product. Efforts toward the total synthesis reveal two challenges addressed herein: achieving a high enantiomeric ratio in the key chloro-etherification step and overcoming a costly stereospecific allylation. Through the use of low-melting point solvent systems such as acetone/HFIP, an enantiomeric ratio of 92:8 has been achieved. Additionally, a recycling pathway for the stereospecific allylation returns a key intermediate, increasing the overall efficiency of the forward synthesis. Future work aims to establish a key cross-metathesis step to install the geranyl side chain present in the natural product.

THAT'S METAL: A NEW MOON-FORMATION MODEL USING NUMERICAL SIMULATIONS
Presenter(s): Hung Nguyen
Category: Physical Sciences
Mentor(s): Seth Jacobson (College of Natural Science)

The canonical theory of lunar formation posits that the Moon formed following an impact event between a Mars-sized body called Theia and the Proto-Earth. This event caused mantle material from the Proto-Earth to be ejected and mixed with material from Theia, forming a protolunar disk (PLD). The Moon's small core size of ~0.02 lunar masses makes it difficult to simultaneously reconcile the compositions of present-day Earth and Moon, and the pressure-temperature regimes of lunar accretion. we model N-body astrophysical accretion and core-mantle differentiation to explore the viable phase space of scenarios for the formation of the Moon. Particularly, we are testing to determine the contributions of Theia mantle and core to the PLD. We test a variety of viable Theia mantle and core compositions and fractions and explore its implications for the composition of the forming Moon. Results from our summer work have shown that it is impossible to simultaneously recreate the lunar core size and the mantle abundances if the PLD is composed only of bulk-silicate Earth composition as the cores tended to be too massive. However, if the Moon accreted from a metallic remnant from Theia impactor embedded inside the disk, it is possible to form the Moon. Thus, instead of building the Moon from just Earth material, we start with a small metal component and add material onward. Simulations of this scenario have shown success in reproducing the Moon's abundance of iron, silicate, and core mass.

ANALYZE DIFFERENT STRING (POLY, NATURAL GUT, ECT.) AND COMPARE
Presenter(s): Shawn Coyle
Category: Physical Sciences
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Picking the right type of tennis string is essential to every player's game. Some differences include durability, power, spin, and control. Although the difference between the strings is minimal, what causes

these differences? My project will cover 5 different types of string, including natural gut, multifilament, synthetic gut, polyester, and kevlar, and I will be examining them by Scanning Electron Microscopy (SEM). I am hoping to find some key differences between the string types and connecting my results to real world scenarios.

THEORETICAL LIGHT-MOLECULE INTERACTIONS IN OPTICAL CAVITIES
Presenter(s): Bera Ayyildiz
Category: Physical Sciences
Mentor(s): Angela Wilson (College of Natural Science), Jared Weidman (College of Natural Science)

Optical cavities consist of two reflective surfaces separated by micrometers or nanometers. These devices create small volumes where light is confined with a tunable frequency. When a molecule is introduced into the cavity, the frequency of the light can be tuned to resonate with a molecular transition, producing a hybrid light-matter state known as a polariton. Polaritons have opened up novel routes for controlling chemical reactions using light. Optical cavities have also gained popularity due to their numerous applications in quantum sensing, quantum computing, and quantum networking. However, the mechanisms underlying the light-matter interactions in these systems remain elusive; thus, it is important to develop theoretical characterizations of such processes. In this project, theoretical simulations of molecules in cavities were performed. The implications of system properties, such as coupling strength and basis set size were considered. The results of this work will help design coupled molecule-cavity systems for applications in polaritonic chemistry and quantum information science.

GENERATING SIMULATED GAMMA RAY EFFICIENCY CURVES FOR FRIB EXPERIMENT E25058
Presenter(s): Abhishek Vilekar
Category: Physical Sciences
Mentor(s): Christopher Wrede (College of Natural Science)

A neutron star, a dead remnant of a massive star, can be formed in a closely a bound orbit with companion star enabling the neutron star to siphon fresh nuclear fuel. This creates an accretion disk around the neutron star, causing hydrogen to build up on its surface to a critical limit resulting in a thermonuclear explosion releasing X-rays called a Type I X-ray burst. Our experiment at FRIB E25058, aims to determine the reaction rate of the 15O(alpha,gamma)19Ne reaction which significantly affects the X-ray light curve, a plot showing the intensity of X-rays over time. To study this reaction, the beta decay of 20Mg into 20Na followed by proton emission to 19Ne is measured to determine the alpha particle branching ratio; this is the fraction of nuclei that emit an alpha particle. Standard radioactive sources of Cobalt-60 and Europium-152 are used to calibrate the gamma-ray detectors by using the known gamma-ray energies. The present work is about simulating the efficiency vs. energy plots using GEANT 4, a software in C++ that simulates how particles propagate through matter, which will be validated by comparing to the data from the calibrations.

PROGRESS IN THE SEARCH FOR TIME -REVERSAL VIOLATION IN PEAR SHAPED NUCLEI
Presenter(s): Skylar Milne
Category: Physical Sciences
Mentor(s): Jaideep Singh (Facility for Rare Isotope Beams)

The existence of the visible part of the universe is thought to be due to subatomic forces unlike each other when you reverse the arrow of time. The Radium Electric Dipole Moment experiment, hosted at Argonne National Lab, is designed to search for these exotic subatomic forces using atomic clocks. A time-reversal violation is indicated by a difference in two atomic clocks oriented clockwise and counterclockwise with respect to an electric field. Radium nuclei are used as these clocks because of their pear-shaped deformations, allowing for a clock rate difference possibly one thousand times that of non-deformed nuclei. The clock rate difference is proportional to the electric field magnitude. To reduce false signals and enable a control experiment insensitive to exotic forces, our apparatus must reverse the electric field orientation. We measure differences in four combinations: each clock faces a different direction and the electric field is switched from up to down. During this switch, the high voltage must be off. Once the electric field direction has flipped, it must be turned back on. This is done with a Solid State Relay (SSR), where the high voltage is applied. A connected computer signal controls and turns off the electric field. The SSR, along with other necessary elements, is housed in an interface box we are designing, fabricating, and testing. This work is supported the U.S. DOE, Office of Science, Office of Nuclear Physics, under contracts DE-AC02-06CH11357 and DE-SC0019455 and DE-SC0025679.

FINDING YOUNG HOT JUPITERS IN TESS DATA
Presenter(s): Ryan Groneck
Category: Physical Sciences
Mentor(s): Adina Feinstein (College of Natural Science)

Despite the hundreds of known giant extrasolar planets (exoplanets) discovered on short orbital periods, their formation mechanism is still poorly understood. This population of planets, known as Hot Jupiters (HJs), are believed to form far from their host star and migrate in, however the timescales of these processes is unconstrained. By detecting and characterizing HJs across a range of ages from 1 Myr - 1 Gyr, we can constrain the formation and migration timelines of these planets. I am the lead developer of a Python-based pipeline that integrates several existing tools to systematically search for and validate new HJ candidates. To do this, I am using observations from NASA's Transiting Exoplanet Survey Satellite (TESS), which provides high-cadence photometry for millions of stars. To quantify the detection efficiency of my pipeline, I perform injection-recovery tests, where synthetic exoplanet transits are added to real light curve data and then recovered by the pipeline. My preliminary results suggest I will be able to detect ~90% of all HJs with radii greater than 0.8 Jupiter radii and periods under 15 days. Whether or not we detect HJs around young stars, the results will provide important insights into the timing and mechanisms of gas giant formation and migration

UGS HONORS: EXPERIMENTAL NUCLEAR STRUCTURE DATA COMPILATION
Presenter(s): Mathew Borlace
Category: Physical Sciences
Mentor(s): Jun Chen (Facility for Rare Isotope Beams)

Worked closely with Dr. Jun Chen at the FRIB to analyze scientific papers and compile data into the XUNDL Database to provide useful information for both further research and data evaluations that will deliver lasting impact towards future endeavors.

QUANTITATIVELY DETERMINING THE EVOLUTIONARY TIMELINE OF MARS THROUGH MARS SAMPLE RETURN MISSION AND CRATER CHRONOLOGY
Presenter(s): Eva Sanchez
Category: Physical Sciences
Mentor(s): Michael Velbel (College of Natural Science)

This project proposes to determine a more precise evolutionary timeline for Mars by combining laboratory analysis of returned Martian rock samples with observations of impact craters on the planet's surface. Understanding when major geological events occurred on Mars is essential for reconstructing its history, including volcanic activity, surface water, and potential habitability. The Mars Sample Return mission offers a unique opportunity to measure the ages of carefully selected rocks using well established dating technology on Earth. By combining sample analysis with remote sensing data, this research will contribute to a clearer picture of how Mars evolved from its early history to how the planet is now, while presenting it in a way that is accessible to non-scientists and scientists alike.

DATA-DRIVEN RECONSTRUCTION OF TRANSIENT LATTICE DYNAMICS IN VO2 USING PHYSICS-INFORMED DEEP LEARNING
Presenter(s): Tri Duc Nguyen
Category: Physical Sciences
Mentor(s): Chong-Yu Ruan (College of Natural Science)

Deep learning is increasingly applied to ultrafast diffraction and pump-probe experiments, where time-resolved measurements encode complex underlying physics. Leveraging these correlations through physics-informed architectures enables data-driven discovery of transient states. We present an iterative physics-informed deep learning framework for ultrafast electron diffraction (UED) studies of the photoinduced phase transition in VO?, addressing the long-standing inverse problem of retrieving transient structures from incomplete, noisy data. The CNN-LSTM Encoder-Decoder model integrates convolutional layers with LSTM units for temporal correlations, yielding phase fraction dynamics and reconstructed Bragg peak intensities. An outer refinement loop couples retrieved phase fractions with lattice constants optimized from peak positions, minimizing a shared loss to capture how lattice distortions alter stacking and symmetry. The model recovers the transient polaronic phase fraction within 3% error and bridges UED structural shifts with optical dynamics. By exploring latent-space

trajectories, it achieves robust inverse mapping of diffraction data to nonequilibrium coordinates, offering quantitative access to metastable phases in correlated materials.

SIMULATING EFFECTS OF LUNAR FLYBY EVENTS WITH SYMBA
Presenter(s): Madeline Edmondston
Category: Physical Sciences
Mentor(s): Seth Jacobson (College of Natural Science)

Lunar flyby events involve relatively small celestial bodies that influence planet-moon systems, and it is important to study these events in order to understand the extreme, high-energy impact required by the giant impact hypothesis with observationally similar compositions of the Earth and Moon. I conduct my research using an N-body integrator called the Symplectic Massive Body Algorithm (SyMBA.) SyMBA has previously been used for numerical simulations of giant impacts and the resulting formation of the Earth-Moon system. In this project, I aim to refine a few of SyMBA's most important integrators for more accessibility and readability. Before getting acquainted with SyMBA, I conducted experiments with Python scripts to better understand the algorithm and simulate a range of flyby masses/velocities/impact parameters. After the refinement of SyMBA's tools, I will then conduct experiments in tandem with the ICER supercomputer to simulate lunar flyby events with real data and plan to analyze effects on orbital stability and system evolution.

SYNTHESIS OF PHOTOACTIVATABLE SINGLE CHAIN POLYMERIC NANOPARTICLES FOR ENHANCED CATALYSIS
Presenter(s): Joey Paras
Category: Physical Sciences
Mentor(s): Melanie Chiu (College of Natural Science)

Formed from linear polymer chain precursors' intramolecular collapse, single-chain polymeric nanoparticles (SCNPs) have shown potential as effective catalysts due to their collapse forming potent and selective microenvironments similar to enzymes alongside the incorporation of transition metal centers. These catalysts are easily recoverable and have been demonstrated to retain their catalytic ability between uses like heterogeneous catalysts, though they do not lose homogeneity. However, attempting to incorporate transition metals into SCNPs often results in coordinatively saturated centers that are catalytically inactive, severely limiting their ability to catalyze a majority of transformations. To address this issue, we propose the synthesis of an SCNP containing metal-carbonyl complexes that can be photoactivated through the dissociation of the carbonyl ligands after incorporation. Our synthetic approach includes the generation of cross-linking and metal-binding monomers; polymerization of these monomers via a controlled radical method; induced collapse via dimerization of cross-linking monomers; and the incorporation of metal-carbonyl complexes. Thus far, we have successfully synthesized both monomers and begun evaluation of polymerization methods. Upon completion of its synthesis, the SCNP will be tested for its ability to be photoactivated as well as demonstrate selectivity against various chemical transformations. Successfully synthesizing a photoactivatable SCNP able to perform as a

selective and recyclable catalyst would further progress toward not only replicating the impressive catalytic properties of enzymes but also toward improving the sustainability of organometallic synthesis in line with green chemistry principles.

HYDRATION OF MARS LAM ANALOG IN RELATION TO FUTURE MARS MISSION ROSALIND FRANKLIN ROVER
Presenter(s): Daniel Panis, Noshad Ammad, Saman Ataei
Category: Physical Sciences
Mentor(s): Michael Velbel (College of Natural Science)

ESA's Rosalind Franklin Rover is a future Mars mission set to launch in 2028, whose primary objective is to search for evidence of life on Mars. Investigating the presence of water and hydrated minerals in regolith or subsurface samples can be used to understand potential past environments in which life may have lived and provide implications for habitability. To prepare for Mars missions, Mars regolith analogs can be used to practice mission objectives and instruments prior to launch. Regolith is a layer of loose, fragmented material that sits on top of the rock surface. Mars regolith analogs are natural earth materials that mimic the physical and chemical characteristics of regolith found on Mars. In this poster, we will be investigating the use of Mars LAM analog regolith in aiding in the rover's objective of the search for evidence of life through the presence of water and indications of hydrated minerals. Individual LAM regolith analog grains were observed under Energy Dispersive Spectroscopy (EDS) to give spectra detailing their elemental composition. By analyzing EDS spectra for elements often present in hydrated minerals, inferences were made about the overall hydration of the analog sample. Our results indicated minimal usefulness of the analog for the mission's objective as limited clay and salt minerals were present from the grains analyzed. Our research will aid in the preparation of Rosalind Franklin Rover mission by contributing to our understanding of the conditions and/or materials the rover may encounter following landing.

FORECASTING HOUSEHOLD ELECTRICITY COSTS IN UGANDA
Presenter(s): Ethan Tyaba Kigundu
Category: Physical Sciences
Mentor(s): Gee Lee (College of Natural Science)

This project forecasts household electricity costs in Uganda. As a work in progress, the eventual goal is to compare the stochastic present value of a solar panel installation with the current and forecasted on grid electricity rates for an individual in Uganda. The goal of this research is to determine whether solar generated electricity is a viable alternative to current energy sources in Uganda. Rather than inheriting the costly burden of transitioning away from fossil-fuel-dependent systems, Uganda can build its energy grid from the ground up around renewable technology. If solar power proves a viable solution, strategic investment in solar infrastructure could not only deliver a cleaner, more sustainable energy future for Ugandans, but position the country ahead of more developed nations still locked into legacy systems.

To predict future electricity costs, rates were modelled using a lognormal random walk based on the consumer price index. The model was based on data from 2014 to 2026.

DETECTING X-RAY FILAMENTS IN THE GALACTIC CENTER BY ADAPTING RIDGE DETECTION FILTERS
Presenter(s): Aleksandr Skorkin
Category: Physical Sciences
Mentor(s): Shuo Zhang (College of Natural Science)

The center of the Milky Way is a diverse and violent environment, full of high-energy phenomena like flares from the supermassive black hole Sgr A* and supernova remnants. Within this dense region exists a population of thin, elongated structures called Galactic Center filaments. First discovered in radio and later in X-rays, the origin of these filaments remains an active area of study. While they may provide clues to the magnetic environment and the high-energy processes occurring in the region, they are difficult to study due to the abundance of point sources and non-uniform background. Previous studies mostly relied on manual visual inspection of the data, which motivated us to develop an automatic filament detection pipeline. This study, contributing to a broader effort, focuses on adapting ridge detection image processing techniques to identify and recover filaments in X-ray data. Using observational data from the Chandra X-ray Observatory, I developed and tested a pipeline, based on adapting the Frangi ridge detection filter, originally developed to detect vessel-like structures in medical images, to an astronomical context. This method highlights elongated structures while suppressing blob-like point sources and smoothing the background. In this presentation, I will show how each step of the pipeline affects the data, detection results, comparisons between filter variants, and patterns observed. The preliminary results show that this approach can successfully recover many known filaments and identify new candidates. Once further refined, the pipeline will be used for future analysis of the Galactic Center filaments.

Physiology

USING CHEMOGENETICS TO MANIPULATE IMMUNE CELL FUNCTION
Presenter(s): Rhianna Ungerman
Category: Physiology
Mentor(s): Sabrina de Souza (College of Natural Science)

Immune cells are essential for physiological and pathological responses. The possibility to artificially control immune cell functions could transform medicine. Designer Receptors Exclusively Activated by Designer Drugs (DREADD) are engineered receptors used to manipulate cell activity via synthetic ligands of living organisms and are activated by the effects of the pharmacological agonist "Agonist 21". The purpose of this study is to measure the effects of chemogenetic manipulation on monocyte and macrophage function. When activated, DREADDs trigger a Gi PCR pathway allowing the Gα subunit to inhibit Adenylyl Cyclase, suppressing intracellular Cyclic Adenosine Monophosphate (cAMP), and the Gβ

and Gγ subunits to directly activate ion channels and influence secondary messengers and transcription factors, ultimately leading to switching immune cells towards anti-inflammatory phenotype. Genetically modified mice are made to contain these receptors and are injected twice with a 1-hour interval. Each trial contains 4-5 mice per group. The control group is injected with Phosphate-Buffered Saline (PBS) both times, the second group is injected with LPS first which triggers an inflammatory response, and the third group with 3mg/kg of A21 (the DREADD activator). Using Quantitative Polymerase Chain Reaction assay, we measure the production of TNF, IL1, IL10, and TgfB genes in each Liver, Spleen, and Brain samples.

MULTIMODAL ASSESSMENT OF THE ESTROUS CYCLE IN GUINEA PIGS USING VAGINAL IMPEDANCE, CYTOLOGY, AND CIRCULATING HORMONES
Presenter(s): Conner Kaminski, Elizabeth Prenkocevic, Faiz Hussain, Tyler Jacobs
Category: Physiology
Mentor(s): Jada Roberts (College of Natural Science), Jason Bazil (College of Osteopathic Medicine)

Accurate estrous cycle staging is essential for reproducibility in reproductive and biomedical research, yet guinea pigs remain underutilized despite their long, human-like cycles and translational relevance. To address this gap, we developed a multimodal staging framework that integrates vaginal cytology, electrical impedance monitoring, and serum hormone profiling to achieve high-resolution characterization of the guinea pig estrous cycle. Across 14 complete cycles, the mean cycle length was 16.05 ± 1.55 days, with diestrus comprising the longest stage (8.38 ± 0.44 days) and estrus the shortest (0.68 ± 0.19 days). Transitional stages exhibited intermediate signatures across modalities. Vaginal impedance values exceeding 6.0 kΩ reliably emerged during the proestrus-estrus-metestrus (PEM) transition, aligning with cytological maturation and peri-ovulatory endocrine profiles. Hormone assays confirmed the expected pattern where estradiol peaked during proestrus, while progesterone rose sharply during metestrus and reached maximal concentrations in diestrus. Together, these findings validate vaginal impedance as a dynamic, noninvasive biomarker of estrous progression in guinea pigs and establish a robust multimodal platform for automated, high-fidelity reproductive monitoring in this translational species.

ADENOSINE SIGNALING MODULATES SUSTAINED NEUROVASCULAR COUPLING IN AWAKE, BEHAVING MICE
Presenter(s): Joslyn Claypool
Category: Physiology
Mentor(s): Qingguang Zhang (College of Human Medicine)

Adenosine is a purinergic neurotransmitter that plays a critical role regulating neuronal activity as well as vascular tone, but its contribution to neurovascular coupling (NVC) is not completely understood. Here, we studied how adenosine regulates brain hemodynamics in unanesthetized, head-fixed mice. Using widefield fluorescence imaging through a polished and reinforced thin-skull window, we simultaneously measured cerebral blood volume, tissue oxygenation, and metabolic signals across the dorsal cortex. In

the somatosensory cortex, voluntary locomotion induced a substantial increase in both cerebral blood volume and brain tissue oxygenation. Blocking adenosine signaling with systemic administration of caffeine (10mg/kg), a non-selective adenosine receptor antagonist, showed no measurable effects on resting-state hemodynamics. To further understand the role of adenosine in NVC, we measured the extracellular adenosine levels using a G protein coupled receptor activation based adenosine sensor (GRABAdo) and fiber photometry. We observed a delayed rise in GRABAdo following locomotion onset, which correlates with the dynamics of locomotion-evoked cerebral blood volume responses. These results indicate that instead of maintaining the basal vascular tone and initiate the vasodilation response to increased neural activity, adenosine contributes to sustaining the vasodilation responses to increased neural activity.

STEROIDS AND MÜLLER CELL FUNCTION: COMPARISON OF CLINICAL VERSUS ENDOGENOUS STEROIDS UNDER HYPERGLYCEMIC CONDITIONS

Presenter(s): Abigail Jager
Category: Physiology
Mentor(s): Brett Trombley (Eli Broad College of Business), Susanne Mohr (College of Natural Science)

Steroid therapy is the primary alternative when anti-VEGF treatment fails in patients with diabetic macular edema (DME). DME exhibits sex-related differences: women show delayed onset, followed by a sharp increase after menopause, suggesting a protective role of endogenous steroids like estrogen. This study examines the protective effects of clinical and endogenous steroids on Müller cell function under hyperglycemic stress. Müller cells were cultured in 5?mM or 25?mM glucose with or without β-estradiol (E2, 5-10?nM), fluocinolone acetonide (FAc, 0.05?ng/mL), or DEHP (50?µM) for up to 96 hours. Cell viability and size were assessed using the DeNovix CellDrop system; mRNA levels were quantified by qPCR. Hyperglycemia increased Müller cell death by 83.6±9.8% (n=5, p=0.0003) and cell diameter by 128.7±23.7% (n=5, p=0.0002). Treatment with E2 (10?nM) or FAc (0.05?ng/mL) significantly reduced hyperglycemia-induced Müller cell death by 46.2?±?5.8% (n=6, p=0.0114) and 78.6?±?6% (n=6, p=0.0468). E2 and FAc prevented hyperglycemia-induced cell swelling by 64.5?±?13.4% (n=6, p<0.0001) and 107±1.1% (n≥6, p=0.0173). DEHP, an endocrine disruptor, reduced the benefits of E2 and FAc by 66.2?±?27.9% and 50?±10.1%. DEHP upregulated interleukin-1β expression (n=3), suggesting enhanced inflammation. DHEA, an endogenous steroid, reduced hyperglycemia-induced cell death by 58?±?7% (n≥4, p=0.00045) and swelling by 67±?6% (n≥4, p=0.0026). Endogenous and clinical steroids protect Müller cells from hyperglycemia-induced dysfunction, while endocrine disruptors exert detrimental effects. These findings should be considered when evaluating reduced responsiveness of patients to steroid therapy of diabetic macular edema.

GLIAL COX2, NEUROPLASTICITY, AND FIBROSIS IN THE POST INFLAMED GUT
Presenter(s): Liana Salazar
Category: Physiology
Mentor(s): Beatriz Thomasi (College of Natural Science), Brian Gulbransen (College of Natural Science)

The main goal of this project is to understand how manipulating glial COX2 could be used to provide therapeutic benefit for colon dysfunction in the resolution phase of colitis in inflammatory bowel disease (IBD). We aim to determine how glial COX2 regulates enteric nervous system (ENS) hyperexcitability and stromal remodeling in the colonic muscularis through PGE2 signaling following acute colitis. We hypothesize that inflammation-driven glial COX2 activity is required to correct ENS maladaptive neuroplasticity and to constrain fibroblast activity. We will combine conditional cell-specific transgenic mice to delete the COX2 gene (Ptgs2) in enteric glia following acute inflammatory event induced by DNBS colitis. This will allow temporal control of glial COX2 during colitis and the ability to assess effects on the ENS and fibroblasts. Outcome measures will include disease activity indices, immunolabeling to assess ENS structure, and calcium imaging to record ENS function. In parallel, we will evaluate the impact of glial COX2 on collagen remodeling through histological staining and RNAscope to detect fibroblast activation. Overall, we will gain knowledge toward the mechanisms that drive neuroplasticity and fibrosis through COX2-PGE2 signaling in the post-inflamed gut. Understanding enteric glial activity during disease, resolution, and remodeling may explain symptom persistence despite mucosal healing and why some IBD patients develop fibrotic complications.

COMPARATIVE ANALYSIS OF COMPUTER VISION APPROACHES FOR PUPIL TRACKING IN MICE
Presenter(s): Jaini Gandhi
Category: Physiology
Mentor(s): Qingguang Zhang (College of Human Medicine)

Pupil diameter is widely used as a non-invasive indicator of internal brain state and reflects neural processes associated with arousal, attention, cognitive effort, and sensory processing. In head-fixed mouse imaging experiments, a widely used model in modern neuroscience, pupil size is typically recorded using a camera while animals perform behavioral tasks. However, reliably extracting pupil size from these recordings remains challenging due to factors such as lighting variability, shadows, reflections, motion blur, and partial eyelid occlusion. Here, we conducted a comparative analysis of multiple classical computer vision approaches used for pupil tracking, including threshold-based segmentation, edge-based ellipse fitting, and symmetry-based detection methods. Each method was assessed based on its ability to accurately determine the pupil location and the pupil size across frames in varying conditions. Building on the observed limitations of individual methods, we further explored a hybrid approach that combines radial symmetry transforms with region-growing segmentation to improve robustness to noise and partial eye occlusion. This work provides a systematic framework for evaluating pupil tracking methods. It will inform the development of more reliable pupil tracking pipelines for neuroscience experiments involving both head-fixed and free behaving mice.

SBI-553'S EFFECT ON APPETITE
Presenter(s): Sydney Milcarek
Category: Physiology
Mentor(s): Gina Leinninger (College of Natural Science)

Obesity remains a major global health concern, given current pharmacological treatments still have unwanted side effects and reduced efficacy in individuals with high adiposity, highlighting the need for new treatments that target alternative ways to regulate appetite. SBI-553 is a β?arrestin biased allosteric modulator of neurotensin receptor 1 (NtsR1) and has been shown to reduce pain and addictive behavior without causing negative side effects, but its effects on feeding and energy balance are still unclear. Given neurotensin's role in appetite regulation, we hypothesized that SBI-553 has the ability to decrease feeding and body weight. To test this, normal-weight mice were treated with 12 mg/kg SBI-553 or saline and underwent metabolic phenotyping in metabolic cages with ad libitum access to food and water and in a fasting-induced refeeding (FIR) paradigm. SBI did not alter oxygen consumption, respiratory exchange ratio, locomotion, food intake, and water intake in metabolic cages. However, in the FIR paradigm, mice treated with SBI-553 ate less food and gained less weight in the hours following refeeding. Compared to saline controls, the treatment only decreases feeding when in fasted conditions, suggesting a motivational component since motivation to eat is heightened in this state. Together, these results suggest that SBI-553 can alter feeding in a context-dependent manner, which furthers our understanding of SBI-553's potential for treating obesity.

EVALUATING HORIZONTAL ONCOGENE TRANSFER VIA EXTRACHROMOSOMAL DNA
Presenter(s): Reagan Huyser
Category: Physiology
Mentor(s): Eunhee Yi (College of Human Medicine)

Extrachromosomal DNA (ecDNA) is a circular form of DNA frequently found in various human cancers and serves as a significant strategy used by cancer cells to amplify oncogenes. Previous studies suggest that ecDNA plays a key part in treatment resistance and poor survival rates in cancer patients. Most ecDNA research has focused on its behavior within individual cells, leaving the intercellular dynamics of ecDNA largely unexplored, even though intercellular communication within the tumor microenvironment is vital for cancer progression. In this study, we tested whether ecDNA is transferred between cancer cells. First, we co-cultured a donor cell line derived from a glioblastoma patient (HF3016) with another glioblastoma patient-derived cell line (HF2354) as a recipient. We found the donor's ecDNAs in the recipient cells, indicating horizontal ecDNA transfer. Second, we tested whether this ecDNA can be transferred to cancer cells in a different organ. We co-cultured HF3016 with a prostate cancer cell line (PC3) as a recipient and found no transferred ecDNA in PC3. This result suggests a potential mechanism that confers resistance to horizontal ecDNA transfer between cancers from different organs. Lastly, we tested whether ecDNA could be transferred between prostate cancer cell lines. We used a PC3 subclonal ecDNA-positive cell line (PC3-C1) as the donor, and another subclonal cell line (PC3-C4) without ecDNA as the recipient. Co-culture experiments showed no ecDNA transfer, suggesting a potential resistant mechanism to horizontal ecDNA transfer. This study provides new

insights into ecDNA biology and suggests a novel potential mechanism of ecDNA-driven cancer progression.

SHIFTING PERSPECTIVES ON PROFESSIONAL SKILLS AND TEAMWORK DEVELOPMENT ACROSS TWO UNDERGRADUATE COHORTS
Presenter(s): Emily Willard
Category: Physiology
Mentor(s): John Zubek (College of Natural Science)

Physiology students recognize the need for professional skills development, yet their perceptions of learning skills such as communication and teamwork have been less understood. We examined shifts in student perspectives before and after the COVID-19 pandemic using the validated Science Student Skills Inventory survey in 551 undergraduates. Students rated inclusion, importance, improvement, and confidence across multiple professional skills, and theme-specific composite scores for each participant was established. Initial results suggest that older students (21-23) were more likely to report professional skills integration into a wider range of course types ($p=0.009$) and assessments ($p<0.001$) compared to pre-COVID students. However, students reported feeling lower perceived improvement ($p=0.026$) and lower perceived importance ($p=0.021$) in professional skills in the post-COVID vs the pre-COVID group. New survey data indicates that 79% enjoy teamwork during class time; however, 51% disliked teamwork activities outside of class. Open-ended responses indicated that students viewed teamwork primarily as task completion rather than collaborative learning. Although students perceived greater utilization of professional skills in coursework, they did not report greater inclusion when asked more specifically, suggesting that exposure alone may not translate to meaningful engagement. Moreover, confidence in skill development remained low across both cohorts and remained unchanged through this instructional transition. With only 23% of students reporting consistent guidance on how to work effectively in teams, these results may prompt instructor efforts to align curricular intent with students' perceived value of these activities.

COMPARISON OF PLATELET QUANTIFICATION METHODS FOR MITOCHONDRIAL BIOENERGETICS RESEARCH
Presenter(s): Grace Vainik, Karthick Prem Satheesh Kumar, Linden Wells
Category: Physiology
Mentor(s): Jason Bazil (College of Osteopathic Medicine), Keeler Steele (College of Human Medicine)

Accurate platelet quantification is critical for reliable bioenergetic measurements. However, traditional platelet counting methods, such as manual hemocytometer analysis, are time-consuming and subject to inter-rater variability. These limitations can result in less reliable data in time-sensitive analysis of human specimens. This project aims to develop a plate reader-based method for estimating platelet concentration using turbidity (optical density, OD) measurements to improve precision and efficiency in high-resolution respirometry assays. To address these limitations, human blood samples will be processed to isolate platelets. The isolated platelets will then be divided into two portions. One portion

will be counted using a hemocytometer, while the other portion will be loaded into a clear, 96-well plate and analyzed using a plate reader at 405 nm and 800 nm. A dilution series at 405 nm will be used to produce a standard curve comparing OD values to platelet concentrations determined by a manual hemocytometer. Additional analysis at 800 nm will be used to reduce variability caused by artifact proteins and hemoglobin to confirm that OD is proportional to platelet concentration in our application. Linear regression analysis will be used to compare the assays. Establishing a reliable OD standard curve will enable rapid estimation of platelet concentration for future experiments involving blood samples without repeated manual counting. This approach improves experimental reproducibility, inter-rater reliability, time-efficiency, and supports analysis of physiologic tissue without preservation. This work supports the accuracy of platelet bioenergetics measurements and represents a step toward precision medicine research.

FROM PAIN CONTROL TO FUNCTION: QUALITY-OF-LIFE OUTCOMES AFTER SPINAL CORD STIMULATION FOR PAINFUL DIABETIC NEUROPATHY

Presenter(s): Saiprashanth Rajesh
Category: Physiology
Mentor(s): Y.S. Mohan (Michigan Spine Specialists)

Background: Painful diabetic neuropathy (PDN) is a result of diabetes mellitus that can cause tingling, burning and sharp pain, oftentimes in the feet and legs. Patients with refractory pain have been seen to benefit from spinal cord stimulation (SCS). Evidence describing the durability of health-related quality of life (QoL) benefits following spinal cord stimulation (SCS) for painful diabetic neuropathy (PDN) remains fragmented, particularly with respect to long-term outcomes, specific responses within subgroups, and differences across stimulation therapies. Methods: MEDLINE, Embase, and the Cochrane Library were utilized in accordance with PRISMA guidelines to compile a systematic review. The reports included were randomized controlled trials, observational studies, case series, and real-world evidence that were screened in between 2015 and 2025. Included reports displayed QoL outcomes in adults with refractory PDN who were treated with SCS. Factors in Qol were analyzed across different stimulation types and follow-up durations. Results: Over 2000 patients within 38 studies met the inclusion criteria. Across all study designs and SCS was associated with consistent therapeutic benefits. The most significant and long term benefits were observed with high-frequency (10-kHz) stimulation, with improvements continuing for up to four to five years in long-term follow-up cohorts. QoL gains extend beyond analgesia with improvements seen in patients' sleep quality, physical function, and mobility. Treatment responses varied, with lower impact seen in patients who had longer-standing disease or more severe pain. No studies reported deterioration in QoL following the initial device's implantation. Adverse effects to the treatment were infrequent Conclusions: Spinal cord stimulation sustained a multidimensional positive impact in quality of life for patients with painful diabetic neuropathy. Treatment efficacy appears influenced by both disease severity and stimulation modality. These findings highlight the potential benefit of earlier therapeutic intervention and support patient grouping strategies to optimize long-term functional and patient-centered outcomes.

HOW ANESTHESIA AFFECTS BRAIN ACTIVITY
Presenter(s): Alexis White, Claudia Beecham, Lily Mitchell, Neha Jampana
Category: Physiology
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

This project explores how brain waves change when a person is under anesthesia. Brain waves are patterns of electrical activity in the brain that help scientists understand how the brain functions. Anesthesia is a medication that causes a temporary loss of consciousness during medical procedures. In this study, we examine general patterns in brain activity before, during, and after anesthesia, and we will also examine brain wave patterns during different stages of sleep to provide a comparison between naturally occurring changes in consciousness and those that occur under anesthesia. By observing these changes, scientists can better understand how the brain responds when a person is anesthetized and not aware of their surroundings. The goal of this project is to create a clear diagram that medical professionals can use as a reference to better understand typical brain wave patterns associated with anesthesia and different states of consciousness.

CHRONIC FLUORESCENT LIGHTING PROMOTES WEIGHT GAIN AND GLUCOSE DYSREGULATION IN A DIURNAL RODENT
Presenter(s): Nikhil Kummur
Category: Physiology
Mentor(s): Katrina Linning-Duffy (College of Social Science), Lili Yan (College of Social Science)

Light exposure plays an crucial role in regulating feeding behavior and metabolic physiology in mammals. Our subjects were the Nile Grass Rats (Arvicanthis), a diurnal rodent. In this study we were able to investigate whether lighting environments can affect physiological outcomes relevant to metabolic regulation. Twenty male grass rats (3-4 months old) were equally separated and housed under natural daylight (5600 lux) or fluorescent lighting (150 lux) to simulate outdoor or indoor light conditions. This experiment observed the grass rats over six weeks, following the assessment of physiological parameters. Grass rats in fluorescent lighting overall showed increased and variable blood glucose levels (241.9 ± 61.6 mg/dl) compared to rats being maintained under daylight conditions, where glucose levels were lower and more consistent (143.9 ± 37.1 mg/dl). It's also noteworthy that 4 out of the 10 animals in fluorescent condition had glucose levels around 500 mg/dl, indicating diabetic. Mass of the epididymides, testes, and adipose tissue are not significantly different between the two conditions. Correlation test between body weight and blood glucose showed no significant correlation in the daylight group ($r=-0.072$, $p=0.843$), while the fluorescent group showed a marginally significant positive correlation ($r=0.604$, $p=0.065$). Subjects with generally increased body weight tended to have higher blood glucose levels under fluorescent conditions. These results indicate fluorescent lighting may influence metabolic regulation and increase the risk for diabetes in the Nile Grass Rat.

EXCESS IRON INCREASES LIPOLYSIS AND INTERFERES WITH THE INSULIN-SENSITIZING ACTION OF CHROMIUM IN BOVINE ADIPOCYTES
Presenter(s): Alexandra Watson
Category: Physiology
Mentor(s): Miguel Chirivi (College of Veterinary Medicine)

During the first weeks after calving, dairy cows exhibit reduced insulin sensitivity in peripheral tissues, such as adipose tissue (AT), which, if prolonged, leads to dysregulated fat mobilization. This increases body weight loss, elevates disease risk, and impairs lactation and reproductive performance. Postpartum chromium (Cr) supplementation has been shown to improve insulin sensitivity, enhancing insulin's antilipolytic action. However, in some herds, Cr supplementation fails to elicit these expected responses. One potential reason for this is excess iron (Fe) in drinking waters, which may interfere with Cr activity. Our goal was to determine the effects of Fe on insulin sensitivity and its interaction with Cr in bovine adipocytes. Primary bovine preadipocyte cells from 8 non-lactating non-gestating cows were cultured and differentiated into adipocytes, during differentiation treated with iron (II) sulfate heptahydrate (100μM) or chromium picolinate (10 μM) alone, or in combination. After incubation with the lipolytic agent isoproterenol, and with insulin added, lipolysis was quantified by glycerol release in the media (nmol glycerol/μg protein). ISO increased lipolysis 1.5-fold. In contrast, Fe-treated adipocytes exhibited a marked potentiation of ISO-induced lipolysis (6.4-fold vs. Basal). Chromium supplementation increased ISO-stimulated lipolysis to 3.1-fold compared with basal. Cells treated with Cr+Fe exhibited ISO-induced lipolysis comparable to Cr alone. These findings indicated that Fe exacerbates adipocyte lipolysis, whereas Cr modulates lipolytic responses in the presence of Fe. Therefore, despite Cr supplementation, elevated Fe exposure may inhibit insulin sensitivity, permitting excessive lipolysis in the AT of dairy cows.

CHARACTERIZING TUMOR-ASSOCIATED MUTATIONS IN THE E2F5 CONDITIONAL KNOCKOUT MODEL OF METASTATIC BREAST CANCER
Presenter(s): Cassidy Tomezak
Category: Physiology
Mentor(s): Eran Andrechek (College of Human Medicine)

The E2F transcription factors regulate cell cycle progression, development, and tumorigenesis. Recent work from the Andrechek laboratory demonstrated that conditional loss of the transcriptional repressor E2F5 in the mammary epithelium leads to modest developmental changes followed by the formation of highly metastatic mammary tumors after a prolonged latency. Whole-genome sequencing of tumors from this E2F5 conditional knockout (CKO) mouse model revealed extensive intertumor heterogeneity and identified candidate single nucleotide variants and copy number alterations that may cooperate with E2F5 loss during tumor progression. The goal of this project is to validate mutations identified in these tumors by confirming their presence within specific genomic regions of interest. Genomic DNA isolated from E2F5 CKO tumor samples is used as a template for polymerase chain reaction (PCR) amplification of target regions within candidate genes, including Kras and p53. PCR products are purified and analyzed by Sanger sequencing, and sequencing chromatograms are manually reviewed to determine whether predicted mutations are present within the amplified regions. By systematically verifying candidate

mutations across multiple tumor samples, this work aims to identify recurrent or biologically relevant alterations that may cooperate with E2F5 loss in mammary tumor development and metastasis. Confirming these variants will refine the mutational landscape of this model and support future studies investigating how transcriptional dysregulation and additional genomic alterations contribute to tumor progression.

Plant Sciences

COMPARING THE SURFACE MORPHOLOGIES OF DATE SEEDS AND JUJUBE DATE SEEDS
Presenter(s): Seeun Sohn
Category: Plant Sciences
Mentor(s): Per Askeland (College of Engineering)

Date fruits and jujube date fruits are both commonly referred to as dates, but they have vast morphological differences. Jujube dates, Ziziphus jujuba, belong to the buckthorn family and are eudicots; dates, Phoenix dactylifera, belong to the palm family and are monocots. This project contrasts the surface morphologies of the seeds of jujube dates and dates with Semi-Electron Microscopy (SEM) pictures. Its results connect to the physiological differences between the development of monocots and eudicots.

IDENTIFICATION OF STAGE-SPECIFIC DISEASE RESISTANCE GENES DURING STRAWBERRY FRUIT DEVELOPMENT
Presenter(s): Brianna Sabbagh
Category: Plant Sciences
Mentor(s): Melanie Leonard (College of Agriculture & Natural Resources), Patrick Edger (College of Agriculture & Natural Resources)

Strawberries are highly susceptible to various fruit diseases, most notably Gray Mold (caused by Botrytis cinerea) and Anthracnose Fruit Rot (caused by Colletotrichum spp.), which often result in devastating crop losses. As the plant shifts resource allocation to support maturation, the genetic underpinnings of stage-specific disease resistance remain poorly understood. In this study, we analyzed global gene expression patterns throughout strawberry fruit development and functionally characterized differentially expressed genes, with a specific focus on those encoding disease resistance. Our results reveal distinct, stage-specific expression profiles for a suite of resistance genes. Furthermore, we investigated whether these genes exhibit subgenome-specific biases, as previously observed for other critical agronomic traits in cultivated octoploid strawberries. These findings provide a framework to guide future breeding and genetic engineering efforts aimed at enhancing disease resistance and ultimately mitigating crop loss.

DEVELOPMENT OF A HIGH-THROUGHPUT WORKFLOW TO EVALUATE DEFENSE-ASSOCIATED GENE EXPRESSION IN APPLES AFTER TREATMENT WITH PROHEXADIONE-CALCIUM AND ACIBENZOLAR-S-METHYL.

Presenter(s): Juliana Banotai
Category: Plant Sciences
Mentor(s): Luisa Castiblanco (College of Agriculture & Natural Resources)

Fire blight, caused by Erwinia amylovora, is a major threat to apple production, particularly in high-density orchards where rapid vegetative growth increases susceptibility to infection. The plant growth regulator prohexadione-calcium (ProCa) and the plant defense activator acibenzolar-S-methyl (ASM) have been used, individually and in combination, to reduce disease incidence and severity. However, the genetics of the defense-associated response triggered by these compounds in the host remains poorly understood. This work focused on establishing a processing pipeline to evaluate the expression of immunity-related genes in apple tree cultivars Gala and Honeycrisp during the 2025 growing season following weekly applications of ASM (1 oz or 2 oz per 100 gal) and ProCa (2 oz per 100 gal), combined (ASM 1 oz + 2 oz ProCa per 100 gal) and an untreated control. Sample collection was conducted over five weeks and included three biological replicates per treatment, per time, per cultivar, resulting in a total of 150 samples. Leaf tissues from developing shoots were collected at five time points after weekly treatment applications, stored at -80 °C to preserve RNA integrity, and homogenized for subsequent RNA extraction and cDNA synthesis. Quantitative PCR analysis targeting five defense-associated genes (PR1, PR2, PR4, JAA, and NIMIN2) was performed using gene-specific primers. Gene expression analyses indicated elevated defense-related gene expression under the combined treatment, after two weekly applications, though overall responses were variable. Establishing this high-throughput workflow enabled reliable handling of large sample sets and supports future molecular studies of plant defense in perennial cropping systems.

FUNCTIONAL AND OPTICAL CHARACTERIZATION OF A UNIQUE THREE-DOMAIN ORANGE CAROTENOID PROTEIN HOMOLOG

Presenter(s): Elisa Berlet
Category: Plant Sciences
Mentor(s): Anupama Puppala (College of Natural Science), Cheryl Kerfeld (College of Natural Science)

The Orange Carotenoid Protein C2 (OCPC2) is a novel homolog of the orange carotenoid protein (OCP) found in cyanobacterial species native to high deserts. In cyanobacteria, canonical OCP family members prevent photodamage from reactive oxygen species by non-photochemical quenching (NPQ) of light harvesting. Previously described structural and functional studies showed that OCP is a two-domain protein that binds a carotenoid cofactor. The N-terminal domain (NTD) functions as an effector domain that binds to the light harvesting complex to induce NPQ, whereas the C-terminal domain (CTD) regulates quenching. Under high-light conditions, OCP photoactivates, undergoing a conformational change to enable NPQ. Compared to canonical OCP, OCPC2 exhibits an extra C-terminal domain. The functional advantages of this three-domain structure are yet unknown.

To gain a better understanding of the role of each of the three domains, we expressed three different subdomain variants: the N-terminal domain alone, the N-terminal domain with the first C-terminal domain, and a dual C-terminal domain construct. After expression and purification of these three variants, spectrophotometric analysis allowed us to confirm the presence of the carotenoid and observe differences in absorption properties among the domain constructs. Spectroscopic and biophysical experiments provided insight into how the domain organization of OCPC2 influences carotenoid binding and translocation, conformational dynamics and their environmental triggers, and quenching activity of OCPC2. Together, these insights suggest the presence of a potentially novel photoprotection mechanism that may contribute to the adaptation of cyanobacteria to a halophilic and hyperarid desert environment.

BERRY BRIGHT - THE ROLE OF ANTHOCYANINS IN OCTOPLOID STRAWBERRY DEVELOPMENT
Presenter(s): Makayla Paul
Category: Plant Sciences
Mentor(s): Melanie Leonard (College of Agriculture & Natural Resources), Patrick Edger (College of Agriculture & Natural Resources)

During the development of the commercial octoploid strawberry (Fragaria x ananassa, 'Royal Royce'), significant color changes occur as the fruit develops. Anthocyanins are the key plant pigments responsible for the red coloration in ripening strawberry tissues. Additionally, they serve as potent antioxidants that mitigate cellular damage and provide significant dietary health benefits. However, transposable elements (TEs) involvement in the regulation of the anthocyanin biosynthetic and metabolic pathways is unknown. To collect the data, I extracted RNA from four different strawberry stages of development (separated by phenotypic color) and proceeded with RNAseq. I used the following bioinformatic tools to analyze gene expression related to anthocyanin biosynthesis such as TAIR, Panther DB, REVIGO, and KEGG pathways. I found that the gene expression for the biosynthesis of anthocyanins and associated metabolic processes during development of 'Royal Royce' strawberry increases during each growth stage. My results demonstrate the importance of increased regulation of Dihydroflavonol 4-Reductase (DFR) and Leucoanthocyanidin Dioxygenase/Anthocyanidin Synthase (LDOX/ANS) genes in anthocyanin biosynthesis to produce the phenotypic color changes during development and to enhance the commercial value of cultivated strawberry. Transposable elements may be a source of rapid evolution for octoploid strawberries since these elements can jump around the genome and affect transcription. Future direction for this project could be utilizing anthocyanin profiling via High-Performance Liquid Chromatography (HPLC) for each 'Royal Royce' developmental stage to validate phenotypic observations and the predicted anthocyanin production derived from the transcriptomic analysis.

ENHANCING LIPID PRODUCTION IN CAMELINA SATIVA THROUGH GENETIC MODIFICATION FOR BIOFUEL APPLICATIONS
Presenter(s): Nicholas Chandzel
Category: Plant Sciences
Mentor(s): Erich Grotewold (College of Natural Science)

Carbon pollution has been a concern in recent years, and one of the many ways to combat the pollution is to rely on sustainable energy sources. One of these sources is biofuels derived from oilseed crops. Camelina sativa is a promising seed oil plant due to its high lipid content, its ability to grow on marginal land, and does not compete with food crops for land. The gene that I focused my research involves a transcription factor gene but at this stage of my research the TF gene name is confidential, which is a regulator known to co-regulate lipid biosynthesis and seed development in oilseed plants. CRISPR-Cas9 was used to generate targeted knockouts of the transcription factor gene in Camelina sativa to investigate its role in lipid synthesis. The lipid content analysis for Camelina sativa seeds are still ongoing, however, the successful generation of these mutant lines provide a foundation for future experiments aimed at understanding how this transcription factor influences seed oil production. Insights from this research could inform strategies to optimize Camelina sativa as a renewable biofuel source and guide future crop engineering efforts.

POINT MUTATION IN KEG SUPPRESSES PLIP3-OX JAMONIC ACID OVERPRODUCTION DEPENDENT PHENOTYPE IN ARABIDOPSIS.
Presenter(s): Breana Hagerty
Category: Plant Sciences
Mentor(s): Yosia Mugume (College of Natural Science)

Plastid lipase 3 (PLIP3) is an enzyme that breaks down the chloroplast lipid monogalactosyldiacylglycerol (MGDG) to release 18:3 fatty acids (FAs) (Wang et al., 2018). The FAs are converted into 12-oxophytodienoic acid (OPDA) in the chloroplast. This OPDA is then exported from the chloroplast to the peroxisome where it can be routed through a series of biosynthetic pathways, one of them leading to biosynthesis of jasmonic acid (JA). PLIP3 over expressing line (PLIP3-OX) in Arabidopsis showed reduction in 16:3 acyl content of MGDG, upregulation of JA responsive genes and stunted plant growth due to the accumulation of JA (Wang et al., 2018) making this line an excellent tool for studying relationship between chloroplast lipids and JA metabolism. Therefore, to identify new factors involved in the JA pathway, we implemented a forward genetic screen in the background of PLIP3-OX line to identify suppressor mutants that rescue the JA over production phenotypes. One suppressor mutant identified is Sup 72, which harbors a His 1457 Tyr point mutation in the KEEP ON GOING (KEG) polypeptide chain and nearly suppresses the PLIP3-OX phenotype. KEG is an E3 ubiquitin ligase which negatively regulates abscisic acid (ABA) signaling by ubiquitinating ABI5 consequently leading to its degradation (Stone et al., 2006). My work studies the molecular mechanism by which a point mutation in KEG suppresses PLIP3-OX phenotype.

CONSERVATION OF ECUADOR'S TROPICAL DRY FORESTS: BIODIVERSITY MONITORING AND COMMUNITY OUTREACH
Presenter(s): Olivia Gregorski
Category: Plant Sciences
Mentor(s): Domenica Gutierrez (Ceiba Foundation for Tropical Conservation)

Conservation efforts were conducted through habitat restoration, biodiversity monitoring, and educational community outreach. Daily hikes through the Lalo Loor Dry Forest Reserve were conducted to collect data on target species presence; habitat restoration was conducted through bio corridor creation, to connect fragment habitats. Educational outreach focused on people from ages 5-20, with activities such as hikes, presentations, and hands-on environmental learning opportunities. The impact of these activities were data collection of population densities for the main target species, the Ecuadorian Mantled Howler monkey and in season native foliage. Environmental education outreach programs were primarily focused on plant and soil interactions and the importance of biodiversity in ecosystems to school aged children.These impacts are very important to better aid in the conversation of conservation in this region. By monitoring key species, we can detect changes and possible trends of populations, to better understand and protect these threatened species. Educating the public, especially local communities, on why The Dry Tropical Forest is important, helped gain support for conservation efforts and environmental education programs.

MSU WHEAT BREEDING INTERNSHIP
Presenter(s): Bryson Willoughby
Category: Plant Sciences
Mentor(s): Aaron Newberry (College of Agriculture & Natural Resources)

The MSU Wheat Breeding Program does many forms of data collection to improve wheat yield throughout the wheat growing regions in Michigan.

USING BARK THICKNESS TO PREDICT WOODY SPECIES RESPONSE'S TO FIRE MANAGEMENT
Presenter(s): Benjamin Lutz
Category: Plant Sciences
Mentor(s): Lars Brudvig (College of Natural Science)

Bark thickness is a key functional trait in woody plants that can mediate responses to various sources of disturbance, including fire. Individuals of all woody species start with thin bark, which thickens as they grow in diameter, but the rate of this thickening as well as maximum thickness achieved differs. In previous research, I quantified this relationship between diameter and bark thickness for six Michigan native tree species. However, a knowledge gap remains in how bark thickness mediates tree response to fire disturbance. To answer this, I paired these bark thickness curves with 10+ years of vegetation data from MacCready Reserve, a restored oak savanna ecosystem. I estimated bark thickness for each sapling and tree in the dataset of the species I am working with, using my bark thickness and diameter

relationships and the diameter measurements from the field data. I then developed linear models to estimate stem density changes over time, as a function of bark thickness, for each species in burned and unburned plots. These results will help inform future restoration actions by better predicting how tree species will respond to prescribed burns at this site

GEOGRAPHIC AND TAXONOMIC DIVERSITY IN PLANT TRAITS WITHIN TREE CANOPIES
Presenter(s): Madelyn Immoos
Category: Plant Sciences
Mentor(s): Kyla Dahlin (College of Social Science)

Global plant trait diversity is affected by environmental variation, evolution, and Earth history. Light gradients differ throughout a tree's canopy and are associated with differences in leaf structure and nutrient allocation. High light in the top of the canopy is expected to lead to higher leaf mass per area (LMA) and smaller leaves. More shaded areas lower in the canopy should have a lower LMA. While these broad patterns are well understood, different taxa appear to vary their vertical morphology in different ways. In this project we assessed how big of a difference there is in key leaf traits based on taxon and height in the canopy. We found that needleleaf species exhibit high LMA and very little vertical variation, while broadleaf species have lower LMA and more vertical variation. This contrast between taxa shows that both leaf functional types contribute to trait diversity within canopies, and simulate the broader patterns observed across biomes and latitudinal gradients. This information has implications for how the canopy light environment is simulated in Earth system models and, therefore, how those models estimate forest carbon uptake and forests' capacities to cool their surrounding environment.

VOLATILE MEDIATED DEFENSE TO BIOTIC STRESS IN ARABIDOPSIS
Presenter(s): Natalia Koziarski
Category: Plant Sciences
Mentor(s): Bailey Kleven (College of Natural Science)

Volatile organic compounds (VOCs) act as antimicrobial agents and airborne signals that prime plant resistance. Pathogen-induced VOCs, including methyl salicylate (MeSA), enhance local and systemic defenses through phytohormone-mediated signaling cascades; however, the regulatory mechanisms linking VOC biosynthesis to defense activation remain unclear. In Arabidopsis, jasmonate (JA)-mediated defense metabolism is energetically costly and negatively impacts growth. We use the JA signaling pathway to investigate how stress-induced defense metabolism is coordinated with plant growth. Focusing on JA ZIM-domain (JAZ) transcriptional repressors, which inhibit JA signaling and restrict metabolic flux toward specialized metabolism, we generated combinations of jaz loss-of-function mutants to systematically tune growth-defense balance. Genetic suppressor screens using the jazD mutant, which lacks 10 JAZ genes, identified CYCLIN-DEPENDENT KINASE 8 (CDK8) as a key regulator of JA-mediated growth-defense trade-offs. RNA-sequencing of jazD showed that loss of CDK8 suppresses VOC-associated gene expression, including the transcription factor ANAC055. Consistent with this, cdk8 loss-of-function mutants exhibit increased susceptibility to the necrotrophic pathogen Pectobacterium

carotovorum ssp. carotovorum (Pcc). Gas chromatography-mass spectrometry analysis indicates that jazD over accumulates MeSA, and this accumulation likely depends on CDK8. To determine whether loss of VOC-mediated defenses alters resistance to Pcc, we are testing ANAC transcription factor mutants (anac019, anac055, anac072, and anac019/055/072) for resistance phenotypes against Pcc and profiling their VOC emissions using a portable GC developed in collaboration with Dr. Xudong Fan (University of Michigan). Future work will define the molecular mechanisms by which CDK8 promotes VOC production during responses to necrotrophic pathogens.

UNLOCKING THE SCENT OF STRAWBERRIES: SUBGENOME-SPECIFIC REGULATION OF TERPENES BIOSYNTHESIS
Presenter(s): Sonia De Donno
Category: Plant Sciences
Mentor(s): Melanie Leonard (College of Agriculture & Natural Resources), Patrick Edger (College of Agriculture & Natural Resources)

The characteristic aroma of strawberries that make the fruit enjoyable are due to a suite of specialized metabolites produced by plants, including terpenes. While terpenes have long been known to contribute to fruit quality, the underlying genes, and genetic variants, that encode for the biosynthesis of these compounds remain poorly understood in strawberry. Our preliminary results not only identified key genes but revealed an increase in terpene expression through developmental stages. Higher expression of these genes can lead to increased production of aromatic molecules, resulting in more fragrant strawberries with an enhanced flavor profile. Furthermore, we analyzed whether these terpene biosynthetic pathways exhibit subgenome-specific expression bias within the complex octoploid genome. Observations in other polyploid crops suggest that specific subgenomes dominate the expression of key agronomic traits. We aim to determine if a particular subgenome is disproportionately contributing to terpene biosynthesis in strawberries. These discoveries will assist in developing future metabolic engineering and breeding programs aimed at enhancing strawberry aroma for commercialized strawberries that are better for consumers.

GENETIC BASIS OF DEVELOPMENTAL SUGAR ACCUMULATION AND SUBGENOME DOMINANCE IN OCTOPLOID STRAWBERRY (FRAGARIA x ANANASSA)
Presenter(s): Marcella Hanna
Category: Plant Sciences
Mentor(s): Erich Grotewold (College of Natural Science), Patrick Edger (College of Agriculture & Natural Resources)

Sugar concentration is a primary determinant of fruit quality and the leading driver of consumer preference, serving as a major target of selection during the domestication of cultivated strawberry (Fragaria x ananassa). Rather than a passive buildup, sugar concentration results from tightly regulated metabolic and transport processes throughout development. While diverse genetic changes impact growth, yield, and metabolite composition in various plant systems, the specific genetic mechanisms

shaping these traits in octoploid strawberry remain poorly understood. A central question is which gene variants and pathways impacting sugar metabolism were targeted during domestication and modern breeding, as well as identifying which of these targets can be strategically modified in future breeding efforts to further enhance fruit quality. Transposable elements (TEs), abundant in plant genomes, modulating gene expression via insertion near regulatory regions, represent a potential driver of this rapid evolution. We hypothesized that gene-proximal TEs contributed to the emergence of novel sugar metabolism profiles during development. Furthermore, we investigated whether these pathways exhibit subgenome-specific expression bias. Analysis of generated transcriptome data from fruit at defined developmental stages, combined with gene ontology and pathway-level assessments, revealed stage-specific regulation of central carbon metabolism preceding and accompanying rapid ripening. Analysis of TE presence-absence variation and gene-proximal density revealed nonrandom associations with sugar metabolism genes, suggesting active contribution to the modulation of sugar biosynthetic pathways. Together, these results provide novel insights into the developmental regulation of strawberry sugar metabolism and the role of transposable elements and subgenome dominance in shaping fruit quality traits during domestication.

DOES MANAGEMENT AFFECT OAK REGENERATION?
Presenter(s): Kaitlyn Trepka
Category: Plant Sciences
Mentor(s): Lars Brudvig (College of Natural Science)

Regeneration of oaks is vital to ecosystems across North America, as they provide habitat, food, and refuge for numerous species, ranging from birds to decomposers. However, harvested or disturbed oak stands cannot regenerate back to their original state. This could be because oaks are shade-intolerant species and need plenty of sun to establish, which could result in gaps in the age structure. A gap in the generation of a species can be concerning because there must be a succession of mature individuals that can reproduce when older ones die. To observe if ecological management regimes influence rates of oak regeneration, oaks were counted in permanently marked transects between three different plots (unmanaged, burn-only, thin-burn). The oaks were then categorized into three age classes: seedlings (<20 cm), saplings (>20 cm & <200 cm), and trees (>200 cm). An ANOVA was used for statistical analysis, and graphs were done in RStudio. There was a statistically significant difference found in the number of oak seedlings and saplings between the treatment areas. The findings matter because they demonstrate that ecological management can influence rates of oak regeneration. The findings are important for future conservation in oak savanna ecosystems.

WEEDING OUT THE WEEDS COLLECTION
Presenter(s): Basia Love
Category: Plant Sciences
Mentor(s): Alan Prather (University Arts & Collections), Carolyn Miller (University Arts & Collections), Katie Fry (University Arts & Collections)

Beal Botanical Garden (BBG) is the oldest continuously operated university botanical garden in the United States. Since 1897, the BBG created a collection for identification purposes of 75 common agricultural weeds. The weed collection grew to 150 native and non-native species in the 1950's. It was also moved to the new economic section that reflects the negative impact on agriculture and green spaces. The collection was planted close to the Red Cedar River. In 2025, BBG conducted a review of the collection and recognized potential adverse effects on the local environment. The collection was downsized to 60 species, removing aggressive/invasive species from the collection and omitting the native species that were once classified as "weeds". Then, the weed collection was relocated away from the Red Cedar River, to prevent the seeds from being transported downstream during flood events. We kept the collection to highlight the effects of globalization, which intentionally and unintentionally introduce non-native species to Michigan. These plants are also important to showcase the first stage of succession after the environment has been disturbed. The goals of the collection are to show the plants that are in the Beal Seed Experiment, remain a hands-on educational tool for the Weed Science Laboratory class and show traits that show why these plants might be considered weeds.

EVALUATION OF THE GOOD NEIGHBOR AUTHORITY'S KARNER BLUE BUTTERFLY HABITATS
Presenter(s): Emma Gerds
Category: Plant Sciences
Mentor(s): Robert Sanders (Michigan Department of Natural Resources)

Karner Blue butterflies are an endangered species, with a shrinking geographical range. These butterflies live in oak savannahs and pine barrens. Wild Blue lupine (Lupinus perennis) is the main part of the Karner Blue butterflies' ecosystem. The plant supports the caterpillar stage, and the butterfly also lays its eggs in the soil directly next to the plant. The butterflies tend to only fly in direct straight paths to other lupine plants, with the decrease in suitable habitats for the butterfly the populations of Karner Blue butterflies have become disconnected and with sporadic clusters. The Good Neighbor Authority works with the Michigan Department of Natural Resources on habitat restoration. My project was to conduct species surveys to determine which of the species that are being planted are surviving. Surveys were conducted on plots between the age of one to five years throughout the Manistee National Forest. The surveys were conducted in a grid pattern every twenty-five feet, a five-by-five sample was taken and every species that was part of the seed mix was recorded. This was repeated at all nine survey locations. Through this I found that the wild lupine was at all survey locations, other plants in the seed mix were not found such as the milkweed that was planted was only found at two of the survey sites. These surveys showed that the equipment used may not be the best to use moving forward. Also milkweed may need to be cold stratified before planting in the fall.

FLOWERING TIME VARIATION IN CAPSELLA BURSA-PASTORIS
Presenter(s): Marissa Benn
Category: Plant Sciences
Mentor(s): Emily Josephs (College of Natural Science)

Phenology, the timing of life history transitions, is crucial to the success of plants because of their sessile nature and need to survive in their given environment. Improper timing of phenological traits, such as flowering, could be detrimental to species' fitness. We are interested in phenology in Capsella bursa-pastoris to understand the genetic basis of flowering time variation in this species. Previous studies have observed variation in flowering time across the globe, though no studies have explored variation across the United States. To determine if this variation has a genetic basis, we conducted a common garden experiment with plants from across the United States. Then, to identify the genetic loci effecting this trait, we conducted a genome wide association study (GWAS).

DROUGHT STRESS GENES IN CAMELINA SATIVA AND THEIR RETENTION ACROSS POLYPLOIDY
Presenter(s): Barman Nasirpour
Category: Plant Sciences
Mentor(s): Patrick Edger (College of Agriculture & Natural Resources)

This project's aim is to identify genes in Camelina sativa that are related to drought stress tolerance and gauging their significance in that role, as well as examining retention and/or change of gene function and expression across polyploidy.

NATIVE MEDICINAL PLANT ECOLOGY
Presenter(s): Emma Olazabal Salgado
Category: Plant Sciences
Mentor(s): Georgina Sch (El Rancho La Paz - Centro Cultiva Salud)

Understanding the importance of medicinal plants within a local ecosystem is essential knowledge for developing sustainable agricultural-medicinal and conservation practices. However their is a gap connecting people with the environment. Having hands-on work in the field helps identify species, their roles in our ecosystem, and how we as humans can better this healthy dependent cycle. This can be seen in communities alongside Valle de Bravo, México. This project explored how sustainable agricultural methods and indigenous ecological practices contribute to the cultivation and understanding of medicinal plants. Specifically, it examined how soil preparation, compost creation, and field?based plant identification can deepen ecological knowledge and support future research on medicinal plant systems. The data was collected through field surveys, counting the number of species in a concentrated area. We also looked at the sample of the species we took from the area, looking at its anatomy and talking deeper about its physiology and medicinal benefits. We did a lot of soil management, which included looking at compost and the important microbial communities that are part of compost. All of our observations and talks where analyzied and documented, to compare data in the future. The findings

revealed that integrating sustainable agricultural-medicinal practices with basic ecological conservation is a possibility and significantly enhances the understanding of medicinal plant ecology and how indigenous communities have survived on it. These findings highlight the value of hands-on work, strengthening ecological literacy and supporting culturally informed approaches to medicinal plant research from people whose families pioneer the practice.

NEIGHBOR EFFECTS ON BELOWGROUND FUNCTIONAL TRAITS IN P. VIRGATUM
Presenter(s): Maxwell Barish
Category: Plant Sciences
Mentor(s): Christopher Blackwood (College of Agriculture & Natural Resources)

Biofuel cropping systems can be made more sustainable by actively sequestering carbon into the soil through root and microbial activity. Panicum virgatum (switchgrass) shows promise in both producing a viable fuel source and actively contributing to soil carbon inputs. Arbuscular mycorrhizal fungi (AMF) help to bridge the nutrient needs in P. virgatum systems and similarly show potential in microbial-mediated soil carbon inputs. In order to understand best practices for these systems, we seek to understand which prairie species could accompany switchgrass, resulting in the most carbon sequestration potential, and which belowground root traits shift with higher carbon sequestration. Soil and root cores were sampled from experimental microplots located in Hickory Corners, MI, and sieved for fine roots. These fine roots were scanned for root trait collection and mounted on slides for quantification of mycorrhizal colonization. From root trait data, we constructed plots and analyzed root trait shifts. We find that no traits were significantly affected in the first year of P. virgatum establishment with neighbors. We conclude that, if such shifts occur, it will be in later years when root systems further establish. Hypothetically, if we see significant trait shifts in following years, it will be important to see that root crossover has increased.

EFFECTS OF SOIL MOISTURE, FERTILITY, AND CLIMATE VARIATION ON THE NET PRODUCTIVITY (DIAMETER GROWTH) OF TEMPERATE TREE SPECIES
Presenter(s): Steven Ihm
Category: Plant Sciences
Mentor(s): Bailey McNichol (College of Agriculture & Natural Resources)

Many interacting factors (e.g., moisture, nutrients, light) influence the productivity of forests globally. However, the relative strength and influence of these factors driving ecosystem function can vary considerably between temperate tree species. This study evaluates the interactive effects of soil moisture, soil fertility, and climate variability (mean temperature and rainfall) on mature tree trunk diameter to understand temperate forest productivity. We monitored five different species across 12 sites along a fertility and moisture gradient across three temporal windows. Then we used linear models to determine the primary factors influencing tree growth rate. The results indicated a significant shift in growth drivers across time periods. Within the first period, diameter size and soil fertility were positive predictors of growth rates. But by the last period, it had inverted, with larger diameters corresponding to

a more negative growth rate for red maple, sugar maple, and American beech. Furthermore, climate sensitivity increased from the earliest to latest time period. Later periods showed positive effects of both annual temperature and precipitation for all species. Conversely, temperature variability emerged as a significant growth inhibitor for sugar maple and white oak. These findings suggest that climate averages and environmental stability have surpassed the effects of soil nutrients and tree size as the main drivers of productivity over time. This shift suggests that mature trees are hitting new physiological bottlenecks. Future research should dive into the mechanisms causing this growth reduction in larger trees and other potential unmeasured variables influencing tree growth.

EFFECTS OF SMOOTH SUMAC ON PLANT SPECIES AND DIVERSITY IN THE NEBRASKA SANDHILLS
Presenter(s): Rachael Patterson
Category: Plant Sciences
Mentor(s): Lillian Hoffart (University of Nebraska - Lincoln)

Grasslands are the most threatened terrestrial ecosystem, but least protected (Scholtz and Twidwell, 2022). A major threat to grasslands is woody encroachment, which is the conversion of grasslands to dense areas of native and non-native woody vegetation, including smooth sumac (Rhus glabra). In Nebraska, smooth sumac may alter the ecological processes as it is clonal with rapid vegetative spread via rhizomes (Ortmann et al., 2014). This research was conducted at the Niobrara Valley Preserve in Brown County, Nebraska, which has a high plant diversity and the threat of smooth sumac. The research question asked was: what are the effects of smooth sumac patches on plant diversity and the presence of herbaceous indicator species? Transects were set up to include prairie, edge, and sumac habitat with three quads per habitat measured. Sumac density and relative herbaceous species abundance was determined in each habitat. We found that herbaceous species diversity was lowest inside the sumac patches compared to the edge and prairie areas. Indicator species of each habitat were identified, with more non-native species in the sumac habitat and native species in the edge and prairie habitats. This research will advance understanding of the impacts of smooth sumac encroachment on biodiversity for land managers and farmers.

IDENTIFICATION OF GENES RELATED TO STEM SCAR SIZE IN VACCINIUM CORYMBOSUM (HIGHBUSH BLUEBERRY)
Presenter(s): Nadia Schoenherr
Category: Plant Sciences
Mentor(s): Minzhe Zhang (College of Agriculture & Natural Resources)

Blueberries (Vaccinium corymbosum L.) are an increasingly popular fruit that are enjoyed for their rich nutritional content and appealing sensory qualities. Stem scars, which are scars from where the stem connects to the berry, have been correlated with fruit size (Çelik, et al., 2020) and water loss (Yan and Castellarin, 2022) depending on their size. What genes are responsible for stem scar size, and how could these genes be utilized in breeding programs to create superior blueberry varieties? Blueberries were harvested from mature blueberry bushes across 3 varieties and scar sizes were measured. A genome-

wide association study (GWAS) will be performed on harvested blueberries to identify genes related to scar size. Results show significant differences in stem scar size across blueberry varieties, suggesting that genes related to scar size will be identifiable in the following GWAS. Connections between scar size related genes and fruit size related genes may also be identified. Utilizing identified genes may allow for increased efficacy of selective breeding or genetic modification to achieve desired blueberry varieties that balance consumer preferences for large berries with small stem scars and high water retention.

INDUCTION OF FLOWERING AND FRUIT SET IN WILD TOMATO ACCESSIONS
Presenter(s): Bianca Henley
Category: Plant Sciences
Mentor(s): Madison Putmon (College of Natural Science), Myeong-Hyeon Min (College of Natural Science), Yongsig Kim (College of Natural Science)

Wild accessions of the cultivated tomato (Solanum lycopersicum) have valuable genetic resources for crop improvement. In this study, we evaluated Solanum habrochaites (LA1777) and Solanum lycopersicoides (LA208, LA2951, and LA1964), which possess traits conferring tolerance or resistance to abiotic stresses or pests. Efficient introgression of these traits into cultivated backgrounds requires timely flowering and fruit set to enable seed production. However, wild tomato species characteristically display prolonged vegetative growth and delayed fruit maturation, with ripening periods extending up to 6-9 months under the general tomato growing conditions (16 h light/8 h dark, 26°C day/18°C night). This study aims to accelerate the transition from vegetative to reproductive stages in wild tomato accessions. We hypothesized that optimization of nutrient availability through targeted fertilizer regimes would promote earlier floral induction besides long-day conditions and growing temperature control. Plants were grown under an 8 h light/16 h dark cycle and 15°C day/5°C night and randomly assigned to one of three treatments: no fertilizer, an N:P:K ratio of 1:1:1, or 1:3:2. Fertilizer-treated plants flowered significantly earlier than control plants, which remained in the vegetative phase for a prolonged period. This result indicates that nutrient composition plays a pivotal role in phase transition in wild tomato species. Additionally, the use of ethephon, a synthetic compound that releases ethylene, may accelerate fruit ripening further. Collectively, this study presents practical methods to reduce the duration of flowering, fruit set, and fruit maturation in wild tomato accessions, hence improving the efficiency of pre-breeding and introgression programs.

UNDERGRADUATE RESEARCH EXPERIENCE IN TREE FRUIT PHYSIOLOGY
Presenter(s): Clara Taggart
Category: Plant Sciences
Mentor(s): Chayce Griffith (College of Agriculture & Natural Resources)

Calcium delivery to developing fruit is dependent on functional xylem networks. Disruption of xylem transport during fruit growth can lead to calcium deficiency disorders and reduced fruit quality. In sweet cherry, declines in xylem functionality during development are associated with reduced firmness, increased pitting, and shortened storability. While plant growth regulators such as naphthaleneacetic

acid (NAA) and abscisic acid (ABA) are known to influence vascular development and fruit physiology, there is limited understanding of how early-season PGR applications affect xylem longevity, calcium uptake, and postharvest quality in sweet cherry fruit. The objective of this project is to determine whether early-season applications of NAA and ABA can maintain or enhance xylem functionality in developing sweet cherry fruit. Specifically, this study asks whether PGR treatments can improve calcium uptake, increase fruit firmness, reduce pitting, and extend fruit storability by prolonging functional xylem during critical stages of fruit development. Field trials were conducted using whole-tree sprays of NAA and ABA applied at multiple concentrations during early fruit development. Fruit was sampled at key developmental stages and at commercial harvest to assess xylem functionality using acid fuchsin dye staining and image analysis. Fruit quality traits including calcium concentration, firmness, size, color, and postharvest performance were measured, with data analyzed to compare treated and untreated fruit across developmental stages. This study is expected to show that NAA and ABA treatments prolong xylem functionality in developing sweet cherry fruit. Improved vascular function is anticipated to increase calcium uptake, enhance fruit firmness, reduce pitting, and improve storage performance relative to untreated controls. These findings will contribute to a better understanding of the physiological mechanisms linking xylem function, calcium transport, and fruit quality in sweet cherry. By identifying PGR strategies that improve vascular longevity and fruit firmness, this research may inform orchard management practices aimed at improving fruit quality, reducing postharvest losses, and enhancing the economic sustainability of sweet cherry production.

WHEAT BREEDING FOR HEAD BLIGHT RESISTANCE

Presenter(s): Ella DeRuiter
Category: Plant Sciences
Mentor(s): Aaron Newberry (College of Agriculture & Natural Resources), Amelia Orr (College of Agriculture & Natural Resources), Eric Olson (College of Agriculture & Natural Resources), Sammy Mitchell (College of Agriculture & Natural Resources)

Fusarium is a fungal pathogen that causes head blight in wheat which impacts yield by producing damaged kernels infected with toxins that are unsafe for consumption. It is important to understand what cultivars have higher resistance and incorporate them into Michigan wheat varieties. What is Wheat Fusarium Head Blight, and how does this disease affect wheat production, future cultivar creation, and implementation into Michigan fields? Wheat with exceptional grain quality was selected for an artificially induced Fusarium Head Blight (FHB) pressure in an isolated and well misted field location. Once the season ends and the wheat is processed, it is sent for genetic testing to identify accumulation of vomitoxins in response to the pathogen. Expected results find cultivars that are still susceptible, and cultivars that have gained some form of resistance to Fusarium. Wheat is an important crop as it is crucial for global food security and is especially important for Michigan's economy. With a destructive fungus like Fusarium, Michigan State University plays an important role by participating in experimental trials that cultivate wheat with resistance to ensure continued improvements in production and economic viability.

A BUGGY SITUATION: NITROGEN'S IMPACT ON INSECT DIVERSITY IN VARIED PLANT COMMUNITIES
Presenter(s): Sam Manson
Category: Plant Sciences
Mentor(s): Mark Hammond (College of Natural Science)

Plants provide insects with and can alter the available resources within their environment. The addition of nitrogen into a plant community increases productivity, but decreases plant species richness by shifting functional group dominance. This nitrogen increase, in turn, causes a cascading effect that may also reduce insect diversity. As human practices continue to influence our environment, there is increased nitrogen availability in terrestrial ecosystems. Studying the response of nitrogen across different communities present, including insects, can elucidate the severity of the consequences that increased nitrogen has on an ecosystem. The question I aim to answer is this: How is insect diversity impacted by the addition of nitrogen in different perennial plant community groups? I surveyed three plant communities (prairie, early successional, and native grasses) located in the GLBRC Biofuel Cropping System Experiment plots at Kellogg Biological Station. Each plot housed two strips- one with long-term nitrogen addition and one without. For each strip, I conducted net sweeps in order to collect present insects, which were then counted and identified to the family level. It was found that insect communities are more diverse and insect abundance may be increased in forb-dominated systems compared to grasses. Although there were not stark differences between the nitrogen and no-nitrogen addition treatments, long-term nitrogen deposition could shift communities away from forbs, risking the loss of insect biodiversity. Insects provide vital services for us, such as pollination and predation of pests, underscoring the importance of conserving their diversity.

CHLOROPHYLL WANT TO PLAY DISC-GOLF? - ANALYZING PHOTOSYNTHESIS ACROSS LAND TYPES
Presenter(s): Jasmine Chalmers
Category: Plant Sciences
Mentor(s): Claudia Colligan (College of Natural Science), Emily Josephs (College of Natural Science), Magie Williams (College of Natural Science)

Have you ever seen plants fighting their way through sidewalk cracks? This simple notice led to the question of whether urban oases are doing their job in supporting plants. Stressed plants have been shown to not photosynthesize to their best ability. In previous observations, Borodinia laevigata, a brassicaceae species similar to the model organism Arabidopsis, was seen in both rural and urban environments, such as disc golf courses. I will be assessing the phenotypic and genetic differences between rural and urban oasis populations to compare their photosynthetic capabilities. Chlorophyll content will account for any chlorophyll stress while leaf number and rosette width will measure overall fitness and greenery. Leaf DNA will also be used to indicate any natural selection. Comparing the photosynthetic performances of these areas will indicate any adaptations or failures of urban populations.

GREENCUTDB: A CLOUD-NATIVE WEB DATABASE FOR PHOTOSYNTHETIC GENE DISCOVERY AND RESEARCH
Presenter(s): Dong Duong
Category: Plant Sciences
Mentor(s): Berkley Walker (College of Natural Science), Ryan Mosley (Information Technology Services)

One-third of all photosynthesis-related genes have no known function. Six research groups studying different photosynthetic organisms work toward filling that gap, but their data has historically lived in fragmented spreadsheets and external databases. GreenCutDB consolidates gene metadata for five photosynthetic organisms into a single searchable web application: Arabidopsis thaliana, Chlamydomonas reinhardtii, Synechococcus 7942 and 7002, Synechocystis 6803, and Anabaena 7120. These span the full photosynthetic lineage from cyanobacteria to land plants. A central feature is the Homologous Group system, which links functionally related genes across species so that a finding in algae immediately surfaces its counterparts in land plants. Researchers can filter and sort genes by multiple criteria, access structured metadata including links to TAIR and UniProt, view related publications, and export results as CSV for downstream analysis. Gene detail pages support researcher annotations with rich-text editing. The system authenticates through MSU Unified Login and enforces access control on all API endpoints. GreenCutDB was developed in collaboration with researchers at the MSU-DOE Plant Research Laboratory.

TOMATO DEVELOPMENT DRIVES THE PRODUCTION OF DISTINCT ROOT ACYLSUGARS
Presenter(s): Savannah Himebaugh
Category: Plant Sciences
Mentor(s): Rachel Kerwin (College of Natural Science)

Plants in the Solanaceae family including cultivated tomato (Solanum lycopersicum) and wild tomato (S. pennellii) produce acylsugars, a type of specialized metabolite, that are critical to herbivory defense. Acylsugars are composed of a sugar core decorated with acyl chains. Acylsugars are known to accumulate in trichomes-leaf and stem hairs-as well as young root hairs in both tomato species. Trichome acylsugars act as sticky fly paper, but the function of root acylsugars is unknown. Trichome and root acylsugars are produced in dedicated cells through independent biosynthetic pathways, each with distinct enzymes. The trichome pathway synthesizes acylsucroses in both tomato species and acylglucoses in wild tomato, while the root pathway produces inositol-based acylsugars in young roots of both species. Preliminary evidence suggests that mature cultivated tomato plants produce structurally different acylsugars in roots compared to trichomes and young roots suggesting the presence of a third biosynthetic pathway. This project aims to characterize root acylsugar profiles in cultivated and wild tomato across development and compare the profiles across age and tissues within and between the two species. The second part of this project is to identify when the developmental transition occurs in order to identify candidate genes for the hypothesized mature root acylsugar pathway. I grew cultivated and wild tomatoes hydroponically, collected tissue and root exudate samples at 12 time points ranging 10-120 days, and analyzed the acylsugar profiles using liquid chromatography-mass spectrometry. I will

present mass spectrometry chromatograms comparing the acylsugar profiles across tissues and ages of both species.

Psychology

GHEEL AS A MODEL FOR THE CONTEMPORARY PARADIGM OF PERSONAL RECOVERY IN COMMUNITY CARE
Presenter(s): Sophia Futo
Category: Psychology
Mentor(s): John Waller (College of Social Science)

Often regarded as the oldest colony for community mental health care in the world, the town of Gheel in Belgium has provided a lasting framework for the successful implementation of community-based care systems globally. This project will explore the comprehensive history of the Gheel colony and investigate the roots of its enduring success, which has earned it recognition as a model for community mental health care. The study will examine Gheel's religious foundations and how they have shaped its care structure, tracing its evolution from the Middle Ages to the present day. In addition, this project will analyze the governance and regulation of Gheel's care model, focusing on key transitions in authority-from Belgian government oversight in the 1850s, to its later autonomy as a Flemish Public Institution, and its current integration into the OPZ (Public Psychiatric Hospital) system. By investigating the unique blend of religious influence, community involvement, policy development, institutional leadership, and a genuine care for others that has sustained Gheel for centuries, this project seeks to identify practical insights for improving contemporary community mental health care programs in the United States. A comparative analysis of Gheel's historical practices and current U.S. community care approaches will further highlight areas for potential reform and innovation.

THE MORNING AFTER MELATONIN: COGNITIVE COSTS OF A COMMON SLEEP AID
Presenter(s): Alianna Kannu, Nicole Roque
Category: Psychology
Mentor(s): Kimberly Fenn (College of Social Science)

Melatonin is an endogenous hormone secreted by the pineal gland that regulates circadian rhythms. It is widely used as an over-the-counter supplement to promote sleep. Despite its popularity, there is no evidence regarding its effects on sleep quality and next-day cognitive functioning in healthy young sleepers. Prior research from our laboratory suggests that melatonin does not improve sleep quality in this population and may impair aspects of morning cognition, particularly attention and alertness. The present study examines the effects of exogenous melatonin on sleep, mood, and cognitive performance in healthy young sleepers using a randomized, double-blind, placebo-controlled design. Participants completed an evening laboratory session and a morning laboratory session, separated by an overnight sleep period. During the evening session, participants complete baseline assessments of sleepiness and

mood, followed by cognitive tasks measuring sustained attention and place-keeping. Saliva samples are collected to measure melatonin concentrations both before and after participants are randomly assigned to receive either 5 mg melatonin, 10 mg melatonin, or a placebo. Sleep is monitored overnight using a Fitbit tracker and sleep diaries to capture both objective and subjective sleep measures. In the morning session, participants repeat assessments of sleepiness, mood, and cognitive performance and provide additional saliva samples. We hypothesize that melatonin will not significantly improve objective sleep quality but will increase morning sleepiness and impair attentional performance and place-keeping. These findings will clarify the cognitive and behavioral effects of melatonin in healthy sleepers and inform more cautious, evidence-based supplement use in populations without diagnosed sleep disorders.

ATTACHMENT STYLE AND RISK TAKING BEHAVIOR THROUGH BALLOON ANALOGUE RISK TASK (BART)
Presenter(s): Ha Tran
Category: Psychology
Mentor(s): Joseph Cesario (College of Social Science)

Attachment theory posited that early caregiver relationships significantly shaped emotional and behavioral patterns in adulthood. While previous research had explored personality influences on risk-taking, there was limited investigation into how attachment styles shaped decision-making patterns. This study examined the relationship between attachment styles and risk-taking tendencies through the lens of life history theory. Participants from Michigan State University completed the Experiences in Close Relationships-Revised (ECR-RS) Questionnaire to assess anxiety and avoidance dimensions, and the Balloon Analogue Risk Task (BART) to measure risk-taking behavior. We hypothesized that individuals scoring low on both anxiety and avoidance dimensions (secure attachment) would exhibit greater risk-aversion, reflecting slow life history strategies characterized by stability and delayed gratification. In contrast, individuals high on anxiety or avoidance dimensions were expected to demonstrate greater risk-taking, adopting fast life strategies due to early environmental unpredictability. A multiple regression analysis examined how anxiety and avoidance predicted risk-taking behavior. This research aimed to examine how early caregiving environments influenced decision-making patterns across financial, social, and health-related domains, contributing to our understanding of the developmental aspects of risk-taking behavior.

DOES ALCOHOL MAKE YOU MORE CREATIVE? THE EFFECTS OF ALCOHOL ON IMAGINATION AND CREATIVITY
Presenter(s): Izabela Terolli, Kruti Bommaraju, Maria Nosovska, Sophia Sarsam
Category: Psychology
Mentor(s): Bayavuya Moyakhe (College of Social Science)

Creativity involves generating novel and meaningful ideas, images, or associations and plays a key role in everyday problem-solving and imaginative thinking. Understanding whether alcohol makes people "more creative" requires examining how alcohol consumption influences the cognitive processes that

support imagination and idea generation. Prior research suggests that alcohol can reduce cognitive control, allowing thoughts to flow more freely and facilitate unusual or remote associations. However, alcohol also impairs focused attention, working memory, and the ability to evaluate or refine ideas, which suggests its effects may vary across stages of the creative process. Alcohol-related shifts in attention, such as reduced focus or increased associative thinking, may encourage imaginative connections but can also hinder accuracy and performance on tasks requiring careful judgment. Together, these findings imply that alcohol may enhance some aspects of creativity while impairing others, leaving its overall impact on imagination and creative thinking unclear. The present study investigates how alcohol consumption relates to imagination and creativity using validated self-report measures. Alcohol use will be assessed with the Alcohol Use Disorders Identification Test (AUDIT), and imagination and creativity will be measured using creativity-related items from the International Personality Item Pool (IPIP). We hypothesize that higher alcohol consumption will be associated with greater spontaneous, flexible idea generation but lower performance on tasks requiring focused evaluation, organization, or cognitive control.

PRESCRIPTION HORMONE THERAPY AND BINGE EATING SYMPTOMS IN PERIMENOPAUSAL WOMEN: EVIDENCE OF AN ASSOCIATION

Presenter(s): Cierra Guinn
Category: Psychology
Mentor(s): Kelly Klump (College of Social Science), Kristen Culbert (College of Social Science)

Endogenous ovarian hormone fluctuations and exogenous hormone use influence risk for binge eating (BE) in adolescence and young adulthood, but their relevance to midlife remains unclear. Perimenopause is a period of pronounced hormonal flux, and many women use prescription hormone therapy (HT) to manage menopausal symptoms. This study examined whether prescription HT use is associated with elevated BE during the menopause transition. Participants were 206 perimenopausal women (ages 40-59) from the Women's Health during Midlife study who were recruited via the population-based Michigan State University Twin Registry. Prescription HT use was assessed via the Menopause Questionnaire. BE symptoms were assessed with the Minnesota Eating Behaviors Survey and daily, for 35 consecutive days, using the Dutch Eating Behavior Questionnaire. Perimenopausal women currently taking prescription HT reported higher mean levels of BE symptoms than non-users (Cohen's d ~.30), even after accounting for age, body mass index, and past HT use. Overall, findings indicate a link between prescription HT use and elevated BE among perimenopausal women. Future research should clarify the directionality of this relationship and elucidate why and for whom HT use may be associated with elevated BE.

ATTENTION CONTROL IMPAIRMENTS FOLLOWING SLEEP DEPRIVATION
Presenter(s): Abbie Church, Anvika Gottumukala
Category: Psychology
Mentor(s): Kimberly Fenn (College of Social Science)

Insufficient sleep impairs vigilant attention; however, less is known about how acute sleep loss affects different facets of attention control. The present study examined how one night of total sleep deprivation affected two facets of attention control: sustained attention and inhibitory control, as well as higher-order cognitive processing, in a large sample of undergraduate students. Participants first completed an evening laboratory session that included a battery of cognitive tasks and heart rate variability (HRV) was also measured. Participants were then randomly assigned to either remain awake overnight in the laboratory or obtain a normal night of sleep at home with objective sleep monitoring. All measures were repeated the following morning. Sleep deprivation significantly impaired performance across measures of attention control. These impairments were most pronounced for sustained attention, whereas inhibitory control showed smaller, but reliable, deficits. Sleep deprivation also reduced performance on higher-order cognitive tasks measuring task switching and problem solving. In addition, HRV was lower following sleep deprivation, consistent with expected physiological changes after acute sleep loss. Together, these findings demonstrate that a single night of sleep deprivation broadly impairs attention control, with particularly strong effects on sustained attention. Sleep loss may disrupt the ability to maintain stable attentional engagement over time, offering insight into how insufficient sleep contributes to lapses in performance during tasks requiring prolonged focus.

PRENATAL HEALTHCARE EXPERIENCES FOR WOMEN IN IRAQ
Presenter(s): Aesha Zakaria
Category: Psychology
Mentor(s): Alytia Levendosky (College of Social Science)

Women globally face health disparities, especially in conflict-affected regions like Mosul, Nineveh, Iraq-formerly occupied by ISIS-where healthcare systems have been destroyed, healthcare disparities exacerbated, and peripartum healthcare systems have been impacted (Younis & Khudhiar Lafta, 2021). Our study examines peripartum healthcare disparities, aligning with the UN's Sustainable Development Goal #3 on Universal Healthcare (Taniguchi et al., 2021). We interviewed 20 postpartum Muslim women of diverse ethnic and socioeconomic backgrounds, who gave birth within 0-6 months prior to their interview and received healthcare in the Nineveh governate. Participants were recruited through public and private clinics and through social media. Those passing screening criteria were scheduled for private interviews at participating clinics. Each 20-30-minute interview included 14 questions asking women to reflect on their experiences in regard to healthcare access, affordability, healthcare providers' treatment, as well as the impact of these experiences on their mental and physical health throughout their pregnancy. We are using grounded-theory framework to generate qualitative analysis of themes from the women's responses. Preliminary results indicate strong disparities between women receiving healthcare in the private vs. public sectors, and between women from low vs. high socioeconomic backgrounds. Mental health is notably under-emphasized in the public sector and under-addressed

among low-socioeconomic income women. By centering the voices of women in post-conflict Iraq, we aim to highlight how Muslim communities affected by regional violence conceptualize mental health. This research contributes to empirical work to inform the development of more equitable and accessible healthcare systems while de-stigmatizing mental health in Muslim-majority communities/countries.

WHO KNOWS YOU BEST? REPLICATING SELF-OBSERVER AGREEMENT IN BIG FIVE PERSONALITY JUDGMENTS BY OBSERVER TYPES
Presenter(s): Abby Marek, Muskaan Arya
Category: Psychology
Mentor(s): Brent Donnellan (College of Social Science), Hyewon Yang (College of Social Science), Lindsay Ackerman (College of Social Science), Richard Lucas (College of Social Science)

Lee et al. (2024) examined self-observer agreement in personality among Dutch university students using self-reports and observer reports from parents, siblings, friends, and romantic partners. Agreement between targets and informants on personality traits was moderate to strong when considering correlations between self-reports and observer reports. However, the pattern of self-observer agreement varied by relationship type: parents of the target perceived them as less neurotic, and siblings of the target perceived them as less agreeable, compared to what the targets reported on themselves. The current project replicates and extends Lee et al. (2024) using self-reports (N = 199) and observer reports (N = 622) of the Big Five personality traits (i.e., extraversion, agreeableness, conscientiousness, neuroticism, openness) to investigate how self-observer agreement differs by relationship type. Targets were recruited through an undergraduate subject pool, and they nominated one to four observers, including parents (44.7%), siblings (9.3%), relatives (4.3%), friends (39.2%), and romantic partners (1.6%). Observers reported the number of years they had known the target, their relationship satisfaction, and their closeness to the target. This replication will examine the correlations between self and observer-reported Big Five personality traits. The strength of self-observer agreement will be evaluated as a function of relationship length, closeness of acquaintanceship, and relationship satisfaction. By extending prior research using Big Five personality reports and an additional sample, this study adds to current research on how relational characteristics shape the accuracy of personality judgements with implications for the validity of observer reports in personality research.

NAVIGATING LEADERSHIP AT MICHIGAN STATE UNIVERSITY: A MIXED-METHODS STUDY OF WOMEN'S WORKPLACE EXPERIENCES AND WELL-BEING
Presenter(s): Elif Yazgan
Category: Psychology
Mentor(s): Aldo Barrita (College of Social Science)

Women's representation in higher education leadership has grown over the past several decades, yet systemic gendered challenges remain deeply woven into organizational structures. Research on gender and leadership continues to show that gender bias shapes how women leaders are evaluated and supported. Because leadership is still widely associated with masculine traits, women leaders often face

a misalignment between societal expectations of women and the "leader prototype." As a result, they frequently encounter heightened pressure to prove legitimacy in ways that their male counterparts do not. While national research shows that women leaders face gendered expectations, discrimination, and emotional labor burdens that can undermine well-being, MSU specific data is very limited. This project examines how women in leadership roles at Michigan State University experience workplace support, discrimination, and psychological well-being, integrating quantitative and qualitative methods to inform evidence-based strategies for equitable leadership. Our main research question is: How do women leaders at Michigan State University perceive the relationship between their leadership roles, workplace support and discrimination experiences, and their psychological well-being and future aspirations?Approximately 150 women in leadership positions at MSU will complete a 20-30 minute Qualtrics survey including quantitative measures of psychological well-being, workplace support, workplace discrimination, and leadership outlook, along with open-ended reflections about leadership experiences. Quantitative analysis will examine associations among well-being, organizational support, experiences of bias, and career outlook, while qualitative analysis will identify thematic patterns shaping women's leadership trajectories, well-being, and future aspirations.

GETTING UNDER THE SKIN: EXPLORING BIOMETRIC RESPONSES TO IDENTITY, STATUS, AND FEEDBACK
Presenter(s): Liam Peck
Category: Psychology
Mentor(s): Quinetta Roberson (Eli Broad College of Business)

Workplace diversity research has explored how social identity, status hierarchies, and feedback dynamics shape employee attitudes and performance. However, less is known about the physiological consequences of diversity-related interactions, particularly during evaluative exchanges such as performance feedback. Drawing on the social identity and status characteristics literatures, this project develops a conceptual model linking diversity-related workplace experiences to acute physiological stress responses. The experimental design underlying this research involves dyadic interactions in which participants complete a professional writing task and exchange either positive or negative feedback under manipulated status conditions. Physiological responses are captured using wearable biometric devices to assess heart rate and related indicators during baseline, task engagement, and live feedback exchange. The design allows examination of how social similarity versus difference, perceived status asymmetries, and feedback valence may shape stress reactivity in real time. This project primarily synthesizes extant research on diversity-related phenomena - including identity threat, evaluation apprehension, stereotype activation, and power dynamics - and integrates this work with physiological stress frameworks. The resulting conceptual model proposes that diversity cues and status signals influence cognitive appraisal processes, which in turn drive autonomic stress responses during interpersonal workplace exchanges. By bridging diversity scholarship with psychophysiological measurement, this research advances understanding of how interpersonal dynamics "get under the skin" and affect employee well-being.

A NARRATIVE MIXED METHODS STUDY OF LIFE CHALLENGES IN THE PSYCHOSIS SPECTRUM
Presenter(s): Abigail Brooke
Category: Psychology
Mentor(s): Anna Benedict (College of Social Science), Henry (Raffles) Cowan (College of Social Science)

Psychotic disorders often severely impair functioning and well-being. Therefore, it is essential to understand factors that support positive trajectories in the early clinical stages of psychosis. Narrative identity, which is the internalized life story individuals construct, relates to well-being and differs across psychosis stages. Mixed-method narrative studies offer a framework for incorporating lived experience into research. Narrative questions regarding individuals' greatest life challenges uniquely reveal prominent issues in people's lives and how they overcome them. This mixed-methods study (n = 48) examines how emotional resolution of greatest life challenges differs by functioning and clinical stage (healthy controls [HC], clinical high risk [CHR], first episode of psychosis [FEP]) among adolescents and young adults (ages 12-25). Participants were classified into high- and low-functioning groups using the Global Functioning Scale. Emotional resolution of narratives was quantitatively coded on a 4-point scale and analyzed using one-way ANOVA. Topics of the challenges were examined qualitatively using an iteratively adapted coding framework to identify thematic differences across clinical diagnosis and functioning. We anticipate that individuals with higher functioning will have greater emotional resolution, and more mundane, role-related topics in their life challenges (e.g., school/work). We also anticipate that individuals with more advanced illness would have lower emotional resolution, and more severe topics in their life challenges (e.g., interpersonal conflict). By integrating quantitative and qualitative analyses of narrative identity, this study aims to identify protective factors associated with resilience and quality of life in early psychosis, informing patient-centered interventions to reduce risk for negative outcomes.

SHEDDING LIGHT ON ATTENTION: THE EFFECTS OF BLUE LIGHT ON ATTENTION CONTROL
Presenter(s): Drew Mendians, Emma Shilton
Category: Psychology
Mentor(s): Kimberly Fenn (College of Social Science)

Light is a key regulator of human circadian rhythms. Blue wavelength light, in particular, has the greatest influence on circadian rhythms due to its short, high-energy wavelength. These wavelengths stimulate photosensitive retinal cells, which detect light and communicate with the brain to regulate circadian timing. Prior research suggests that blue light may improve vigilant attention and increase functional connectivity in the brain. We examined if blue light exposure affects attention control during the mid-afternoon circadian dip. Upon arrival, participants were pseudo-randomly assigned to one of two experimental conditions: Blue light or control (no blue light). All participants wore Luminette 3 light therapy glasses which project blue light into the retina. Participants assigned to the blue light group received blue light exposure for thirty minutes at 1000 lux, the setting that contained the purest form of blue light. Participants in the control group wore the same glasses for the same duration but received no light exposure (the glasses were turned off). After the intervention, participants performed several tasks measuring sustained attention, inhibition, working memory, and task switching. We found that blue light

generally improved sustained attention, but did not have a significant effect on inhibition, working memory, or task switching, suggesting that blue light may only enhance certain aspects of attention control. Despite early evidence suggesting that blue light enhances cognitive performance, our well-powered study found that its effects are limited to low level cognitive processing, suggesting blue light has limited effectiveness to broadly enhance cognition.

CAREGIVER'S PERCEPTIONS OF MENTAL HEALTH SUPPORT FOR AUTISTIC YOUTH
Presenter(s): Elizabeth Antrassian, Kayla Michael, Maddie Kauffman
Category: Psychology
Mentor(s): Emma Chatson (College of Education), Kristin Rispoli (College of Education), Sam Turecki (College of Education)

Autism spectrum disorder is a neuro-developmental disability characterized by social communication challenges, restricted and repetitive patterns of behavior or interests, and sensory differences. Autistic youth are at higher risk for mental health challenges, such as depression and anxiety, given challenges with communication, emotion regulation, and socialization (Kerns et al., 2020; Duong et al., 2021). Compounding the high rates of mental health challenges, specialized service providers for autistic youth are limited, reducing caregivers' options in seeking support for their children (Garbacz et al., 2016). Presently, less is known about caregivers' unique experiences supporting the mental health needs of their autistic youth. Furthermore, there is limited literature regarding strategies caregivers can use to support the unique experiences of autistic youth with mental health challenges. Data for the present study were drawn from a larger qualitative study exploring the experiences of caregivers, school professionals, and autistic students in identifying and seeking services to promote mental health challenges. Study aims include (1) understanding caregivers' experiences supporting the mental health of autistic youth and (2) identifying caregivers' needs in supporting the mental health needs of youth. Two-hour, virtual focus groups were conducted with N = 11 caregivers and school professionals. The researchers will conduct thematic analysis for qualitative coding (Braun & Clarke, 2021). Results will inform the adaptation of a consultation framework, COMPASS-MH, to promote family-school collaboration in supporting the mental health of autistic middle school students (Rispoli & Lee, 2023).

EVIDENCE FOR TWO SIMULTANEOUSLY ACTIVE ATTENTIONAL TEMPLATES IN VISUAL WORKING MEMORY
Presenter(s): Sofiia Shchur
Category: Psychology
Mentor(s): Syd George (College of Social Science), Taosheng Liu (College of Social Science)

The contents of visual working memory (VWM) can function as attentional templates, thought to actively guide attention to relevant features in the environment. However, it is debated how many templates can concurrently guide attention. In the current experiments, we aim to adjudicate two different hypotheses. Under the single-item template (SIT) hypothesis, attentional templates are activated sequentially in alternation rather than simultaneously, whereas the multiple-item template (MIT) hypothesis proposes

simultaneous guidance by multiple active templates. In both experiments, we use a briefly presented (33ms) random dot color coherence stimulus to mitigate the possibility of template switching. Participants were shown either a signal display that contained an overrepresentation of a color or a noise display that did not contain any overrepresented color; they were asked to detect the coherence signal. In the first experiment, participants were either given zero, one or two cues at the beginning of each trial, which indicated the coherent color signal, if it was present. We found reduced detection sensitivity in two-cue compared to one-cue trials, accompanied by an increased false alarm rate. This pattern of result was replicated in the second experiment, where we introduced a colored-line mask to interrupt the iconic memory processing to further reduce the possibility of template switching, as well as a second noise display that contained both cued colors on two-cue trials. Overall, our results contradict the SIT model and suggest that VWM can contain at least two active attentional templates to guide behavior.

ASSOCIATIONS BETWEEN ANXIETY AND DEPRESSION AND ERROR-RELATED BRAIN ACTIVITY
Presenter(s): Danielle Tse, Tristan Janisse
Category: Psychology
Mentor(s): Jason Moser (College of Social Science)

Error monitoring involves detecting mistakes and can facilitate adjustments to future behaviors to limit errors. The error-related negativity (ERN), an event-related potential found within EEG, is a negative deflection peaking between 50-150ms on the midline of the scalp in response to making an error. The ERN has been shown to reflect cognitive deficits in psychopathology, where depressive symptoms are associated with blunted ERN amplitudes and anxiety symptoms are associated with enlarged ERN responses. The effects of anxiety and depression on the ERN has been inconsistent, with some studies suggesting an offsetting effect of the two forms of psychopathology, whereas others deny the interplay or effect of psychopathology on error monitoring physiology altogether. Given the high comorbidity between anxiety and depression, the relationship between anxiety, depression, and the ERN remain unclear. One model of the co-occurrence of anxiety and depression, termed the tripartite model, lays out general distress, physiological hyperarousal, and anhedonia as three core constructs. Investigating the transdiagnostic mechanisms underlying both anxiety and depression in relation to error monitoring may provide valuable insight into the diverging effects of anxiety and depression on the ERN. Therefore, this study will investigate the effect of physiological hyperarousal and anhedonia on the ERN using a multiple linear regression model. We hypothesize that physiological hyperarousal will translate to increased amplitude of the ERN, whereas elevated anhedonia will result in a lower ERN amplitude.

HEALING TRAUMA THROUGH CREATIVITY: THE BENEFITS OF ART THERAPY FOR ADOLESCENTS
Presenter(s): Madilyn Moore
Category: Psychology
Mentor(s): Lorelei d'Andriole (College of Arts & Letters)

My interest in art served as a protective factor throughout my adolescence and was foundational to forming my identity and self-expression. My experience as a youth mentor has led me to witness the same benefits of art in my youth. Art became a safe place for her to describe her experiences, and she felt much more comfortable to speak openly after. Currently, as a fourth year psychology student, art therapy has been a major subject of interest that I'd like to research further. I strongly believe that art provides an outlet for expression that can be extremely beneficial for mental wellbeing. Having an outlet is especially important for Adolescents, who are learning to navigate new social and and personal experiences.

DOES EXERCISE INTENSITY BUFFER STRESS-RELATED EMOTIONAL EATING? EVIDENCE FROM AN UNDERGRADUATE SAMPLE
Presenter(s): Lily Cassel
Category: Psychology
Mentor(s): Blair Burnette (College of Social Science), Sydney Damon (College of Social Science)

Stress is associated with a reduced capacity to eat for physical rather than emotional reasons, placing individuals at risk for disordered eating. Exercise may help reduce stress and protect against this risk. This study examined whether stress associated with eating for physical rather than emotional reasons, and if this association differed by exercise intensity. We hypothesized that stress would be negatively associated with eating for physical rather than emotional reasons and that this association would vary by exercise intensity, being weakest at moderate intensity. Participants were U.S. undergraduates (N = 2066; M age = 19.53, SD = 1.74); 73.4% identified as female, 22.0% male, 1.7% trans/nonbinary/other, and 2.9% unspecified. The sample was 34.8% White, 4.6% Black, 3.5% East Asian, 3.5% South Asian, and 53.6% other/unspecified. Surveys assessed eating for physical rather than emotional reasons, physical activity intensity (low, moderate, vigorous), and stress over the past two weeks. A linear regression model with an interaction (stress*exercise intensity) examined whether exercise intensity moderated the association between stress and eating for physical rather than emotional reasons. The overall model was significant, $F(8,767) = 3.4$, $p < .001$, adjusted $R^2 = .02$. However, neither stress ($b = -0.17$, $p = .14$), exercise intensity ($b = 0.08$, $p = .50$), nor their interaction ($b = 0.01$, $p = .84$) were significantly associated with eating for physical rather than emotional reasons. Findings suggest further research is needed to clarify how, when, and for whom stress relates to emotional eating and what factors may protect against this.

EXAMINING THE RELATIONSHIP BETWEEN FREQUENCY OF CAREGIVER GIVEN OPPORTUNITIES FOR IMITATION AND CHILD IMITATION SKILLS
Presenter(s): Elizabeth Doran, Hala Shaaban, Michael Vu, Stephanie Barroso
Category: Psychology
Mentor(s): Brooke Ingersoll (College of Social Science), Isabella Babore (College of Social Science)

Introduction: Imitation is central to early social communication development by supporting language learning and reciprocal interactions (Bates et al.,2014). Imitation progresses early and builds language, play, and joint attention. Children with autism may exhibit limited imitation skills (Ingersoll, 2008). Adult language input has shown to contribute to language acquisition of autistic children (Smith et al., 2023). However, little research has been done to understand how adult input can influence imitation skills. Objective: This study investigates whether caregiver use of models and opportunities for imitation is related to child imitation skills. Methods: The RISE study collected videos to assess caregiver RIT use across assessment and early intervention session recordings. Parent opportunities for imitation were scored during a 10-minute parent-child free play interaction. Caregivers also completed an online self-reported survey, The Parent Interview for Autism-Clinical Version (PIA-CV). The motor imitation subscale of the PIA-CV was used to gather parent-reported data of child imitation skills. Results: A Spearman's correlation was used to examine the relationship between the child's imitation skills (interval) and the frequency of opportunities for imitation (ranked). The analysis was statistically insignificant, $r_s(164) = -.114$, $p = .148$. Conclusion: The number of opportunities that caregivers provide for imitation was not related to their child's imitation skills as assessed via parent report. Data was concurrent. Future studies should aim to understand additional predictors that may influence caregivers' use of imitation opportunities.

LIFESPAN PERCEPTIONS OF EVENT-RELATED PERSONALITY CHANGE
Presenter(s): Lena Youngs, Mariana Rodrigues de Paiva Peralva
Category: Psychology
Mentor(s): Josephine Fealy (College of Social Science), Ted Schwaba (College of Social Science)

How commonly do life events affect personality across the lifespan? Lifespan and social investment theories that major life events can shape personality development, with younger adults who experience frequent role transitions and identity exploration being especially likely to perceive personality change, whereas middle aged and older adults may view their personalities as more stable. We tested this pre-registrated hypothesis using archival panel data from the Longitudinal Internet Studies for the Social Sciences (LISS), a representative sample of the Dutch population. We estimated age differences in perceived event-related personality change among participants aged 16-95 who completed the Life Events Study Questionnaire (N=5,513). Participants reported whether a life event in the past 10 years changed who they are as a person and indicated the perceived impact of that event on personality traits. Supporting our hypothesis, older age was associated with a lower likelihood of perceiving an event-related personality change ($r = -.18$, $p < .001$), and logistic regression showed that with each additional year of age, the odds of personality change decreased by 2.02%. The data showed that perceived personality change increased from adolescence into early adulthood, peaking around age 30, and then

declined across the remainder of adulthood. Overall, these findings support lifespan and social investment theories that emphasize early adulthood as a key developmental period for personality change and highlight age-related differences in how individuals interpret the psychological impact of life events.

SOCIOECONOMIC CONTEXT, NARRATIVE IDENTITY, AND LIFE SATISFACTION IN EARLY PSYCHOSIS
Presenter(s): Marlo Lulgjuraj
Category: Psychology
Mentor(s): Anna Benedict (College of Social Science), Henry (Raffles) Cowan (College of Social Science)

Schizophrenia spectrum disorders are associated with substantial functional and psychosocial impairment, and declines in well-being may emerge before diagnosable psychosis onset. Early stages of illness, including clinical high risk (CHR) for psychosis and first episode psychosis (FEP), represent critical periods for shaping recovery-related outcomes. Socioeconomic disadvantage is prevalent in psychosis and linked to poorer functioning and recovery. However, little research has examined how socioeconomic context relates to subjective well-being during these stages. This study examined whether parental income predicts life satisfaction across the psychosis-risk spectrum and whether narrative identity serves as a resilience factor. Narrative agency, defined as viewing oneself as capable of intention, action, and influence, was examined as a moderator of the relationship between income and well-being. Data were drawn from a multi-site dataset of 140 participants across control, CHR, and FEP groups. Analyses included group comparisons and regression models. Results indicated that individuals at CHR for psychosis reported significantly lower life satisfaction than healthy controls ($b = -0.58$, $SE = 0.23$, $p = .014$). Narrative agency showed a positive trend-level association with life satisfaction ($b = 0.38$, $SE = 0.20$, $p = .060$), whereas parental income was not significantly related to well-being ($b = 0.08$, $SE = 0.06$, $p = .22$). CHR participants reported lower life satisfaction than controls in models including agency, income, and diagnostic group ($b = -0.49$, $SE = 0.24$, $p = .049$). Findings suggest reduced life satisfaction may emerge during the CHR period and that narrative agency may function as a resilience factor.

PERCEPTIONS OF PERSONALITY-CHANGING LIFE EVENTS ACROSS ADULTHOOD
Presenter(s): Kennedy Vincent, Marin Richards, Naomi Wilson
Category: Psychology
Mentor(s): Josephine Fealy (College of Social Science), Ted Schwaba (College of Social Science)

Across the lifespan, personality trait development may be influenced by major life events. Lifespan theory suggests that different events may be especially impactful at different ages. We tested whether this using archival panel data from a representative study of the Netherlands, the LISS sample ($N = 5,513$). Participants aged 16-95 completed an open-ended questionnaire where they reported which major life event, if any, most impacted their personality traits in the last 10 years. Supporting our pre-registered hypotheses, we found that the events most commonly perceived as personality-changing differed across younger adults (ages 16-30), middle-aged adults (aged 31-59), and older adults (aged 60+). In particular, younger adults were more likely to recall that their personality was impacted by

educational events, like graduating from college, and older adults were more likely to attribute change to health-related events. However, contrary to our hypothesis, family-related events were more commonly perceived as affecting personality in younger adulthood than middle and older adulthood. Overall, these findings support theories of lifespan development that emphasize the psychological importance of gains in early life and losses in late life.

MOTIVATIONS UNDERLYING VOLITIONAL PERSONALITY CHANGE SEEKING AND THEIR ASSOCIATIONS WITH WELL-BEING
Presenter(s): Dhruv Bhatnagar, Gabriella Otto, Keke Zheng
Category: Psychology
Mentor(s): Brent Donnellan (College of Social Science), Hyewon Yang (College of Social Science), Lindsay Ackerman (College of Social Science), Richard Lucas (College of Social Science)

Past work consistently finds that people want to change their personality, but research is surprisingly scarce regarding motivations underlying why people do or don't want to change. In the present study, we provide a nuanced look into personality change seeking and individual differences in underlying change motivation. Leveraging the strengths of both qualitative and quantitative analyses, we collected open-ended responses to change seeking questions as well as self-report surveys of personality and well-being variables across three US universities (N = 1,680). In Study 1, we first explored themes underlying personality change motivation. We identified three motivational themes for why people seek to change their personality: interpersonal (e.g., how one acts with or is perceived by others), health/well-being (e.g., improving mental, physical health), and achievement (e.g., academic or professional performance). Four themes explained why people do not seek change: acceptance (e.g., content with the self), life outcomes (e.g., personality has led to good things in life), authenticity (e.g., changing would compromise who one is), and lack of motivation (e.g., change not compelling). In Study 2, we will examine the association between change seeking and well-being (e.g., self-esteem, narcissism) using multiple regression analyses. We will explore these associations across change seeking groups (those who do want to change compared with those who do not), as well as across the different motivations identified in Study 1 within a change seeking group. Overall, this study provides new insights into the motivational aspects underlying volitional personality change seeking and their potential associations with well-being.

NARCISSISTIC BEHAVIORS AND PSYCHOLOGICAL NEED SATISFACTION IN ROMANTIC RELATIONSHIPS
Presenter(s): Anna Sarinopoulos
Category: Psychology
Mentor(s): Gwendolyn Seidman (College of Social Science)

This study investigates associations between narcissistic behaviors and need satisfaction in romantic relationships through the lens of Self-Determination Theory (SDT). SDT identifies three needs: autonomy (a sense of freedom), relatedness (feeling close to others), and competence (experiencing self-efficacy). These needs are important for wellbeing, and relationship partners can enable or undermine each other's need fulfillment. This study explores ways those with narcissistic personality traits may

undermine their partners' needs. The Narcissistic Admiration and Rivalry Concept (NARC) describe two strategies narcissistic individuals use to maintain grandiose self-perceptions: admiration (self-promotion) and rivalry (self-defense). In this study, 375 undergraduates completed measures assessing narcissistic admiration and rivalry of themselves and their partners, the extent to which their partners meet their needs for autonomy, competence and relatedness, and a variety of need-undermining behaviors and attitudes. Results revealed that narcissistic rivalry was associated with greater autonomy-undermining behaviors (the use of manipulation, bullying, and autocracy as control tactics in relationships). Rivalry was associated with relatedness-undermining behaviors: less communal and more agentic attitudes about relationships and greater exchange orientation (i.e., the belief that things should be kept even between relationship partners). It was predicted that narcissism would relate to competence-undermining behaviors (less partner enhancement and greater partner blame), but these behaviors were unrelated to narcissism. Perceived partner narcissistic admiration positively predicted competence need satisfaction, whereas perceived partner narcissistic rivalry negatively predicted both competence and relatedness need satisfaction. These findings highlight the distinct relational consequences of admiration and rivalry, with implications for understanding how narcissistic partner behaviors undermine wellbeing.

DOES THE STATUS OF THE LISTENER MATTER? CHILDREN'S STORYTELLING DECISIONS FOR PEERS VERSUS AUTHORITY FIGURES

Presenter(s): Avery Shippe, Emily Foltz, Kennedy Kaliszewski
Category: Psychology
Mentor(s): Meltem Yucel (College of Social Science)

Gossip, evaluative talk about other people, is a common way people share social information, and may be shaped by who the listener is. Adults and even young children talk about themselves and others. Recent research has shown that 5- to 7-year-old children believe actors (those who participate in an act) are more appropriate storytellers than observers (those who saw them do it). Less is known about how 4- to 8-year-olds decide who should tell one's story, and whether these judgments differ across peer versus authority audiences. In the current study, children hear a story in which an actor does a trick on the slide at school while an observer watches. They then judge who should tell the story to either the teacher or a classmate, how permissible it is, and why. Data collection is currently underway. We hypothesize that children will judge storytelling as more permissible when done by the actor rather than the observer and more permissible when shared with a peer than an authority figure. This study will clarify how children's emerging norms for information sharing vary across horizontal (peer) versus vertical (authority) contexts, including their permissibility judgments and justifications.

IMPACT OF DIFFERENTIAL DIMENSIONS OF PARENTAL BEHAVIOR ON YOUTH AGGRESSION AMONG MONOZYGOTIC TWINS
Presenter(s): Harini Sangeetham, Riya Nair, Sophia Jansen
Category: Psychology
Mentor(s): Alex Burt (College of Social Science), Logan Gillenwater (College of Social Science)

Parenting is one of the strongest predictors of youth aggression (AGG). Importantly, however, neither parenting nor youth AGG are unidimensional constructs. AGG includes physical aspects of aggression (fighting) and social aspects of aggression (gossiping). Parental behavior similarly includes both positive behaviors (involvement) and negative behaviors (conflict). In this study, we will investigate parent-child conflict and involvement as differential predictors of distinct sub-types of AGG. To ensure that results reflect environmental associations between parenting and AGG, rather than genetic confounds, analyses will be conducted in a sample of 850 monozygotic youth twins and their primary caregivers. Parent-child conflict and involvement were measured via child- and parent-report on the Parental Environment Questionnaire. Relational and physical aggression were measured via parent-report on the Subtypes of Antisocial Behavior scale. We will utilize a multivariate multiple regression model that will simultaneously predict physical and relational aggression with both dimensions of parental behavior. Sex, age, race/ethnicity, and socioeconomic status will be included as covariates. We hypothesize that conflict will be a stronger predictor of physical aggression while involvement will be a stronger predictor of relational aggression. We also hypothesize that these associations will be environmental in origin (i.e., they will persist within discordant monozygotic twin pairs). Positive findings would suggest that different dimensions of parental behavior differentially predict subtypes of AGG, potentially informing the development of targeted, behavior-specific parenting interventions.

PREDICTABLE PERFORMANCE AND UNPREDICTABLE FATIGUE: RESILIENCE IN SONAR MONITORING
Presenter(s): Jessica Belknap
Category: Psychology
Mentor(s): Kimberly Fenn (College of Social Science)

Sustained attention is essential to operational environments such as sonar monitoring, where missed signals can have dire consequences. Sonar operators must classify nearby ships based on dynamic auditory and visual cues. This is typically done over extended periods, where time-on-task fatigue increases the likelihood of attentional lapses. We examined whether cognitive abilities predict either task performance or resistance to fatigue during a four-hour simulated sonar monitoring task. Participants took part in two experimental sessions. Session 1 involved a comprehensive cognitive battery assessing abilities such as attention, working memory, and visual tracking, among others. In Session 2, participants completed an extended sonar monitoring simulation in which they identified and classified signals with four distinct acoustic frequency patterns. Across the four-hour task, participants exhibited a clear decline in sonar monitoring performance. Individuals with higher working memory capacity and stronger visual tracking ability demonstrated faster reaction time and greater accuracy throughout the simulation. However, none of the cognitive ability measures significantly predicted resilience to time-on-task fatigue. Higher-ability participants outperformed others overall, but were not more resilient to performance

decline over time. This pattern suggests that cognitive ability predicts the ability to perform the sonar monitoring task, but not the capacity to withstand fatigue, highlighting the need to identify mechanisms that support sustained attention during prolonged monitoring.

DOES SOMEONE'S SOCIAL GROUP INFLUENCE HOW OPEN AN INDIVIDUAL IS TO DIFFERING POLITICAL VIEWS?
Presenter(s): Genevieve Orlewicz, Nicole Thomas, Peyton McLaughlin
Category: Psychology
Mentor(s): Mark Brandt (College of Social Science)

People differ in how open they are to political beliefs that are different from their own. Why might this be? We theorize that those who have more politically diverse social ties are more open to political disagreement. Here, we examine the relationship between the political diversity of people's social grouups, and their levels of moral humility and dogmatism. Moral humility is defined as the recognition of one's own moral faults, limitations, and potential for errors. Dogmatism is the tendency to be unwavering in one's beliefs, closed minded, and unable to tolerate opposing views. We predict that politically diverse social groups will predict lower dogmatism, higher moral learning, higher moral falibility, and lower moral superiority by showing people the value of opposing viewpoints. We test this idea in a large survey of undergraduate students (n = 421) where respondents rated the political diversity of their social groups and reported their moral humility and dogmatism. By identifying a factor that makes people open to opposing viewpoints, this research can inform efforts to reduce political division.

THE ROLE OF WORKING MEMORY IN AUDITORY RHYTHM DISCRIMINATION
Presenter(s): Michael Salem, Nessia Brooks, Samyuktha Vijayakumar
Category: Psychology
Mentor(s): Bailey Rann (College of Social Science), J McAuley (College of Social Science)

Previous work shows that adults who stutter have a greater relationship between working memory and auditory rhythm discrimination than typical adults. One explanation for this finding is that adults who stutter may be unable to leverage an internal beat to discriminate rhythms, in contrast relying on a distinct working-memory dependent interval-based timing mechanism. The present study investigated the role of working memory in auditory rhythm discrimination for typical adults, varying the complexity of the rhythms. We hypothesize that typical adults will show greater correlation between working memory and rhythm discrimination for rhythms that make it more difficult to leverage an internal beat. Adult participants completed two rhythm perception tasks. For the first task participants listened to two standard rhythms and made same-different judgments about a third comparison rhythm. Participants made rhythm discrimination judgments about simple and complex metric rhythms and nonmetric rhythms. For the second task, participants judged whether a beat track overlayed on musical excerpts was on or off the beat of the music. The three working memory tasks were the Operation Span (OSPAN), Reading Span (RSPAN), and Symmetry Span (SSPAN) tasks. Preliminary results reveal a significant positive correlation between rhythm discrimination and working memory for complex metric rhythms but not for

simple rhythms. Nonmetric rhythms currently show no correlation between rhythm discrimination and working memory. The difference in correlation between working memory and simple and complex metric rhythm discrimination parallels the overall greater reliance on working memory for rhythm discrimination in adults who stutter.

INDIVIDUAL DIFFERENCES IN NARRATIVE PERCEPTIONS OF INSTRUMENTAL MUSIC: THE CONTRIBUTION OF EMPATHY
Presenter(s): Nora Thornber, Rachael Farquharson
Category: Psychology
Mentor(s): Bailey Rann (College of Social Science), J McAuley (College of Social Science)

Previous research on narrative perceptions of music has found that across cultures listeners show similar overall between-culture levels of narrativity (the extent to which instrumental music triggers a story in listeners minds) and narrative engagement (how vivid, clear, and detailed stories are in listeners minds). There is also a high degree of within-culture but not between-culture similarity in the stories that listeners generate. Despite these similarities, there are large individual differences in narrative perceptions of music that appear to be unrelated to culture. The present study considers the role of individual differences in empathy. We hypothesize that higher individual characteristics of empathy will be associated with increased narrativity, greater narrative engagement, and greater story detail. To investigate this, participants listened to one of two ~5-minute western instrumental excerpts and indicated whether or not they imagined a story. If they imagined a story, they wrote down the imagined story. Participants also completed a narrative engagement survey and a number of surveys including the Interpersonal Reactivity Index (IRI) that measured characteristics of empathy. Generated narratives were judged by independent raters for narrative richness and detail. Results reveal that individuals with higher assessed levels of empathy were more likely to imagine a story, have higher narrative engagement, and write longer and more detailed stories. This research raises the question of whether individuals with higher levels of empathy have richer narrative experiences of music or whether cultivating narrative experiences of music lead to higher levels of empathy.

ANALYZING TIKTOKS UNDER THE HASHTAG "FITNESSNUTRITION"
Presenter(s): Claire Arkinstall
Category: Psychology
Mentor(s): Blair Burnette (College of Social Science), Sydney Damon (College of Social Science)

Social media use is associated with a tendency to compare oneself to others and is correlated with body image concerns and disordered eating. TikTok is an increasingly popular social media platform reaching just under 2 billion monthly users. Many TikTok users specifically turn to this platform for health and fitness information, which becomes dangerous in an era of diet culture and fast-spreading misinformation. The current study is a content analysis of TikTok videos under the hashtag "#FitnessNutrition." We collected videos shown under this hashtag on a new TikTok account to avoid algorithmic biases. Additional criteria for video collection were that videos must be 2 minutes or less to

reduce coder fatigue. Out of those collected, 99 videos were ultimately coded. Analyses revealed a majority of creators were non-professional white men, highlighting gender and racial disparity among those distributing #FitnessNutrition information and underscoring misinformation concerns. Indeed, despite being non-professional, most creators made specific nutrition claims, often doing so judgmentally or talking down to those who do not abide by these claims. These videos also often began with the creator "body checking" or purposefully showing their body, potentially contributing to issues regarding associations between social media use and body image and disordered eating concerns. This research may suggest viewers should take caution when viewing videos making nutrition claims on social media. Future research could investigate the effects of viewing videos under the hashtag "FitnessNutrition" on body image, confidence, disordered eating, and health behaviors.

EXAMINING CAREGIVER WELL-BEING AS AN OUTCOME IN PROJECT IMPACT INTERVENTIONS
Presenter(s): Evelyn Fairbanks
Category: Psychology
Mentor(s): Mehreen Hassan (College of Communication Arts Sciences)

Caregiver mental health is a vital area of early intervention research, as caregivers often serve as the primary support system for families during an intensive and demanding time. Within this domain, caregiver stress has emerged as a significant outcome due to its strong associations with caregiver well-being and child outcomes, particularly among families of children with autism spectrum disorder (ASD). This analysis addresses the question: how has caregiver stress been measured and impacted across studies implementing Project ImPACT, and what caregiver demographic characteristics, study designs, and countries are represented in this literature? The primary aim was to use existing research to identify patterns, strengths, and limitations across studies. Ten peer-reviewed articles were included following a structured screening process. Data were extracted on sample demographics, country, caregiver stress measures, study design, and outcomes. Seven studies were conducted in the United States, with one study each in Iran, India, and China. Samples were predominantly female caregivers. Caregiver stress was most commonly assessed using the Parenting Stress Index (PSI) or its short form. Study designs included randomized controlled trials, non-randomized experimental studies, single-case designs, a case series, and one mixed-methods study. Most studies reported reductions in caregiver stress following intervention, though findings varied. Limitations included small sample sizes and limited demographic diversity. Overall, findings highlight caregiver stress as a meaningful outcome and emphasize the need for more rigorous and equitable research practices.

IMPROVING THE DETECTION OF RARE TARGETS IN VISUAL SEARCH
Presenter(s): Ian Render Flores, Lauren Proper, Maxwell Mccort, Paige Abraham
Category: Psychology
Mentor(s): Mark Becker (College of Social Science)

As targets become rare in a visual search task, the likelihood of missing them increases dramatically - the Low prevalence effect (LPE). The LPE has implications for important real-life search tasks with rare

targets, such as TSA Screening and Radiology. Our lab previously demonstrated that inserting a set of probe trials - target-present trials that included post-response feedback - in a low prevalence search task reduces the LPE. Here we investigated whether feedback is critical to the probe benefit by manipulating whether the probe trials include post-response feedback or not. We also had participants search for two low prevalence targets (T's and O's) and had the probe targets match one of the targets in 80% of the probe trials. Finally, we eye tracked participants. The use of unbalanced probe trials and eye tracking allowed us to investigate the search mechanisms responsible for the probe benefit. Specifically, we were able to examine how probes affect quitting thresholds, item-by-item identification criterion, and top-down search guidance- three putative mechanisms that could improve rare target search. We found similar performance in the feedback and no feedback conditions suggesting that changes in the perceived prevalence rate of targets, rather than post-response feedback, is responsible for the probe benefit. Further, the eye-movement data suggests that the benefit is due to increased top-down guidance toward features associated with frequently probed targets, rather than changes in quitting thresholds or identification criterion. These findings may have implications for improving target detection in important real-world searches.

CROSS-SECTIONAL ASSOCIATION BETWEEN FOOD ALLERGIES/SENSITIVITIES AND PICKY EATING IN ADOLESCENTS.
Presenter(s): Ryan Sheehan
Category: Psychology
Mentor(s): Vivienne Hazzard (College of Human Medicine)

This study sought to examine whether food allergies/sensitivities are associated with picky eating in adolescents. Cross-sectional data came from 189 adolescents in the Greater Flint, Michigan area who participated in the Food and Eating in Teens Study and provided data on variables of interest for this analysis. Data were self-reported via survey, with a single item each to assess food allergies/sensitivities and picky eating (the latter item comes from the Picky Eating subscale of the Nine Item Avoidant/Restrictive Food Intake disorder screen [NIAS]). An ordinal logistic regression model adjusted for age, gender, race/ethnicity, and family socioeconomic status (SES) was conducted. The mean age of participants was 14.5 years (SD = 1.7, range: 11-17). 45.5% identified as boys, 51.9% identified as girls, and 2.6% identified as non-binary/gender-fluid. After adjusting for sociodemographic characteristics, participants who did not know whether they had a food allergy/sensitivity had over three times the odds of endorsing higher agreement with the statement "I am a picky eater" compared to those without a food allergy or sensitivity (OR = 3.05; 95% CI: 1.31, 7.12; p = .01). The association between having known food allergies/sensitivities and picky eating was not significant (OR = 1.34; 95% CI: 0.67, 2.67; p = .40). Results of this study suggest that adolescents who do not know whether they have a food allergy/sensitivity are more likely to exhibit picky eating habits compared to their peers who do not have food allergies/sensitivities.

A TEXT ANALYSIS OF NATIONAL ANTHEMS IN OVER 190 COUNTRIES
Presenter(s): Lauriel Ellis, Nicole Bommarito
Category: Psychology
Mentor(s): Hyewon Yang (College of Social Science), William Chopik (College of Social Science)

National anthems are thought to capture the values a country espouses, inspiring people to feel national pride and advocate for their country. Each anthem partly reflects that nation's history-capturing their experiences with liberation, colonialization, and historic events. However, anthems-and cultural values-change over time, and few studies have examined whether the particular lyrics of national anthems correspond to broader cultural values. The current study linked national anthem lyrics from over 190 countries to broader cultural psychological values. Using text analysis via the Linguistic Inquiry and Word Count software, we found countries characterized by harmonious cultural values tend to have anthems that prioritize social relationships, particularly family. These associations held when controlling for GDP, income inequality, and the year the anthem was adopted. Mentions of social relationships were associated with more positive emotional tones in the anthem lyrics. Lyrics were mostly unrelated to other cultural values, with some exceptions (e.g., more masculine countries had fewer social references). Future research will examine how and why national anthems change over time in concert with important things happening in those countries.

EXAMINING THE DIFFERENCE OF NARRATIVES AND INTERPRETATIONS OF MUSIC EXCERPTS BETWEEN DIFFERENT CULTURES
Presenter(s): Madelyn Corgan, Natalie Seitz, Solomon Makonnen
Category: Psychology
Mentor(s): Soohyun Cho (College of Arts & Letters)

This study examines cross-cultural differences in narrative interpretations of instrumental music among Western and Dong Chinese listeners. As a continuation of research conducted by the Digital Humanities and Literary Cognition Lab at Michigan State University in partnership with the University of Arkansas and the University of Hong Kong, this project investigates how enculturation shapes imagined narratives during music listening. Participants included an American cohort from Arkansas and Michigan and a cohort from Dimen, China, a geographically and culturally distinct Dong minority community in the mountainous Guizhou region. Participants listened to Western, Chinese, and Dong instrumental excerpts and recorded the "stories" they imagined while listening. Findings indicate that listeners across cultures readily construct narratives in response to instrumental music, demonstrating shared cognitive tendencies in narrative listening. However, key linguistic and thematic differences emerged. Dong participants used significantly more performance-related language regardless of the music's origin, while Western music elicited more references to conflict and war, particularly among Western respondents. Dong listeners also identified East Asian cultural elements in Chinese music more frequently than Western participants identified Western cultural elements in Western music. Across all cohorts, niche pop culture references-most notably the "Tom and Jerry Effect" associated with Stravinsky's Four Etudes for Orchestra, No. 4-illustrated the influence of globalized media and enculturation on narrative

construction. These findings highlight both universal and culture-specific aspects of music cognition and suggest broader applications in marketing, cross-cultural communication, and cognitive literary studies.

TO WHAT EXTENT DOES YOUR SOCIAL GROUP (OR "CLOSE OTHERS") AGREE OR DISAGREE WITH YOUR POLITICAL VIEWS?
Presenter(s): Genevieve Orlewicz, Nicole Thomas, Peyton McLaughlin
Category: Psychology
Mentor(s): Mark Brandt (College of Social Science)

Anecdotally, liberals and conservatives are often described as living in political "echo chambers," rarely interacting with people who hold opposing views. But how accurate is this perception? In this study, we examine the extent to which individuals' political views align with those of their close social ties. Specifically, we assess perceived agreement between participants' political beliefs and those of their close friends and family members. We predict that, on average, people will report high levels of agreement with their close others. We also test whether agreement differs between family members and peers, and whether Republicans report greater agreement with family members than Democrats. To test these predictions, we conducted a large survey of undergraduate students (n = 421), who reported their own partisanship, their perceived political similarity with close others, and the nature of those relationships (e.g., family vs. peer). In a time of growing political segregation, this study provides empirical evidence on whether people are exposed to diverse political views through their close social ties.

ASSOCIATIONS BETWEEN ADULT ATTACHMENT ORIENTATIONS AND CHANGES IN MENTAL AND PHYSICAL HEALTH OVER TIME
Presenter(s): Sasha Palmkoeck
Category: Psychology
Mentor(s): William Chopik (College of Social Science)

Adult attachment orientations have been consistently linked to mental and physical health, yet most evidence comes from cross-sectional or short-term longitudinal studies. Therefore, it remains unclear whether attachment-related differences in health persist across longer periods of adulthood or shape trajectories of health and well-being over time. The present study examined associations between adult attachment orientations and changes in mental and physical health across a 13-year period in a nationally representative sample of Dutch adults (N = 3,450). Attachment anxiety and avoidance were assessed starting in 2010, participants completed annual assessments of self-rated health, functional limitations in daily activities, physical complaints, chronic conditions, and depressive symptoms through 2023. Multilevel growth curve models were used to estimate overall associations between attachment orientations and health, as well as interactions with time. Higher attachment anxiety and avoidance were associated with worse health and well-being across all outcomes. Attachment anxiety showcased associations with poorer self-rated health, greater physical complaints, and more depressive symptoms. In contrast, attachment orientations largely did not control changes in health and well-being over time,

with only small effects indicating differences in self-rated health and depressive symptoms between individuals higher versus lower in attachment anxiety. These patterns likely reflect normative age-related changes rather than benefits associated with attachment insecurity. Overall, the findings suggest that adult attachment orientations are linked to enduring disparities in mental and physical health across more than a decade, highlighting attachment insecurity as a long-term vulnerability factor rather than a primary driver of age-related change.

THE SPEED OF SIGHT: COMPARING THE TEMPORAL DYNAMICS OF MANUAL RESPONSES AND EYE MOVEMENTS
Presenter(s): Morgan Gaston
Category: Psychology
Mentor(s): Jan Brascamp (College of Social Science)

When presented with an ambiguous bistable stimulus, the visual system must make an unconscious decision to determine which percept dominates. The mechanisms underlying this phenomenon remain largely unknown. Traditional vision studies have relied upon behavioral responses to reveal the current percept; however, these manual reports can result in noisy or inconclusive data. In this study, we utilize eye tracking of Optokinetic Nystagmus (OKN), an involuntary motion-tracking response, as a physiological proxy for perceived direction of an ambiguous rotating cylinder; the eyes involuntarily follow the perceived direction. This approach allows us to investigate visual perception independently of behavioral reporting. Here, we compare this eye-based method with conventional report-based methods. Specifically, we compare the temporal onset of OKN shifts against manual keypresses to determine which measure more accurately captures the moment of perceptual transition. This comparison allows for a deeper investigation into the latent periods between unconscious physiological shifts and conscious behavioral reports.

HOW COUNTRY PRIDE AFFECTS IMMIGRANTS' LIFE SATISFACTION
Presenter(s): Madeline Hilditch, Mina Arikan
Category: Psychology
Mentor(s): Kenya Mulwa (College of Social Science), Mark Brandt (College of Social Science)

Immigrants experiencing notable changes in life satisfaction after moving. Extensive research discusses factors that may increase life satisfaction for immigrants, such as improved socioeconomic status, alignment with social norms as well as legislative values, and developing a sense of belonging while living in a host country. Significantly less attention has been given to the role of identity and attachment. We address how pride in and importance of one's country of origin may impact ease of transition and feeling of belonging while living abroad. Using data from the UK Household Longitudinal Study (UKHLS), with a sample of approximately 4,300 immigrants and 25,600 non-immigrants, we examine the extent to which immigrants' connection to their country of origin influences life satisfaction. We further explore whether the ability to maintain cultural practices in the host country affects this relationship. By distinguishing between symbolic attachment (sense of pride and connection to country of origin) and enacted cultural

behaviours (language, practice of religion, social ties), this study investigates whether origin connection serves as a source of improved quality of life or as a barrier to integration and belonging. Data analysis is ongoing. Findings will offer insight into the social and identity-based dimensions of immigrant satisfaction and highlight the importance of cultural maintenance in shaping life satisfaction in the country of residence.

RATER CONFIDENCE AND PARTICIPANT AGREEMENT IN THE DEVELOPMENT OF A NEW FUNCTIONAL ASSESSMENT
Presenter(s): Rachael Blanchard
Category: Psychology
Mentor(s): Anna Benedict (College of Social Science), Henry (Raffles) Cowan (College of Social Science)

Although the Premorbid Adjustment Scale is widely used to assess social and academic functioning prior to psychiatric illness onset, it is limited in the number of assessment time points and emphasizes peer relationships and school performance to the exclusion of other domains (Cannon-Spoor et al., 1982; Mastrigt & Addington, 2002). To address these limitations, we developed the Retrospective Assessment of Functioning interview (RETRO), which evaluates social and role functioning and well-being from early childhood through early adulthood, providing a more comprehensive view of functioning and lived experience of serious mental illness across development. To support the RETRO's refinement as a reliable and valid tool, 50 undergraduates from Michigan State University viewed graphs depicting their lifetime functioning for each domain as rated by the RETRO. Participants rated how well the visual outputs matched their experiences using a 5-point Likert scale, and raters reported confidence in administering and scoring the assessment. Given prior evidence linking rater confidence to assessment accuracy (Miller et al., 2015; Hedley et al., 2016), multi-level modeling examined whether the relationship between rater confidence and participant agreement varies across domains and life periods. Data collection is ongoing. We hypothesize that rater confidence will be positively associated with participant agreement, but that this relationship will differ by domain and developmental stage. Specifically, associations are expected to be stronger for objective domains (social and role functioning) than for subjective well-being, and strongest for recent life periods (adolescence and early adulthood) and weakest for early childhood, due memory limitations.

THE RELATIONSHIP BETWEEN FOOD INSECURITY AND BODY KINDNESS: DOES PERCEIVED ETHNIC DISCRIMINATION INTENSIFY THE ASSOCIATION?
Presenter(s): Kate Benoist
Category: Psychology
Mentor(s): Blair Burnette (College of Social Science), Sydney Damon (College of Social Science)

Food insecurity (FI) is a risk factor for body image dissatisfaction, but its association with body kindness remains unclear and could be impacted by ethnic discrimination. This study examined whether FI was associated with body kindness and whether this relationship varied by ethnic discrimination. We hypothesized that FI would be negatively associated with body kindness, with stronger associations at

higher levels of ethnic discrimination. Participants were U.S. adults (N = 1,058; M age = 36.00, SD = 11.42). Overall, 51.3% identified as female, 45.4% male, 1.2% trans/nonbinary/other, and 2.7% did not specify gender. The sample was 9.3% Asian, 17.7% Black, 12.5% multiracial, 45.2% White, and 15.4% other/not specified. Surveys assessed food security status, perceived ethnic discrimination, and body kindness. A linear regression model with an interaction term (FI*ethnic discrimination) was entered to examine the moderating effect of ethnic discrimination on the association between FI and body kindness. The overall model was significant, $F(8,846)=10.91$, $p <.001$, adjusted $R2 = .08$, and greater FI associated with lower body kindness ($b = 0.60$, $SE = 0.22$, $t = 2.73$, $p =0.007$), while ethnic discrimination ($p = .27$) and the interaction ($p = .28$) did not. This suggests FI may be a barrier to body kindness regardless of experiences with ethnic discrimination. Future work should examine whether this pattern of findings replicates or if outcomes differ between moderately versus highly food-insecure groups.

SPOUSAL PERSONALITY AND COGNITION: IS PERSONALITY OF SELF AND SPOUSE RELATED TO COGNITIVE OUTCOMES?

Presenter(s): Avery Bell, Kayla Kas-Mikha, Sophie Hong
Category: Psychology
Mentor(s): Aislinn Low (College of Social Science), William Chopik (College of Social Science)

Prior research indicates personality traits, as defined by the Five Factor Model, are linked with various cognitive outcomes. It is also known that spouses' personality traits can influence their partner extensively. However, little is known about whether spouses' personality traits and their partners' cognition are related. Our research aimed to investigate the relationship between spouses' personality traits and their partners' cognitive functioning. Using data from 2,112 participants and their spouses in the Health and Retirement Study Harmonized Cognitive Assessment Protocol (HRS HCAP) sub-study, multiple regression analyses examined how self and partner personality traits predicted cognitive performance across five domains (episodic memory, speech-attention-executive, visuospatial ability, verbal fluency, and numeric reasoning) in older adulthood. These analyses found results consistent with previous literature for actor personality and cognitive ability, such that higher neuroticism is related to a decrease in performance of cognitive ability. In addition, we found that partner neuroticism was associated with an increase in episodic memory performance ($\beta=0.053$, $p=0.026$), and partner conscientiousness was associated with an increase in visuospatial performance ($\beta=0.068$, $p=0.021$). Overall, the results suggest that cognitive performance across a variety of domains is largely related to one's own personality and less so to the personality of one's spouse. Nonetheless, domain-specific associations of spouse conscientiousness and neuroticism indicate that spouses may still play a role in one's own cognition. These findings warrant further investigation into the nuances of these associations and their implications for the development of cognitive disorders.

EXAMINING PARENT COUNTRY OF ORIGIN IN COMMUNITY AUTISM SPECTRUM DISORDER DIAGNOSIS
Presenter(s): Anshika Yerasi, Devan Nahal, Lisa Cela
Category: Psychology
Mentor(s): Brooke Ingersoll (College of Social Science), Lauren Duvall (College of Social Science)

Most autism research originates from high-income Western countries, contributing to global underdiagnosis and limited representation of immigrant families (de Leeuw et al., 2020). Parent country of origin may influence access to community Autism Spectrum Disorder (ASD) diagnosis through structural, cultural, and systemic barriers. This study examined whether parent country of origin was associated with differences in community ASD diagnostic status across multiple urban sites in the United States (U.S.). : Data were collected from families participating in a randomized controlled trial across four urban testing sites: Boston, MA, Chicago, IL, Seattle, WA, and East Lansing, MI. Caregivers reported demographic information, including parent country of origin and whether their child had received a community ASD diagnosis. A chi-square test of independence was conducted using SPSS to examine the association between parent country of origin and community ASD diagnosis status. A chi-square test of independence revealed a significant association between parent country of origin and community ASD diagnosis status, $\chi2(1) = 5.71$, $p = 0.017$, such that children of parents born outside of the U.S. were more likely to have a community diagnosis than children of parents born in the U.S. The association was small (Cohen, 1988), Cramer's V = 0.18. Post-hoc analyses revealed that most parents born outside the U.S. were enrolled at one of the three sites located in or near major cities. Findings from this study suggest that parent country of origin may be associated with improved access to community ASD diagnosis. However, these findings should be interpreted with caution, as they do not align with previous research and may not generalize to the broader population. Further, these findings indicate that major cities likely have additional supports that improve access to community diagnostic services. Nevertheless, these results highlight the importance of addressing structural and systemic barriers to improve equity in autism identification and representation in research and clinical systems.

REPLICATION AND EXTENSION OF MORAL LUCK JUDGMENTS
Presenter(s): Abigail Mitchell, Alisia Coipel, Caitlyn Gregg, Cameron Korson, Isaac Gladstone, Laci Reichling, Nicholas Merrill, Randy Tran, Ruth Adewusi, Sri Tulasi Devi Inturi, Tamira Richey
Category: Psychology
Mentor(s): William Chopik (College of Social Science)

People often claim that moral judgments should be based on intentions rather than outcomes, yet in practice they frequently punish individuals more harshly when outcomes turn out badly. This tension-known as the puzzle of moral luck-has been documented across philosophical and psychological work, particularly in judgments of punishment. Prior research suggests that while wrongness and blame may be judged similarly across lucky and unlucky outcomes, punishment judgments often diverge. Less is known about whether this outcome-based punishment gap is consistent across different social contexts and individual characteristics, or whether it is amplified by cues such as the agent's identity or background. We proposed a replication and extension of Kneer and Machery's moral luck paradigm that varies agent demographics (e.g., race, gender, morality) and contextual framing (e.g., negligence) while

measuring judgments of wrongness, blame, permissibility, and punishment. We expect to replicate the finding that punishment will be higher for the morally unlucky target. These findings would clarify when and for whom moral luck effects emerge, highlighting how social biases intersect with moral evaluation. More broadly, this work would inform debates about fairness and consistency in legal and moral decision-making.

BODY KINDNESS AMONG THOSE DIAGNOSED WITH TYPE 2 DIABETES, HIGH BLOOD PRESSURE, AND HIGH CHOLESTEROL

Presenter(s): Christina Pettinger
Category: Psychology
Mentor(s): Blair Burnette (College of Social Science), Sydney Damon (College of Social Science)

Type 2 diabetes, high blood pressure, and high cholesterol are associated with stigma and self-criticism and could reduce body kindness (BK), particularly among individuals recently diagnosed who have had less time to develop coping skills. This study examined whether each diagnosis was associated with BK and, within each diagnostic group, whether time since diagnosis was associated with BK. We hypothesized that all diagnoses would be negatively associated with BK and that, within each diagnostic group, time since diagnosis would be positively associated with BK. Participants were U.S. adults (N = 1,058; M age = 36.00, SD = 11.42). Overall, 51.3% identified as female, 45.4% male, 1.2% trans/nonbinary/other, and 2.7% did not specify gender. The sample was 9.3% Asian, 17.7% Black, 12.5% multiracial, 45.2% White, and 15.4% other/not specified. Linear regression models separately tested associations between each diagnosis and BK. Among individuals with each condition, additional models tested whether time since diagnosis of that specific condition was associated with BK. Results indicated that type 2 diabetes ($b = -0.50$, $p = .006$), high blood pressure ($b = -0.59$, $p < .001$), and high cholesterol ($b = -0.53$, $p < .001$) were each significantly associated with lower BK. Time since diagnosis was not significantly associated with BK for any condition (p's > .32). This suggests that these diagnoses are associated with reduced BK, but that time since diagnosis is not meaningfully related. Future research should clarify these findings by examining mechanisms and longitudinal changes in this association between diagnosis type and BK.

INVESTIGATING PROACTIVE AND RETROACTIVE FEATURE-BASED SUPPRESSION

Presenter(s): Cora Custer, Morgan Dodd, Patryk Malysa, Tristan Janisse
Category: Psychology
Mentor(s): Mark Becker (College of Social Science)

There is debate in the attention literature about whether there is attentional suppression of known distractor features, and if so whether this type of suppression can be applied proactively or only reactively. Our study addressed this issue using a novel method that had a negative color-cue (indicating a color that would not contain the target) and then presented search stimuli superimposed on colored squares. Varying the onset time of the colored squares and search stimuli allowed us to separate when suppression and the search task could begin. Simultaneous presentation of the two was used to evaluate

proactive suppression and found no evidence for suppression - the negative cue did not speed reaction times (RTs). By contrast, presenting the colored squares for two seconds before the search array found significant retroactive suppression -RTs were faster following a negative cue. Follow-up experiments reduced the length of this delay in an attempt to investigate the time course of retroactive suppression. However, across delays ranging from 250 to 1500 msec, we found no evidence for suppression- raising the possibility that the initial finding was spurious. Indeed, a direct replication of the two second delay condition failed to replicate the retroactive suppression finding. Notably, suppression did occur when the negative cue color remained constant throughout the experiment, suggesting that feature-based suppression requires substantial learning to be effective. Taken as a whole, these results raise serious questions about the existence of a suppressive mechanism that can be applied voluntarily based on cue.

WHICH JOBS ARE REALLY HELPING SOCIETY? (IT DEPENDS WHO YOU ASK)
Presenter(s): Farra Lie, Tien Nguyen
Category: Psychology
Mentor(s): Ethan Wright (College of Social Science), Kevin Hoff (College of Social Science)

Although work makes up a huge part of our lives, little is known about how different people perceive the societal contributions of different occupations. It is pertinent to understand why people vary in their perceptions of occupations, as this reflects how people assign value and status to different kinds of work. Examining these disparities may give us insight into why some jobs are valued or seen as more beneficial than others, ultimately affecting funding decisions, public policies, career aspirations, and broader societal outcomes. By analyzing survey data across 776 participants and 254 occupations, this study examines how age, education, gender, political ideology, and social class relate to individual perceptions of occupational value. We also examine overall trends in ratings to determine which occupations are perceived as having the highest and lowest impacts. Our results suggest that healthcare-related jobs are generally perceived as the most beneficial for society. Among the potential explanatory variables, political ideology most strongly predicted differences in ratings within occupations, followed by gender and social class. In terms of specific occupations, Substance Abuse and Behavioral Disorder Counsellors, Chief Executives, and Actors exhibit the greatest variation in perceived societal impact ratings. Overall, results indicate that people show varying degrees of agreement in terms of how they view different occupations' impact on the world, and that people tend to rate occupations similar to themselves as more impactful.

CHANGES IN SOCIAL AND EMOTIONAL CONTENT IN SONG LYRICS ACROSS POPULAR ARTISTS' DISCOGRAPHIES
Presenter(s): Logan Gibson
Category: Psychology
Mentor(s): William Chopik (College of Social Science)

Previous studies have found that cultural products reflect psychological characteristics of those that produce them and the cultures in which they are immersed. However, these studies were limited in that

they only examined a selection of the most popular songs or changes within one artist over time. The current study analyzed around 40,000 songs across 233 artists from years 1947 to 2024. We analyzed lyrics for within-artist change of social and emotion-related lyrics and historical differences in emotion-related lyrics. Over time, artists' use of words related to sadness and emotional negativity decreased while words related to anxiety increased slightly. We observed decreases in words related to family and friends along with a decrease in references to social relationships within artists over time. We observed a decrease in words associated with sadness while angry lyrics increased slightly over historical time. Interestingly, both positive and negative lyrics in music decreased across decades. We also found references to family and friends in song lyrics have decreased slightly over time. These results provide insight into the ways artists change throughout their careers and how music itself changes historically.

THE RELATIONSHIP BETWEEN RELIGION AND MEDIA TRUST
Presenter(s): Emma Dye
Category: Psychology
Mentor(s): Mark Brandt (College of Social Science)

Confidence in the media has eroded. Due to this shift, trust in the media is a topic of great interest among both social scientists and the public. Religion has historically exerted great influence on people's attitudes towards institutions, as religious leaders and norms shape individuals' attitudes. I examine if religion is associated with trust in the media. I examine this relationship by analyzing the association between religion, media sources, and confidence in the media. Using the World Values Survey (N countries = 66), I created a measure of religious commitment using questions including belief in God and frequency of prayer. This measure was correlated with the reported media trust, media sources, newspaper usage, and internet usage. Results indicated variation in the relationship between religion and trust in media across national contexts. Additionally, I also examine the relationship between religion, newspaper, and internet consumption. To further contextualize these findings, I plan to test if there's a relationship between media trust and freedom of the press in each country.

STRUCTURE AND CHANGES IN SEXUAL FANTASY OVER TIME
Presenter(s): Sasha Palmkoeck
Category: Psychology
Mentor(s): William Chopik (College of Social Science)

Sexual thoughts and fantasies are common in people's lives and an important part of their sexuality. Nevertheless, they are understudied partly because of some of the stigma involved with disclosing thoughts and fantasies. To date, most research has relied on self-report instruments or hyperfocusing on one particular fantasy or collection of thoughts. As a result, there are few taxonomies describing the natural occurrence and grouping of sexual fantasies and how they might change over time. In the current study, we examined the structure of sexual fantasies and how aspects of sexual fantasies changed over time in a sample of nearly 300,000 erotic stories from over 60,000 authors. Studying fantasies over the lifespan will allow us to understand how sexuality develops and potentially destigmatize sexual fantasies.

REPLICATION AND EXTENSION OF INSTRUCTOR MINDSET ON STUDENT EXPECTATIONS
Presenter(s): Abigail Mitchell, Alisia Coipel, Caitlyn Gregg, Cameron Korson, Isaac Gladstone, Laci Reichling, Nicholas Merrill, Randy Tran, Ruth Adewusi, Sri Tulasi Devi Inturi, Tamira Richey
Category: Psychology
Mentor(s): William Chopik (College of Social Science)

Students' academic experiences are shaped not only by course content, but also by the signals instructors convey about ability and learning. Prior research shows that when professors are perceived as endorsing fixed mindset beliefs, students report greater psychological vulnerability, lower belonging, and reduced engagement-especially in STEM fields. However, students differ widely in how they respond to these cues, and it remains unclear which individual characteristics protect against or exacerbate vulnerability in fixed-mindset contexts. We propose a replication and extension of Muenks et al.'s paradigm examining whether student characteristics-including prior mindset, academic setbacks, race/ethnicity, socioeconomic background, and social support-moderate responses to professors' expressed mindsets. We expect that students with stronger growth mindsets or greater external support will show reduced psychological vulnerability even when exposed to fixed-mindset signals. This should also extend to other academic outcomes (e.g., likelihood of dropping the course). By identifying which students are most sensitive to mindset cues, this work would help clarify boundary conditions of mindset effects and inform targeted interventions. Ultimately, these findings could guide efforts to foster more inclusive and supportive learning environments in STEM education

RELATION BETWEEN THE BREAKDOWN OF RHYTHM & THE SUBJECTIVE RATE OF TIME PASSAGE
Presenter(s): Emma Adams, Josh Petkoff, Tanmay Shekhar
Category: Psychology
Mentor(s): J McAuley (College of Social Science), Matthew Oakes (College of Music)

Auditory rhythms are ubiquitous in everyday life. This is exemplified by music and speech. One characteristic of musical rhythms is that they convey the sense of a periodic beat. However, if music slows down too much, the rhythm breaks down and the beat is lost. The present study investigated individual differences in the time point when rhythms breakdown, losing the sense of beat. Participants were presented with a two-tone sequence and judged whether they were perceived to be grouped or isolated in time. The time interval between the onsets of the first and second tones vary randomly between 0.5 and 4.0 seconds. Participants completed 10 blocks of 36 trials. For each participant, we calculated the proportion of isolated responses for each of the inter-onset-intervals. We determined the point at which the rhythm broke down by the inter-onset-interval that yielded 50% isolated responses (commonly referred to as the point of subjective equality - PSE). Participants also completed a survey assessing the rate at which individuals experience the passage of time. Preliminary results reveal an average PSE of ~1.7 seconds with a range of 0.8 to 2.6 seconds. Ongoing analyses are examining the relationship between the rate of time passage and point of rhythm breakdown.

A METHODOLOGICAL COMPARISON OF MOTION-BASED PUPIL DILATION PARADIGMS
Presenter(s): Isabella Padula
Category: Psychology
Mentor(s): Jan Brascamp (College of Social Science)

Research on pupillary responses to motion plays a large role in understanding the physiological mechanisms underlying visual perception and attention. The pupil is sensitive to changes in visual stimuli, and factors such as luminance, motion, speed, and direction all contribute to variations in pupil size. While many studies have demonstrated pupil dilation in response to motion stimuli, earlier work by Barbur et al. (1992) reported consistent pupil constrictions during a motion-based task. This finding has been influential within the field of pupillometry and differs from more recent literature, as well as to results obtained in our own laboratory. Pupil dilations are the signficant result. These differing conclusions suggest that minor changes in the actual task procedure may contribute to varying physiological responses. This may yield conflicting pupil dilation and constriction results. Investigating these methodological differences is therefore essential for clarifying how motion-based stimuli produce either constriction or dilation at the physiological level. By systematically examining different experimental procedures, the goal is to better refine research methods and ultimately determine how the sympathetic and parasympathetic activaitions yield different pupillary results.

INVESTIGATING GENDER DIFFERENCES IN AUTONOMIC PUPIL RESPONSES
Presenter(s): Mary Cottone
Category: Psychology
Mentor(s): Jan Brascamp (College of Social Science)

Exposure to bright light causes pupils to constrict (PLR), and darkness causes pupils to dilate (PDR). However, little research has been conducted to understand the differences between male and female pupil responses to brightness, cognition, and emotion tasks. Cardiovascular research shows that parasympathetic responsiveness is greater in females and that sympathetic responsiveness is greater in males. Since pupil size relies on these autonomic nervous system reflexes, we believe gender can affect pupil size reactions. Previous studies report weak correlations between gender and pupil size responses to PLR and PDR, but they didn't control for the age ranges of participants. Literature shows there is a strong correlation between pupil size response and age due to autonomic deficit and diminished pupil size in older populations. In this study, relative pupil size between biological males and females is compared after completing brightness, cognition, and emotion tasks while controlling for age differences. The brightness task shows the participant dark grey and bright grey rectangles to stimulate the PLR and PDR. The cognition task involves the participant reporting if a line on the screen is tilting left or right, each trial getting progressively harder according to their personal difficulty level. The emotion task has participants listen to emotionally charged words with high and low arousal ratings. Data for biological male and female participants ages 18-22 will be analyzed and compared for these three separate tasks. We hypothesize that we will see measurable differences between male and female participants across all tasks after controlling for age.

PROVIDER PERSPECTIVES ON INTERVENTION DECISION-MAKING AND GOAL IMPLEMENTATION IN FAMILY-CENTERED APPLIED BEHAVIOR ANALYSIS.
Presenter(s): Haley Price
Category: Psychology
Mentor(s): Brooke Ingersoll (College of Social Science), Hannah Tokish (College of Social Science)

Introduction This study examines the alignment between Applied Behavior Analysis (ABA) providers' perspectives on selecting and implementing intervention goals, incorporating family values, and defining meaningful progress for children with autism. Despite recommendations for family-centered goal setting, prior research suggests that providers characteristics and training experiences may influence how family priorities are implemented into interventions. These differences inform more collaborative and family centered goal-setting practices in ABA. Methods ABA providers completed self-report surveys assessing perspectives on their priorities, involvement in goal setting, family value integration, and experiences with disagreement or systemic constraints. The survey included provider items and open-ended questions to capture perspectives on goal-setting experiences. Providers will also complete the Measure of Processes of Care for Service Providers (MPOC-SP), a validated measure of family-centered care practices, to provide a standardized assessment. Results Expected findings include variability in providers' reported goal-setting, priorities and FCC practices, with higher MPOC-SP scores expected to be associated with greater perceived caregiver involvement, stronger emphasis on family-relevant outcomes, and higher ratings of meaningful progress Discussion Findings are expected to identify patterns of misalignment in ABA goal setting and highlight the role of family-centered care processes in supporting collaborative practice. Results may inform training, supervision, and service delivery models aimed at improving decision making, strengthening caregiver-provider partnerships, and increasing the social validity of intervention goals in ABA services.

EARLY LIFE PREDICTORS OF OPTIMISM CHANGES
Presenter(s): Madison Hart
Category: Psychology
Mentor(s): William Chopik (College of Social Science)

Early environments are thought to be important for shaping people's personalities across the lifespan. People with harmonious childhood environments typically report better emotion regulation, close relationships, and health and well-being over time. However, very little research has formally linked relationship dynamics of the whole family to changes in individual difference characteristics prospectively over time. People are embedded in family systems, such that their relationships with siblings and even the relationship quality between their parents might affect their development. The current study examined within-family relationship dynamics in adolescence predicts changes in optimism over nearly 30 years. We used data on videotaped family interactions between mothers, fathers, adolescents, and siblings and prospective data on optimism over the next 30 years. Social relations modeling and growth curves will estimate how optimism changes as a function of family dynamics in adolescence. Findings will be discussed in the context of how influential are early relationships are for our later personality.

HOW MANY LEADERS DO YOU SEE?
Presenter(s): Chloe Alexander
Category: Psychology
Mentor(s): Dorothy Carter (Eli Broad College of Business)

Women remain underrepresented in formal leadership roles, yet research shows that teams with more women tend to outperform teams with fewer women. We argue that part of the explanation for this disconnect lies in socialization. Girls develop in smaller, intimate peer groups where leadership is shared; boys develop in larger, hierarchical groups where dominance determines who leads. These experiences produce adults who see fundamentally different leadership landscapes in the same room. Men may scan for "the" leader; women may recognize leadership as something many people are doing. We ask: do men and women see the same number of leaders in a group, and what are the consequences for teams and for who gets recognized as a leader? We address this across two studies. In an online vignette study (n=587) participants, women identified more leaders than men, regardless of whether the team was centralized or decentralized. A laboratory study replicated this in teams, where participants directly experienced. Tests of measurement invariance confirm that men and women are not assessing the construct in the same way. These findings suggest a mechanism linking gender composition to team effectiveness: women's tendency to recognize distributed leadership may help explain why teams with more women perform better. More broadly, the findings point to a perceptual mechanism underlying the glass ceiling: if male evaluators are less likely to recognize distributed leadership, women's contributions may be invisible to the gatekeepers who determine advancement.

MARIJUANA USE AND DISORDERED EATING AMONG U.S. UNDERGRADUATES: THE MODERATING ROLE OF PERCEIVED STRESS
Presenter(s): Stacie Nickelson
Category: Psychology
Mentor(s): Blair Burnette (College of Social Science)

Marijuana use is associated with disordered eating (DE), and college students could be particularly at risk due to elevated stress. This study examined whether marijuana use was associated with DE and if this varied by stress. Marijuana use was hypothesized to be positively associated with DE, especially at higher stress levels. Participants were U.S. undergraduates (N = 2066; M age = 19.53, SD = 1.74); 73.4% identified as female, 22.0% as male, 1.7% as trans/nonbinary/other, and 2.9% unspecified. The sample was 34.8% White, 4.6% Black, 3.5% East Asian, 3.5% South Asian, and 53.6% other/unspecified. Surveys assessed marijuana use, stress, and DE. Sex-stratified linear regression with an interaction (marijuana use*stress) tested whether stress moderated associations between marijuana use and DE. Among females, the overall model was significant, $F(7, 465) = 2.0$, $p = .05$, adjusted $R2 = .02$. Stress was positively associated with DE ($b = 0.10$, $p = .02$), but marijuana use ($p = .41$) and the interaction ($p = .35$) were not. Among males, the overall model was significant, $F(7, 95) = 2.72$, $p = .01$, adjusted $R2 = .11$. Stress was positively associated with DE ($b = 0.26$, $p = .002$), but marijuana use ($p = .32$) and the interaction ($p = .49$) were not. Findings indicate that stress is associated with DE but does not modify non-significant marijuana use and DE associations. Future research could examine motivations for

marijuana use to determine whether it reflects stress-related coping or unrelated factors, and how this may influence DE risk.

ACCURACY AND BIAS IN JUDGMENTS OF PURPOSE IN CLOSE OTHERS
Presenter(s): Nitya Thakur
Category: Psychology
Mentor(s): William Chopik (College of Social Science)

People routinely form impressions of close others' internal psychological characteristics, and these impressions can be both accurate and systematically biased (Connelly & Ones, 2010; Luo & Snider, 2009). Even in highly familiar relationships, perceivers may track others' actual characteristics while also relying on subjective inferences, projections, or motivational distortions. This work has primarily examined personality traits and has typically neglected various types of well-being (e.g., purpose in life). Are close others accurate or biased in their judgments of purpose in life, and does the degree of accuracy and bias depend on relationship characteristics? In two samples (S1: dyads; S2: four-person groups), we examined sources of purpose-related judgments, their accuracy and bias, and what predicts greater accuracy and bias. We found that people overestimated how purposeful their close others were. However, people also projected their own purpose on others, assuming their loved one were more similar to them than they actually were. Finally, there was some degree of accuracy, such that purpose may detectable when making judgments. We found limited evidence that relationship characteristics (e.g., relational length, closeness) moderated these associations, with a few exceptions. This project extends work on interpersonal judgments to purpose in life and the potential sources of these judgments.

THE IMPACT OF SEXUAL ASSAULT MYTHS AND UNIVERSITY TRAINING ON PERCEPTIONS OF SEXUAL ASSAULT AND LIKELIHOOD TO REPORT
Presenter(s): Nicole Becker
Category: Psychology
Mentor(s): Joseph Cesario (College of Social Science)

With sexual assault being an important concern on college campuses, it is critical that this issue is continuously studied and addressed by universities. Most U.S. universities have training programs that familiarize students with the institutional policies around relationship violence and sexual misconduct (RVSM), as well as the reporting process and other campus resources. However, there are additional factors that can impact a student's perception of sexual assault experiences and their likelihood to report, including the presence or absence of common sexual assault myths or scripts. These myths commonly contribute to victim-blaming and other shared beliefs regarding sexual assault, which may limit retention, as students may maintain their previous misconceptions despite receiving training. Students may also forget information they learned during training over time. Most MSU students take only one training course per year, usually lasting one to two hours, which provides plenty of time throughout the year for students to forget essential content. To study the impact of sexual assault myths and the effectiveness of RVSM training, I will be conducting an online survey of undergraduate students

at Michigan State University (MSU). Participants will respond to hypothetical scenarios regarding their perception of whether the scenario depicts sexual assault and their likelihood to report given MSU's RVSM and Title IX Policy. Data will be analyzed using a multi-level nested regression model with a between-subjects design. Results of this study may inform suggested changes to be made to MSU's current RVSM training programs and further research on this topic.

COMPARATIVE EFFECTS OF BMI AND BODY FAT PERCENTAGE ON DISORDERED EATING SYMPTOMS IN ADOLESCENT BOYS AND GIRLS
Presenter(s): Ronan Scott
Category: Psychology
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Bianca Frost (University of Pretoria)

Higher body mass index (BMI) is associated with disordered eating symptoms (DE); however, BMI imprecisely measures body composition by indexing overall body size without distinguishing fat from lean mass. Body fat percentage (BF%) provides a more specific index of adiposity, and within sociocultural contexts that idealize thinness and leanness, may better predict DE. This study examined the overlapping and distinct associations of BMI and BF% with DE symptoms in adolescent boys and girls. Participants were 280 boys and 1,313 girls (N=1,593); ages 8-18 from the Michigan State University Twin Registry. Height and weight were measured in the lab and used to calculate age/sex-adjusted BMI percentiles. BF% was assessed with bioelectrical impedance analysis. DE symptoms (i.e., body dissatisfaction, binge eating, dietary restraint, and weight preoccupation) were assessed with validated self-report questionnaires. All analyses adjusted for age and pubertal status. BMI and BF% showed similar associations across all DE variables in both sexes. After accounting for shared variance, BMI remained significantly and moderately associated with body dissatisfaction, dietary restraint, and weight preoccupation; BF% showed only modest associations with body dissatisfaction. Findings indicate that body size may be more strongly associated with DE than adiposity. Because BMI was most predictive of DE in both sexes, it may be that adolescents' awareness of their weight and BMI labels (e.g., overweight, obese) heightens DE. Adolescents generally lack awareness of their BF%, which may be protective, particularly in social contexts that stigmatize weight and narrowly define appearance ideals.

REJECTING FRAGMENTATION: CENTERING SUBJECTIVITY
Presenter(s): Jason Gilbert
Category: Psychology
Mentor(s):

We can prove things with demonstrable evidence and make a difference in the world. In this way, it has never been easier to feel connected within academia. This study functions as a proposal for future study, utilizing Bridgette Bardot (BB) to simulate community. Participants will be shown a BB film of their choosing. Immediately following the film they will be prompted with the question: "If you could direct a film with BB, what would you do?" The best answer will then be granted deepfake technology and receive commission for a subsequent study where participants are shown the BB derivative film.

Immediately following the film they will be prompted with the question: "If you could direct a film with BB', what would you do?" The commission aims to simulate a real world movie going experience and it is expected to increase or decrease with further derivations.

WHAT IMPACT DOES A DIVERSION PROGRAM THAT USES PYD HAVE ON COURT-REFERRED YOUTH'S CIVIC ENGAGEMENT?
Presenter(s): Aliesha Salogar
Category: Psychology
Mentor(s): Emily SF Zagurny (College of Social Science), Sean Hankins (College of Social Science)

Diversion programs are youth intervention initiatives that aim to help youth involved with the court using a strength-based lens. Court-involved youth often lack social support and are not engaged with their community, which harms their social development and emotional intelligence. In turn, the youth's community does not get the benefit of youth involvement. This problem remains prevalent in the community, especially with the rise of internet usage and social media. Michigan State University's Adolescent Diversion Program (ADP) works with these youth towards Positive Youth Development, which in part is accomplished through setting individualized goals, or S.M.A.R.T. Goals, that the youth and their advocate focus on during the intervention. These goals are designed to utilize youth's intrinsic motivation and enhance community involvement for overall increased Positive Youth Development.

TEMPORAL ATTENTION AND TONIC PUPIL SIZE
Presenter(s): Sydney Kleiner
Category: Psychology
Mentor(s): Jan Brascamp (College of Social Science)

In a pupillometry study consisting of 15 experiment blocks with varying stimuli, two of these blocks are of particular interest in the assessment of arousal and attention. During these two blocks, the spacebar and foot pedal block, participants are instructed to press the foot pedal/spacebar about as frequently as things happened during "no task" blocks, or event frequency (for example, "press about as frequently as the colored rectangles changed colors during the colored rectangles block"). To investigate the relationship between attention/alertness and pupil size, this study analyzes two aspects: temporal attention and cognitive effort. Temporal attention refers to how participants paid attention to events as they happened over time. This was measured through comparing participant's accuracy in reproducing the event frequency to their pupil response during no task blocks, during which participants did nothing except focus on the fixation point. The predicted relationship between accuracy and pupil size is that a larger pupil dilation correlates linked to higher levels of accuracy. Cognitive effort refers to the mental effort put into a given task, and was measured by comparing amplitude of event-related pupil responses during the spacebar and foot pedal blocks. This study focuses on the correlation between accuracy, effort, and pupil response amplitude to analyze levels of activity in the locus coeruleus, a part of the brain responsible for arousal and attention. The hypothesized relationship posits that with higher

accuracy of spacebar and foot pedal presses and with higher levels of cognitive effort, there will be a larger pupil response.

OPTIMIZING STUDENT UNDERSTANDING: COMPARISON OF NOTE-TAKING METHODS
Presenter(s): Dylan Wilkus, Liam Mowat, Sasha Vivek, Thomas Buzzell
Category: Psychology
Mentor(s): Brendan Valentine (College of Social Science)

Note-taking is a common learning strategy, and the method can influence learning and memory. Prior research found that students who write notes by hand perform better on conceptual questions than those using laptops. This difference is thought to occur because typing encourages students to copy material word-for-word, while writing encourages deeper processing. In two experiments, we examined how note-taking methods influence comprehension and memory. We also measured how different levels of verbatim overlap (the amount that material is copied word-for-word) affect memory. In the first experiment, undergraduates were given articles about Norse settlements under four conditions: writing notes on paper, writing notes on a tablet, typing notes on a laptop, or a no note-taking control. Participants were later tested on memory and conceptual understanding. Average accuracy scores for all students who took notes showed higher performance than the control. Verbatim overlap was relatively low, and there were no significant differences across note-taking methods. These initial results suggest that note-taking supports improved memory when verbatim recording is low. In the second experiment, participants watched a lecture on immunology and were given printed, digital, or no slides, and were permitted to take notes on either the slides or blank documents, on either paper or laptop. Later, we tested participants on memory and understanding. Participants with digital slides performed worse on conceptual questions and had higher verbatim overlap in their notes compared to the others. Based on these results, students should handwrite notes and avoid transcribing verbatim to maximize conceptual learning and memory.

Science, Technology, Engineering, Mathematics (multiple disciplines)

EFFECTS OF BACILLUS SUBTILIS COMBINED WITH PLANT EXTRACTS ON THE MORPHOLOGY OF THE SMALL INTESTINE DURING THE WEANING PERIOD IN PIGS
Presenter(s): Lily Trapp
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Kwangwook Kim (College of Agriculture & Natural Resources)

Preliminary data demonstrated that pigs supplemented with Bacillus subtilis and plant extracts improved feed efficiency and reduced severity of post-weaning diarrhea. Building upon these findings, this study evaluated the effects of Bacillus subtilis combined with plant extracts on intestinal morphology in weaned pigs. A total of 240 pigs (6.12 ± 0.53 kg body weight) weaned at 19 ± 1 days of age were allotted to four dietary treatments in a randomized complete block design, with initial body weight as blocking

factor (6 pigs/pen; 10 pens/treatment). Treatments were: (1) Control (CON): basal nursery diet; (2) BPS: CON + 500 mg/kg Bacillus subtilis + plant extracts; (3) BPD: CON + 1000 mg/kg Bacillus subtilis + plant extracts; and (4) CBX: CON + 50 mg/kg carbadox. Pigs were fed for 28 days in two phases (day 0-14; day 15-28). One pig per pen was euthanized at the end of each phase to collect small intestinal tissues and analyze morphological changes. On day 14, jejunal crypt depth was lower ($P < 0.05$) in BPS compared with CBX, with BPD intermediate. On day 28, BDP reduced ($P < 0.05$) crypt depth and increased ($P < 0.05$) villi height-to-crypt depth ratio compared with CON. In the ileum, crypt depth was reduced ($P < 0.05$) in BPS, BPD, and CBX versus CON, with increased villus height-to-crypt depth ratio. Overall, supplementation of Bacillus subtilis and plant extracts enhanced intestinal development comparably to antibiotics in weaned pigs.

AGREEMENT BETWEEN IN-PERSON AND DIGITAL MEASUREMENTS OF EQUINE STRIDE LENGTH USING TWO DIFFERENT SOFTWARE'S

Presenter(s): Sydney Fish
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Brian Nielsen (College of Agriculture & Natural Resources), Renee Harbowy (College of Agriculture & Natural Resources)

Stride length is an important indicator of equine lameness because changes in stride length often reflect pain or asymmetry in a horse's movement. Traditionally, stride length is measured in-person. New software now allows stride length to be measured digitally, reducing the time and labor required for traditional methods. The objective of this study was to evaluate the agreement between stride length measurements taken in-person and those obtained through two digital tracking software, Kinovea and Tracker. Stride lengths were measured in-person by trotting a horse through a freshly raked dirt pathway, where an observer marked the left front hoof at strides 0 and 3, and the total length of the 3 strides was recorded. Horses completed a total of 3 passes, and the average stride length was calculated as the average length of a single stride across all 3 trials. Digital stride lengths were measured from video recordings calibrated with a known reference length. The agreement between in-person, Kinovea, and Tracker measurements was analyzed using SAS 9.4 software. A least-squares means test showed similar average stride lengths with in-person measuring 1.89 m, Kinovea 1.87 m, and Tracker 1.94 m. A difference of least squares means test revealed that Kinovea did not differ from manual measurements (0.015 m, $p=0.44$), whereas Tracker differed, measuring 0.049 m longer ($p=0.01$). Lastly, a Levene's test indicated no difference in variance between Kinovea and Tracker ($p=0.59$). These findings suggest that Kinovea produced similar results to in-person measurements and was the most user-friendly.

ENGINEERING EXTRACELLULAR VESICLES TO TARGET PANCREATIC BETA CELLS FOR THERAPEUTIC DELIVERY IN TYPE 1 DIABETES MELLITUS
Presenter(s): Mandy Murphy
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Masako Harada (College of Engineering)

Type 1 diabetes mellitus (T1DM) is an autoimmune disease characterized by T-cell-mediated destruction of pancreatic β-cells, which produce insulin to regulate blood glucose (BG). As a result, patients with T1DM require consistent insulin supplementation and BG monitoring. Developing strategies for targeted therapeutic delivery to β-cells could provide a more effective long-term treatment. Extracellular vesicles (EVs) are lipid-bilayer-enclosed nanoparticles secreted by many cell types that transport biomolecules, including RNA, DNA, lipids, and proteins. EVs represent a promising therapeutic delivery platform due to their biocompatibility, low immunogenicity, and ability to carry therapeutic cargo or display targeting proteins. SCAB-1 and SCAB-5 are single-chain variable fragment antibodies previously reported to target beta-cells, and p1316 is a monobody identified as enriched in the pancreas by our lab's VesicleVoyager screening platform. The goal of this study is to engineer EVs to display SCAB-1, SCAB-5, or p1316 and evaluate their binding specificity for pancreatic β-cells. DNA encoding each targeting protein will be transiently transfected into a stable HEK293T cell line expressing the fluorescent protein mCherry. Both mCherry and targeting proteins are fused to the lactadherin C1C2 domain to promote localization to EV surfaces. Engineered EVs will be isolated by ultracentrifugation, then characterized using nanoparticle tracking analysis, transmission electron microscopy, and western blotting. Binding specificity will be evaluated in a co-culture of MIN6 β-cells and 4T1 breast cancer cells using insulin staining and mCherry fluorescence. Successful identification of EV display proteins that selectively target β-cells would enable future development of EV-based mRNA or gene therapies for T1DM.

RESTORING THE ELECTRICAL SYSTEM FOR A SYRIAN VILLAGE USING CLEAN ENERGY
Presenter(s): Michael Chioini
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Camelia Suleiman (College of Arts & Letters)

The Civil War in Syria heavily affected Syrian society and infrastructure. This presentation explores how the electrical infrastructure of Syrian villages was crippled and forever impacted as a result of the Civil War, as well as the way I would address this problem if I actually had the ability to. I was inspired for this project because I learned about how the Syrian Civil War affected much of the country's infrastructure, and I wanted to apply my love for working on mechanical projects to a way to help this problem. Within the presentation, I mention how these crippled Syrian villages came up with a temporary fix for the electrical infrastructure, and how it will cripple them further. I also mention how exactly the electrical infrastructure was directly and indirectly impacted as a result of the war, what's currently being done in Syria to permanently fix the issue, and I explore more of my idea to fix the problem, Wind turbine grids. Wind turbines are a clean and reliable alternative to the diesel generators that were previously used to power these villages. I also present on the ideal kind of wind turbines for the Syrian climate that would

prove most efficient. Overall, the Syrian electrical infrastructure problem should be addressed before the infrastructure is further crippled.

EVALUATION OF NANO-BIOSENSOR PROBES FOR RAPID DETECTION OF SALMONELLA
Presenter(s): Katherine Heinecke
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Evangelyn Alocilja (College of Agriculture & Natural Resources)

The detection of Salmonella in poultry is critical for ensuring food safety and protecting public health. Traditional methods for Salmonella detection, while effective, are time?consuming and labor?intensive, often requiring several days to obtain results. To address this challenge, biosensor probes targeting the flj, hilA, and invA genes were developed for the rapid detection of Salmonella in poultry meat samples. This study evaluated the individual and combined performance of these three probes under laboratory conditions, focusing on their sensitivity and selectivity toward Salmonella against non?target microorganisms. When used in combination, the probes are expected to demonstrate enhanced detection limits and improved discrimination of Salmonella strains compared with single?probe assays. Results will be benchmarked against conventional detection methods, with the multiplexed biosensor system to provide reliable results within 4 hours, substantially reducing detection time. Integration of this combined?probe biosensor into poultry processing environments could enable faster responses to contamination events, lowering the risk of pathogen outbreaks and strengthening food safety management across the industry.

ENGINEERED INTRACELLULAR LISTERIA AS A MULTI-MECHANISTIC THERAPEUTIC PLATFORM FOR HISTIOCYTIC SARCOMA
Presenter(s): Tiffany Rennells
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Christopher Contag (College of Engineering)

Histiocytic sarcoma (HS) is a rare and aggressive malignancy of phagocytic immune cells including dendritic cells and macrophages. As a cancer derived from antigen-presenting cells (APCs), HS is challenging to diagnose and treat due to diverse clinical presentation ranging from localized lesions to disseminated multi-organ infiltration of tumors. Consequently, current treatment strategies including surgery and chemotherapy have demonstrated limited and variable success, underscoring the need for targeted therapeutic approaches. As HS cells are derived from APCs, they naturally uptake extracellular particles such as bacteria. Listeria monocytogenes (Lm), a Gram-positive intracellular bacterium, preferentially accumulates in APCs and can serve as a vehicle for intracellular protein delivery. In this project, we utilize a quadruple attenuated intracellular Listeria strain (QUAIL), engineered to reduce virulence and eliminate extracellular growth while maintaining intracellular viability. QUAIL can be further modified to delivery tumor suppressor proteins such as p53 to restore apoptotic signaling, azurin to stabilize p53 and promote apoptosis, checkpoint blockade molecules such as anti-PD-L1 to enhance anti-tumor immunity, and STING agonists to activate innate immune pathways and promote

immunogenic tumor clearance. We hypothesize that by simultaneously targeting multiple anti-tumor mechanisms via a single engineered Listeria vehicle, this platform will enhance systemic therapeutic efficacy and improve clearance of HS tumor cells in vivo.

WATER AND WAR
Presenter(s): Caleb Veyna
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Camelia Suleiman (College of Arts & Letters)

Syria's recent issues, which include war against other nations and itself, has severely damaged water and sanitation systems. Due to the damage of these systems, the risk of waterborne diseases has significantly increased. My presentation examines whether more functioning and chlorinated water stations could reduce disease cases in northwest Syria. Using data from 10 districts, the researchers of one source found that when more stations worked and were properly chlorinated, there were fewer cases of diarrhea, typhoid, and jaundice. The results show that safe water access saves lives even in zones of conflict.

ALTERED OVARIAN MORPHOLOGY AND ELEVATED ANTI-MULLERIAN HORMONE IN FEMALE OFFSPRING FROM PREECLAMPTIC-LIKE BPH/5 MOUSE
Presenter(s): Kendall Ball
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Victoria Bailey (College of Veterinary Medicine), Viviane Cristine Leite Gomes (College of Veterinary Medicine)

Preeclampsia, a hypertensive disorder of pregnancy, causes long-term adverse effects on offspring. In female offspring, reproductive outcomes resemble polycystic ovarian syndrome (PCOS), the leading endocrine disorder in women. However, the mechanisms underlying preeclampsia and PCOS remain poorly understood. In parallel to humans, female offspring from the preeclamptic-like Blood Pressure High Subline 5 (BPH/5) mouse exhibit precocious puberty, hyperandrogenism, and abnormal estrous cycles. Herein, our objective is to characterize endocrine profile and ovarian morphology in female offspring from preeclamptic-like BPH/5 pregnancies, in comparison to Blood Pressure Normal Subline 3 (BPN/3) mice. We hypothesized BPH/5 females will have elevated anti-mullerian hormone (AMH) and altered ovarian morphology, including increased number of cysts, pre-antral, and atretic follicles. Ovaries and serum were collected from adult BPN/3 ($n = 7$) and BPH/5 ($n = 7$) mice in diestrus. Paraffin-embedded ovaries were sectioned (5 µm) and underwent hematoxylin-eosin staining. For an inter-strain comparison, the number of differing structures within each ovary was counted, and Student's t-tests were performed. We found an increased number of primordial ($p < 0.0001$), primary ($p < 0.0001$), secondary ($p < 0.001$), early antral ($p = 0.0011$), and atretic follicles ($p < 0.01$) in adult BPH/5 females. AMH concentration was also two-fold higher in BPH/5 females ($p < 0.001$). No differences were found in the number of large antral follicles, corpora lutea, or cyst-like structures between strains. These findings

suggest exposure to a preeclamptic intrauterine environment results in abnormal ovarian morphology alongside elevated AMH levels, consistent with PCOS-like ovarian phenotype.

UTERINE ARTERY PERIVASCULAR ADIPOSE TISSUE EXPANSION AND IMPAIRED VASCULAR REMODELING IN A MOUSE MODEL OF OBESITY AND SUPERIMPOSED PREECLAMPSIA
Presenter(s): Jessica Rowe
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Viviane Cristine Leite Gomes (College of Veterinary Medicine)

Impaired uteroplacental vascular remodeling and placental hypoxia are key pathophysiological features of preeclampsia, a leading hypertensive disorder of pregnancy that is substantially influenced by maternal obesity. Perivascular adipose tissue (PVAT) surrounds most blood vessels and supports vascular homeostasis, but, in obesity, it becomes proinflammatory and profibrotic, potentially disrupting vascular remodeling. The role of uterine artery PVAT (utPVAT) in pregnancies affected by obesity and preeclampsia remains unknown. Blood Pressure High Subline 5 (BPH/5) mouse displays spontaneous obesity and a preeclamptic-like phenotype. We hypothesized that expanded BPH/5 utPVAT would present signs of hypoxia and inflammation and uterine arteries from BPH/5 females would display impaired outward hypertrophic remodeling characteristic of healthy pregnancies. Uterine arteries and surrounding utPVAT were collected from adult non-pregnant (NP) and late-gestation (e18.5) BPH/5 and control Blood Pressure Normal Subline 3 (BPN/3) females. Uterine artery diameter and wall thickness were quantified histologically. In BPN/3 females, uterine artery lumen and media thickness were greater at e18.5 compared to NP ($p<0.05$). Conversely, uterine artery media thickness and lumen diameter were comparable between NP and e18.5 BPH/5 ($p>0.05$). BPH/5 females had greater utPVAT mass than controls pre-pregnancy and at e18.5 ($p<0.05$). Flow cytometry was performed and utPVAT from NP and e18.5 BPH/5 had more macrophages and fewer dendritic cells and eosinophils ($p<0.05$). In conclusion, similar media thickness and lumen diameter between uterine arteries of NP and e18.5 BPH/5 females are suggestive of impaired remodeling. BPH/5 females also displayed utPVAT expansion and appear proinflammatory, suggesting a disrupted microenvironment contributing to impaired remodeling.

NUTRITIONAL RISKS IN WEST AFRICAN DIETS -A PRIMARY CARE, DIVERSITY AND PUBLIC HEALTH PERSPECTIVE
Presenter(s): Amechi Anwah
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Bess German (Honors College)

West African immigrants represent one of the fastest-growing immigrant populations in the United States, yet their health experiences are often overlooked within primary care education and practice. This project examines how cultural dietary practices-such as fufu-based meals, soup-centered dishes, and the use of seasoning cubes-interact with the U.S. food environment and healthcare system to influence chronic disease risk. While these foods are culturally meaningful and commonly home-cooked, changes in food availability, portion size, and preparation after migration can increase sodium intake,

refined carbohydrate consumption, and overall cardiometabolic risk. At the same time, limited provider familiarity with culturally specific foods often results in generic nutrition counseling that lacks relevance to patients' lived experiences. This disconnect can reduce engagement, delay prevention, and contribute to disparities in hypertension, insulin resistance, and related chronic conditions. By using nutrition as a case example, this project highlights the broader importance of culturally responsive primary care in diverse populations. As the United States continues to become more culturally diverse, integrating cultural understanding into healthcare education and practice is essential for improving prevention, equity, and health outcomes across immigrant communities.

HARVESTING CA-47 FROM FRIB BEAMLINE FOR CA-47/SC-47 MEDICAL ISOTOPE GENERATOR
Presenter(s): Vaughn House
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Deepika Davuluri (College of Natural Science), Katharina Domnanich (Facility for Rare Isotope Beams)

The Isotope Harvesting Program at the Facility for Rare Isotope Beams (FRIB) relies on capturing the co-produced radionuclides derived from primary beam interacting with an aqueous beam dump during accelerator operations. This process provides researchers with access to radioisotopes that are otherwise difficult to obtain through conventional production methods. Harvested isotopes can be separated at high isotopic purity and are applicable across multiple research areas, including the production of radiopharmaceuticals. Solid isotope harvesting is another harvesting technique at FRIB for producing isotopes. This methodology utilizes a cassette constituting metal foils to intercept the secondary beam and capture the radionuclide of interest. These embedded radionuclides are further processed using chromatography techniques for achieving required purity. This project investigates the design of solid-harvesting system for Ca-47(t_ = 4.53 days), a radionuclide relevant for its ability to produce Sc-47(t_ = 3.35 days). A primary beam containing Ca-48 was fragmented to produce a secondary beam of Ca-47, which was harvested using a cassette containing tantalum and aluminum foils arranged to capture isotopes. The foils were then dissolved in 6M HCl. The Ca-47 was separated from impurities using cation exchange chromatography. The separation yield of Ca-47 from this experiment is 95%. This will be used in the future for creating a Ca-47/Sc-47 generator, producing Sc-47 for radiopharmaceutical applications.

QUANTITATIVE PET MRI ASSESSMENT OF OATP MEDIATED HEPATIC FUNCTION IN A HUMANIZED MOUSE MODEL
Presenter(s): Emma Lechniak
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Christiane Mallett (College of Human Medicine), Erik Shapiro (College of Osteopathic Medicine)

Hepatocytes play a critical role in liver function by transporting molecules from the bloodstream; however, accurately quantifying this uptake noninvasively in vivo remains a challenge. Organic anion

transporting polypeptides, or OATPs, are key hepatic transporters that mediate uptake of bile acids, hormones, and certain imaging agents into hepatocytes. Altered OATP activity is associated with liver dysfunction, yet current clinical techniques do not directly assess transporter function. This study compares magnetic resonance imaging and positron emission tomography as quantitative tools for measuring OATP-mediated hepatic uptake in living subjects. Using a transgenic mouse model expressing human OATP transporters in the liver, we administered Gd EOB DTPA, an FDA-approved MRI contrast agent, alongside Yttrium 86 EOB DTPA, a radiolabeled analog developed in the Shapiro laboratory. Dynamic simultaneous PET MRI was performed for one hour post-injection. Liver regions of interest were analyzed using PMOD software to quantify MRI signal enhancement and percent injected dose on PET. To confirm transporter-specific uptake, animals were pretreated with rifampicin, a well-characterized OATP inhibitor. Uptake values with and without inhibition were compared across imaging modalities. These results will clarify whether PET and MRI provide consistent measures of hepatic OATP activity and support the development of noninvasive imaging approaches for evaluating liver function.

ESTABLISHING QUALITY THRESHOLDS FOR CONTROLLED ENVIRONMENT STRAWBERRY PRODUCTION
Presenter(s): Lily Wei
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources), Somneang Oul (College of Agriculture & Natural Resources)

Growing demand for strawberries has led to increased controlled environment (CE) production. The primary cultivar for CE production, 'Albion', is low-yielding and unprofitable, and additional cultivars and growing conditions need assessment for yield efficiency. Current federal guidelines provide limited guidance for determining berry quality and acceptability. We aimed to identify parameters to produce CE strawberries with high yield and quality. The quality of four strawberry cultivars ('Albion', 'Mara de Bois', 'San Andreas', and 'Seascape') grown at four day/night temperatures ranging from 18/10ºC to 27/19ºC was assessed. Each strawberry was cut in half, with one half used for sensory evaluation by a consumer panel (n=103) and the other half used for physicochemical measurements. Sensory quality was evaluated based on liking (appearance, shape, texture, flavor, and overall), attribute intensity (ripeness, freshness, firmness, juiciness, strawberry-flavor, sweetness, and sourness), and Just-About-Right (JAR) scaling (size and firmness). Mass, diameter, color, instrumental firmness, soluble solids content, and titratable acidity were measured to assess physicochemical quality. Data was analyzed using ANOVA and LSD post-hoc tests, and berry-to-berry uniformity of physicochemical and sensory attribute scores was compared with consumer liking and JAR scores to establish a percent acceptability (%A) metric for evaluating CE strawberry quality. Higher growing temperatures yielded higher berry-to-berry uniformity but lower %A; however, the degree of uniformity is cultivar-dependent. Quality thresholds for mass (13-27g), diameter (33-44mm), a* color (26-42), instrumental firmness (1.73-6N), and SSC/TA ratio (4-24 ºBx/% acid) can be used to guide CE strawberry production decisions.

COMPLEXITY OF THE U.S. HEALTH DISADVANTAGE
Presenter(s): Anish Komatireddy, Sidharth Unniyampath
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Daniel Thiel (Lyman Briggs College), Lynnette King (College of Social Science)

Health disparities in the US are a reflection of systemic issues that go beyond access to healthcare. With excessive healthcare spending, the country's life expectancy, avoidable mortality, and chronic disease effects, the US continues to fall behind those of similar high-income nations. By doing an in-depth analysis of peer-reviewed literature and global data, this paper addresses the systemic factors causing this gap. Four connected determinants are the main focus: education, socioeconomic status, structural discrimination, and trust in the healthcare system. Access to healthcare, job opportunities, and knowledge of healthcare are all impacted by educational inequality. Affordability, financial security, and being able to efficiently handle a person's health are all impacted by economic inequality. Institutional distrust lowers participation in preventive services, while structural discrimination impacts treatment quality and access. Instead of functioning as individual obstructions, these determinants function as a system of encouragement. Instead of concentrating only on insurance access, upstream institutional and social frameworks should be addressed if US health outcomes can be significantly improved.

HOW DO DIFFERENT HUMAN INFANT GUT MICROBIOMES INFLUENCE EXPLORATION, MEMORY, AND RESPONSE TO NOVELTY IN BOTH SOCIAL AND NON-SOCIAL CONTEXTS IN MICE?
Presenter(s): Nelli Gaspar, Rachael Over
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Rebecca Knickmeyer (College of Human Medicine)

What if autism starts in the gut? This study aims to identify how different human infant gut microbiomes influence exploration, memory, and response to novelty in both social and non-social contexts We accomplished this aim by transplanting microbes from infant stool into germ-free pregnant mice and studying the offspring using the Novel Object Recognition (NOR) and the Three Chamber Social Preference tests. We focused on two infant communities: one enriched in Bifidobacterium (HUM1) and one enriched in Bacteroides (HUM2). For comparison, additional pregnant germ-free mice received either fecal material from specific-pathogen-free (SPF) mice or autoclaved SPF feces; the latter group remained germ-free until behavioral testing. In the NOR, a mouse is placed in a box with two similar objects and allowed to explore them for five minutes. Then one object is replaced with a novel object and exploration is recorded for another five minutes to assess preference. The three-chamber test measures sociability by seeing whether a mouse spends more time in the chamber with another mouse (vs. an object) and social memory by seeing whether it prefers a new unfamiliar mouse over a familiar one. The reason we used mice is because mice let us control the microbiome to test cause-and-effect on various behaviors, which cannot ethically be done in infants. We are currently in the process of analyzing the data to determine possible links between infant gut microbiome and social interaction and affinity for novelty.

THE ROLE OF AMINO ACID BIOSYNTHESIS PATHWAYS IN APPLE AROMA VOLATILE PROFILES AND CONSUMER PREFERENCE
Presenter(s): Alyssa Hawkins, Sarah Coyne, Sarah Samir Modi
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources)

Acetohydroxy acid synthase (ALS) is a key enzyme in the biosynthesis of branched-chain amino acids, precursors to branched-chain esters, which contribute to aroma compound production in most but not all varieties of apples. Cox's Orange Pippin, which does not have ALS, and Jonagold, which does, were included in the study. To investigate the impact of branched-chain esters on apple aroma, we applied a treatment to inactivate ALS and block branched-chain amino acid synthesis, resulting in an altered balance of volatile compounds. By subsequently feeding those amino acids or their precursors, the pathway is restored, and branched-chain ester aroma compound production will recover. We hypothesize that readministering a branched-chain amino acid will result in a noticeable difference in apple aroma and that consumers will prefer the aroma of apples with branched-chain esters. In this study, 94 panelists were recruited to evaluate the aroma profile of apple peel samples from treated and untreated Cox's Orange Pippin and Jonagold apple cultivars. Panelists assessed the samples using the following sensory evaluation methods: duo-trio, paired-preference, and rate-all-that-apply (RATA). For Cox's Orange Pippin, the presence of the branched-chain esters significantly altered the aroma profile, and panelists preferred these samples, noting an increase in the apple-like aroma. For Jonagold, no significance in aroma profile difference, preference, or attributes was observed. Its more complex aroma profile suggests that the branched chain esters had a minimal impact. Collectively, the results indicate branched-chain esters significantly affect simpler aroma profiles but have a limited impact on complex aroma profiles of apples.

EFFECTS OF PRE-TREATMENT AND MILLING TECHNOLOGIES ON PULSE FLOUR QUALITY
Presenter(s): More Pastrana
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Sharon Hooper (College of Agriculture & Natural Resources)

The demand for pulses and pulse flour has increased over the past years. Pulses are high in protein and are a significant source of vitamins and minerals. Consumers' interests have switched from conventional wheat to plant-based alternatives. However, the absence of gluten in pulse flour affects dough rheology and food product quality. The objective of this project was to determine the effects of pre-treatment and milling technologies (pilot-scale hammer and compression\decompression mills) on pulse flour quality. Pulse-based crackers were made using pinto beans, navy beans, and chickpeas as the pulse flour samples. Protein, starch, dietary fiber, color, textural, and particle size analyses were performed.

EFFECT OF PROCESSING METHODS ON THE OLIGOSACCHARIDE CONTENT OF EDIBLE PULSES
Presenter(s): Shamita Ingalagi
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Karen Cichy (College of Agriculture & Natural Resources), Sharon Hooper (College of Agriculture & Natural Resources)

Beans contain carbohydrates called oligosaccharides, which can affect both their nutrition and how easy they are to digest. These sugars are naturally found in legumes and are often linked to digestive discomfort, but they may also have health benefits because they can support helpful bacteria in the gut. Since beans are usually eaten after cooking or other processing, it is important to understand how these processes change the sugar content. The goal of this project is to study how different processing methods affect the sugar and oligosaccharide content of beans. The experiment will focus on common beans such as pinto, yellow, and navy beans. Raw beans will be compared with beans that have been processed using methods like roasting, steaming, boiling, and canning. For the experiment, the beans will first be freeze-dried and ground into a fine powder. The sugars will then be extracted using an ethanol-water extraction method. After extraction, the sugar content will be analyzed using High Performance Liquid Chromatography (HPLC). This method will allow the measurement of sugars such as glucose, fructose, sucrose, raffinose, and stachyose. By comparing the sugar profiles of beans after different processing methods, this project aims to better understand how processing affects the carbohydrate composition of beans.

ENCAPSULATION OF TERPENE BIOSYNTHESIS IN A PROTEIN NANOREACTOR
Presenter(s): Liam Clark
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Bjoern Hamberger (College of Natural Science), Trine Andersen (Research & Innovation)

Terpenoids are one of the most diverse families of specialized metabolites known to biochemistry. These compounds have high biological activity and are used in nature as potent chemical signals capable of communication across kingdoms of life. Two abundantly produced bacterial terpenes are methylisoborneol and geosmin, which are responsible for the earthy smell of soil and are extremely potent odorants. Certain bacteria are capable of localizing terpene metabolism within a class of protein shells known as encapsulins. Recent research has unveiled that certain filamentous bacteria are capable of subcellularly compartmentalizing the terpene synthesis of methylisoborneol; however, this system has only been experimentally validated once. This project aims to recharacterize and elaborate on the compartmentalization of terpene metabolism within protein shells. For this project, two species of Streptomyces living on the root of switchgrass have been identified as terpene encapsulators. Bioinformatic analysis has identified two encapsulin shell genes and four terpene synthase genes which contain regions associated with encapsulation. These genes were heterologously expressed in an engineered strain of Escherichia coli, with enzymatic activity confirmed via GC-MS. Future analysis will entail cryo-EM structural imaging of assembled encapsulin shells both with and without cargo enzymes. Cross-compatibility of interspecies encapsulin proteins will also be investigated. This investigation will yield critical insight into terpene synthase encapsulation and spatial regulation of specialized

metabolism. Successful characterization sets the stage for the creation of new technology in terpene biosynthesis, and expands on existing documentation to establish compartmentalization as a conserved terpene production mechanism across species.

GENETIC ANALYSIS OF NOVEL OSI12 GENE IN TRACHEAL BRANCH FUSION
Presenter(s): Jiasheng Li
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Lan Jiang (Oakland University)

The Drosophila tracheal system is a commonly used model for studying tubular morphogenesis and epithelial tube fusion. Tracheal branching fusion is mediated by specialized fusion cells that establish adhesive junctions and form continuous lumens between adjacent branches. Previous studies have identified several members of the Osiris gene family involved in tracheal development, and the Osi12 gene is highly expressed in tracheal fusion cells, suggesting a potential role in branching fusion. In this study, an Osi12 loss-of-function mutant was constructed using CRISPR-Cas9 gene editing technology. Homozygous mutant larvae were identified using GFP markers and validated by PCR and Sanger sequencing. Tracheal morphology was observed using bright-field microscopy and compared with wild-type larvae. The results showed that the Osi12 mutant exhibited defects in tracheal branching fusion, including incomplete branch connections and discontinuous tracheal networks. These findings suggest that Osi12 plays a regulatory role in Drosophila tracheal branching fusion and normal tubular structure development. This study provides new insights into the genetic regulation of tubular structure morphogenesis and may contribute to understanding the mechanisms of tubular organ development.

EXAMINING SCALING LAWS OF PARAMETRIC MATRIX MODELS
Presenter(s): Nick Rohde
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Dean Lee (Facility for Rare Isotope Beams)

Parametric Matrix Models (PMMs) are a powerful new tool in machine learning, which allow for a multitude of ways to approach complex equations. In this work, we examine the scaling laws of PMMs and how their accuracy and efficiency changes with several different factors. Factors include but are not limited to trainable parameter count, amount of data, and initial formulation of the PMM. Through various plots of accuracy and inference time, we can get an idea of how PMMs scale compared to other, more common, machine learning models.

HARVESTING OF PT-197 FROM FRIB BEAMLINE FOR RADIO CISPLATIN GENERATION.
Presenter(s): Alexa Annika Calderon
Category: Science, Technology, Engineering, Mathematics (multiple disciplines)
Mentor(s): Deepika Davuluri (College of Natural Science), Katharina Domnanich (Facility for Rare Isotope Beams)

At the Facility for Rare Isotope Beams (FRIB), primary beams are fragmented to produce secondary beams used to study fundamental questions in nuclear physics. In addition to these experiments, rare isotopes are generated as byproducts when fragmented beams interact with water beam dumps, forming the basis of the Isotope Harvesting Program. Secondary beams can also be intercepted using a cassette of stacked metal foils, enabling solid-target harvesting of more exotic isotopes. These harvested isotopes can then be purified using chromatographic techniques. This project focuses on the recovery and purification of platinum-197 (t1/2 = 19.9 h), a radionuclide with strong potential for cancer theragnostic applications. Pt-197 emits beta particles and Auger electrons that can damage cancer cells, while also producing gamma radiation suitable for single-photon emission computed tomography (SPECT) imaging. During harvesting experiments, beam particles were collected using a cassette containing stacked tantalum and aluminum foils designed based on LISE++ predictions. The irradiated materials were processed, and Pt-197 was isolated using extraction chromatography. Chemical conditions were optimized to address challenges associated with the reduction of platinum within the aluminum foil matrix, improving recovery yields up to 89 percent while maintaining high isotopic purity. These results demonstrate an effective method for producing and recovering Pt-197 through isotope harvesting at FRIB. The purified isotope supports future development of radiolabeled cisplatin and advances in cancer imaging and targeted therapy, highlighting how accelerator byproducts can be transformed into valuable biomedical resources.

Showcase

VISUALIZING DATA WITH LEGOS: THE PROPORTION OF PEOPLE WITH INTELLECTUAL AND DEVELOPMENTAL DISABILITIES IN STATE INSTITUTIONS (2013-2023)
Presenter(s): Liam Bordoni
Category: Showcase
Mentor(s): Rebecca Tegtmeyer (College of Arts & Letters)

Inspired by my younger brother, much of my recent undergraduate work as a designer has revolved around Intellectual and Developmental Disability (IDD), with a particular interest in data visualization. However, in an ever-growing age of digital oversaturation and information overload, creating accessible, intriguing, and informative data visualizations is harder than ever. Exploring ways to depart from the more traditional digital representations of data, I was eager to experiment with physical mediums. A study out of Cornell looking at creating accessible data visualizations specific to the IDD community emphasises the benefit of physicality in their results, noting a "need for a narrative and tangible approach to accessible data visualization." This particular project is constructed entirely out of legos, an homage to my brother's fixation of choice, and a familiar medium to many in the IDD community. Taking

advantage of 3-dimensional space, the display is an amalgamation of a classic bar chart, heatmap, and topographic map, showing the proportion of individuals with IDD who were institutionalized in each state between 2013 and 2023. There are 561 total data points across 51 states (including the national average) and 11 years, cleanly and accessible organized, differentiated by both height and color. The data shows a significant trending decrease in institutionalization across the country as the years progress. Over a third of the country's states have done away with government institutions entirely by 2023, and have prioritized Medicaid-funded facilities that largely focus far more on accommodative support, rather than institutional suppression.

FIGURE MOVING
Presenter(s): Audrey Perry
Category: Showcase
Mentor(s): Lorelei d'Andriole (College of Arts & Letters)

This piece represents the movements of objects through nature and how we don't notice it everyday.

FASHION
Presenter(s): Audrey Perry
Category: Showcase
Mentor(s): Lorelei d'Andriole (College of Arts & Letters)

I have sewn a garment that showcases my skills in draping, hand sewing, and creativity.

ADAPTIVE FASHION AND SOLUTIONS FOR DAILY LIVING
Presenter(s): Reagan Wiley
Category: Showcase
Mentor(s): Saetbyul Park (College of Arts & Letters)

Adaptive fashion is clothing designed to meet the needs of individuals with physical disabilities, sensory sensitivities, and other challenges that make traditional apparel difficult to wear. Despite representing over 1.3 billion people globally, individuals with disabilities remain significantly underserved by the mainstream fashion industry. This research aims to explore the specific clothing needs of people with disabilities and use those insights to inform the design and construction of adaptive garments. The study will be conducted in three phases: 1. Needs Assessment - Engage with individuals through interviews, surveys, and focus groups to identify key functional, aesthetic, and emotional requirements in clothing. 2. Pattern Development - Use gathered insights to create garment patterns that incorporate universal design principles for comfort, ease of dressing, and personal style. 3. Garment Construction and Evaluation - Produce prototype garments and conduct user testing to assess fit, functionality, and user satisfaction. The goal is to develop stylish, functional, and inclusive clothing that enhances

independence, dignity, and self-expression to enrich daily life. This research will lay the groundwork for a truly inclusive fashion future.

FABRICATION AND CASTING
Presenter(s): Evan Yalowitz
Category: Showcase
Mentor(s): Jacquelynn Sullivan Gould (College of Arts & Letters), Jamie Weinfurter (College of Arts & Letters)

I have been working with Jacquelynn Sullivan-Gould and Jamie Weinfurter in the production of metal sculptures through fabrication and casting processes. Specifically, Jamie and I have collaborated to participate in the annual iron pour hosted by the College for Creative Studies in Detroit because we do not have the facilities to work with iron here at Michigan State. This opportunity will allow me to connect and work with other students attending CCS, like Wayne State University, Cranbrook, University of Michigan, and other Michigan institutions. With Jacquelynn, we are creating large scale public art sculptures to consider how we interact with art in a public landscape. This has allowed me to expand my knowledge with materials and further develop my fabrication skillset. For the forum, I would like to come in person and bring examples in of what I have made. I could also supply supplemental materials, such as a poster, if needed.

CAGED BEAUTY
Presenter(s): Katherine Costello
Category: Showcase
Mentor(s): Lorelei d'Andriole (College of Arts & Letters)

Caged Beauty is a series of wire and pearl works that explores an influential period in my childhood and my coming-of-age as a young woman. I chose to work with black wire and pink pearls because their contrast carries tension-the wire suggests restriction and confinement, while the pearls symbolize softness and femininity. This interplay reflects the pressures of social expectation and body image, and the push and pull between restraint and beauty. Through this piece, I invite viewers to reflect on the role of women in society and the ways identity can feel both celebrated and constrained. Ultimately, this project represents a transformative period in my life-one in which my sense of self was challenged, reshaped, and redefined.

BLUEPRINTS OF CHEMICAL CARCINOGENS: FAST FASHION'S TOXIC IMPRINT ON OUR GENES
Presenter(s): Grace Adams
Category: Showcase
Mentor(s): Lorelei d'Andriole (College of Arts & Letters)

This project utilizes cyanotype, a photographic printing process that uses ultraviolet light to produce blue photographic prints. To explore the intersection of materialistic culture, environmental health, and epigenetics. By converting photographs and text into film negatives and "printing" these images onto denim, the work uses a pair of adult and childrens jeans as a physical stand-in for biological "genes." The core of this research focuses on epigenetics. The study of how environmental factors and lifestyle habits can alter gene expression without changing the underlying DNA sequence. The project highlights the role of chemical carcinogens and how they act as switches that can trigger the development of cancer. Through the lens of fast fashion and overconsumption, this illustrates how our "disposable" clothing habits have physical consequences. The toxic dyes and industrial waste occurring in mass garment production fill our environment and subsequently our bodies. By merging art and science, this presentation demonstrates how human consumption habits are quite literally rewriting our biology. The "fabric" of our lives and our biological blueprints are inextricably linked. Through our consumption habits, we are quite literally writing our own destiny and rewriting our biology, proving that we have no one to blame but ourselves.

CELESTIAL
Presenter(s): Leo Pratt
Category: Showcase
Mentor(s): Saetbyul Park (College of Arts & Letters)

Celestial is a hand sewn ball gown initially presented as a competitive piece for Miss Kalamazoo Pride 2025. The gown is composed of satin, crepe, and tulle. The corset is composed of EVA foam, hot glue, gold chains, acrylic beads, and polyester cording.

FASHION, CLOTHING, AND STYLE IN YOUNG AMERICA
Presenter(s): Carly Stewart, Isabelle Robinson, Mackenzie Anderson
Category: Showcase
Mentor(s): Thomas Summerhill (College of Social Science)

Throughout the history of the world, fashion has been an ever-changing concept that represents people, the United States was no exception. Early America was a time of change and embraced independence among individuals who had previously faced years under another nation's rule. Through clothing, early Americans found meaningful ways to express themselves and communicate what was important to them-illustrating that fashion, though seemingly minor, played a significant role in their lives. Factors including foreign political involvement, tensions between social classes, and much more gave clothes far more meaning than simple fabric. This project explores how societal pressures and expectations,

emerging trends, and political forces shaped fashion as a crucial force of individual expression as well as conformation and alienation in Jacksonian America.

MASS INCARCERATION AND THE ARTS
Presenter(s): Elena Forman
Category: Showcase
Mentor(s): Guillermo Delgado (Residential College in Arts & Humanities)

The rate of incarceration in the United States, proportional to the number of citizens, is the highest in the world, as of May, 2021. The rate of incarceration for People of Color, specifically Black and Latinx people is disproportionately high compared to the number of each of these groups in the United States. The experiences of incarcerated individuals varies greatly based on race, ethnicity, religion, sexuality, and gender. There are many other factors that influence's a person's experience within prison, including whether they make their way into an "in-group," the type of crime they were in prisoned for, which level of prison they are incarcerated in, and whether the prison has mental health and educational resources for inmates. My undergraduate research project as two facets, a podcast featuring interviews with formerly incarcerated individuals and family members of those in prison, and a visual art project of digital broadsides, a collaboration between myself and incarcerated poets. The project seeks to examine the United States prison system through the lens of those who have experienced it most intimately, and through one of the factors that can most benefit an inmate's experience: art. While recording devices are not permitted inside prisons, the art of digital broadsides allows inmates poetry to reach those outside of prison, amplifying their own words. Combined with the podcast which includes discussion on solitary confinement, the levels of the prison system, and personal experiences, the broadsides feature poetry and art collaborations between MSU students and incarcerated artists.

UNDERSTANDING BEHAVIORAL HEALTH CARE IN EMERGENCY DEPARTMENTS: PATIENT EXPERIENCE, ACCESS, AND CARE GAPS
Presenter(s): Marita Rechdan
Category: Showcase
Mentor(s): Linda Tansil (Henry Ford Providence Novi Emergency Department)

Emergency departments (EDs) serve as a critical access point for individuals experiencing behavioral health crises. However, many EDs are not structurally designed to meet the complex mental health needs of patients, resulting in prolonged wait times, limited access to specialized care, and fragmented follow-up services. This project explores behavioral health care delivery within emergency departments, with a focus on patient experience, systemic barriers, and opportunities for improvement. Using a research-informed and creative approach, this presentation synthesizes existing literature on behavioral health utilization in EDs and applies it to real-world clinical contexts. Particular attention is given to the role of behavioral health professionals, including therapists and social workers, in assessment, de-escalation, crisis intervention, and coordination of care. The project highlights common challenges faced by patients, such as stigma, emotional distress, and difficulties navigating complex healthcare systems.

To enhance accessibility and engagement, the findings are presented through visual storytelling and animation that illustrate a patient's journey through the emergency department. This format emphasizes the human experience behind behavioral health emergencies while maintaining patient privacy and ethical standards. By examining gaps in care and interdisciplinary solutions, this project aims to increase awareness of behavioral health needs in emergency settings and underscore the importance of compassionate, integrated approaches to care. The presentation encourages future healthcare professionals to consider patient-centered strategies that promote equity, access, and improved outcomes.

FEMINISM AND FRANÇAIS: AN OF THEE I SING REVIVAL
Presenter(s): Anastasia Breen
Category: Showcase
Mentor(s): Adam Yankowy (College of Arts & Letters)

Of Thee I Sing is a George and Ira Gershwin musical written in 1931. The show is set in the US during a presidential election in the 1930s. John P. Wintergreen is running for president and hopes to win over the hearts of the people by marrying the most beautiful girl in the United States. Though a southern contestant named Diana Devereaux wins the competition, Wintergreen chooses to marry the head of the pageant: Mary. Wintergreen wins the presidential election, but he faces the anger of Diana - who enlists the help of the French to turn her ire into an international conundrum. Of Thee I Sing is a well-written musical with beautiful music that highlights the egregious populism and misogyny of men in power - a theme that rings true today. While a 2025 revival of this show would certainly connect to the current political climate in the US, the misogyny within the story as written goes farther than poking fun at political/social trends and degrades women rather than uplift their stories. With a 2025 revival and rewrite, the roles of Diana and Mary would be uplifted and celebrated more within the story, with more attention to their objectives and character arcs in tandem with the male main characters.

Social Science, Arts, Humanities (multiple disciplines)

IMPACT OF PEER LEADERSHIP IN A STUDENT-RUN NEWSROOM
Presenter(s): Ava Moschet
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Robert Gould (College of Communication Arts Sciences)

Student-run newsrooms are essential spaces for experiential learning in journalism education, yet the most effective leadership structures within these environments remain debated. This study examines student perceptions of leadership in Focal Point News, a weekly, student-produced television newscast at Michigan State University led by student executive producers rather than faculty. Drawing on survey data and qualitative reflections from newsroom participants, the research explores how leadership models influence student engagement, learning, and newsroom culture. Findings reveal a strong

preference for student-led leadership over professor-led models. Participants described student leaders as more approachable and more responsive to the realities of student workloads and peer collaboration. Students also reported that peer leadership fostered a greater sense of ownership, confidence, and professional development within the newsroom. While faculty involvement was valued for mentorship and guidance, respondents indicated that excessive faculty control could limit autonomy and creativity. These findings suggest that student-led leadership models can enhance both educational outcomes and newsroom morale in academic media settings. The study contributes to ongoing conversations about experiential learning and leadership development in journalism education by highlighting the benefits of peer leadership in preparing students for professional newsroom environments.

BUILDING CLINICAL COMMUNICATION SKILLS IN PRE-HEALTH PHYSIOLOGY STUDENTS THROUGH A COMPLEMENTARY MEDICINE RECOMMENDATION ASSIGNMENT
Presenter(s): Harrison Feber
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Erica Wehrwein (College of Natural Science)

Health care communication skills are important as there is a correlation between effective physician-patient communication and improved health outcomes. Also, the NIH reports a twofold increase in complementary and alternative medicine (CAM) therapy usage from 2002-2022, with 55% of patients reporting use. We incorporated an assignment into our senior human physiology capstone laboratory course (PSL 475L) that ties clinical lay communication skill-building to developing awareness of CAM use. The course is part of the physiology majors at Michigan State University. ~90% of our students are aspiring pre-health professionals. The course is rooted in human physiology laboratory activities, but also includes work on professional skills. Approximately 10% of course points are professional development. One skills-based assignment is students are given a scenario where a patient has come in with a condition and would like to explore alternative therapies. They write a 250-500 word recommendation plan, including a brief description of the condition and of the therapy. Students then put their patient plan through an online de-jargonizer program (https://scienceandpublic.com/) and iteratively revise it in the program to achieve an appropriate lay language score. The assignment is worth 50 pts points (Total Semester 2000 pts). Students perceived self-efficacy in communication skill significantly improved ($n=300$, $p<0.001$) when comparing pre- and post-semester survey responses. In conclusion, adding this low stakes assignment to our lab course allows for clinical communication skills building, increased awareness of CAM therapies, and improves comfort with health lay communication for future health care practitioners.

LEVERAGING TRAIL COUNTERS TO UNDERSTAND SPATIOTEMPORAL USE ON THE TWO TRAILS OF THE MANISTEE RIVER

Presenter(s): Alsacia Goelzer
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Dan McCole (College of Agriculture & Natural Resources), Elizabeth Perry (College of Agriculture & Natural Resources)

The Manistee River Trail/North Country Trail (MRT/NCT) forms the Manistee River Loop in the Huron-Manistee National Forest of northwestern Michigan. The loop follows the Big Manistee River and connects to the North Country National Scenic Trail via bridges at the north and south ends, passing through mixed forest, steep river bluffs, and scenic overlooks. This highly accessible, multi-use trail system attracts hikers, backpackers, and campers and experiences concentrated use at key locations. From 2023-2025, a research team collected passive infrared TRAFx trail counter data to support recreation management and better understand system-wide use and site-specific activity. Fifteen counters were intentionally placed at main and secondary access points and along trail segments to capture use levels across the loop and at points of interest such as the suspension bridge. Using the full 2024 dataset, this project evaluates whether counter records alone can infer visitor direction and what information can and cannot be reliably derived from this relatively low-cost monitoring method. Analysis is ongoing, with syntheses planned for early 2026. Visitor sequences will be grouped using date, time, and counter ID, with time gaps between detections used to infer travel paths. These sequences are expected to identify entry points and the most common directional routes. Overall, this study tests the strengths and limitations of infrared trail counters for mapping visitor movement and informing sustainable recreation management in high-use areas.

PROVIDER TRAINING AND PRACTICE FACTORS AFFECTING FAMILY-CENTERED CARE DELIVERY IN APPLIED BEHAVIOR ANALYSIS

Presenter(s): Haley Price
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Brooke Ingersoll (College of Social Science)

Introduction Family-Centered Care (FCC) improves equity and quality in autism services, but evidence suggests it remains underutilized in Applied Behavior Analysis (ABA) practice. FCC supports collaborative decision-making and aligns services with family values and lived experiences. Training providers in FCC is essential for supporting children with Autism Spectrum Disorder (ASD) and families from racially, linguistically, and economically minoritized backgrounds. The present study examines provider characteristics that predict FCC practices using national survey data collected from board-certified ABA providers across the United States. Methods The sample included N = 1,089 board-certified ABA providers practicing in community, school, and clinic-based settings. FCC practices were assessed via a self-report survey measuring two subdomains: Showing Interpersonal Sensitivity (SIS) and Communicating Specific Information (CSI). Hierarchical multiple regression analyses tested whether provider credentials, service setting, years of experience, caseload size, and the extensiveness of parent training predicted SIS and CSI scores. Results Parent training extensiveness was the strongest predictor of

both SIS and CSI. Providers with advanced certification (BCBA-D) or a BCaBA credential reported significantly higher SIS, though certification was not associated with CSI. School-based providers reported lower SIS than those in clinic-based settings. Caseload size significantly predicted higher CSI scores. Race and ethnicity were not significant predictors in either model after accounting for practice-level characteristics. Discussion Findings highlight that practice-related factors may drive FCC delivery more than provider demographics. Enhancing FCC training in pre-service and in-service contexts could improve provider-family collaboration and promote culturally responsive, equitable care for neurodivergent populations in ABA

PTSD OF SYRIAN REFUGEES IN TÜRKIYE
Presenter(s): Jae Cash
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Camelia Suleiman (College of Arts & Letters)

Syria is the world's highest population displacement with 11 million in Syria forced from their homes due to conflict and destruction from the Arab Spring. Türkiye is one of the largest host countries for Syrian refugees hosting around 4.5 million refugees. Many of these refugees experienced substantial amounts of trauma from immigration and the wars they escaped from. This presentation is about the struggle of Post Traumatic Stress Disorder of Syrian Refugees in Türkiye created from the Arab spring in 2011. The presentation explores what Post Traumatic Stress Disorder is and how Syrian refugees would end up with PTSD and what the government of Türkiye is doing to help. This is important so we can educate ourselves on the impact of violent wars on the civilian people in areas currently going through war. The information was collected from various online scholarly articles about PTSD, mental health, personal accounts, various Turkish news outlets, migration records, and international political program websites. Some of the information is also provided from the class UGS 200H providing background on Syria and the refugee crisis.

THE IMPACT OF RACE ON COLLEGE HOOKUP CULTURE
Presenter(s): Saanvi Seth
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Sarah Prior (College of Social Science)

I will be exploring how an individual's racial background and cultural values affect whether or not they participate in college hookup culture. I will look into various forms of literature and utilize preliminary data analysis to conduct my research for this presentation. By analyzing how race plays a role in students' decisions, I aim to discover if traditional cultural values and norms force them to adapt to "hookup" norms or not.

INTIMACY DIRECTION: THE ART OF CONSENT
Presenter(s): Rileigh Wine
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Alexis Black (College of Arts & Letters)

At the center of art is human connection, and at the heart of human connection is intimacy. The intimacy of a glance. The tenderness of a touch. The art of intimacy direction is an essential part of moments of staged intimacy for theatre and film. Intimacy directors are movement specialists who focus on how intimacy functions to serve the story of a particular production. Intimacy directors are also advocates for actors safety and establish consent forward practices and protocols in a theatre space. They work alongside directors and actors to build moments of staged intimacy that are safe, sustainable, repeatable, and work within each actor's boundaries. Through my work with MSU faculty and professional Intimacy director, Alexis Black, I have developed the necessary skills, knowledge, and language to begin to build my career as an Intimacy director.

ASSOCIATIONS BETWEEN HOUSEHOLD FOOD-INSECURITY AND PRESCHOOLER SOCIAL, EMOTIONAL, AND BEHAVIORAL FUNCTIONING
Presenter(s): Avery Lee
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Jiying Ling (College of Nursing)

Household food insecurity affects many families with young children and has been linked to adverse developmental outcomes; however, its relationships with social, emotional, and behavioral functioning during preschool years are less well understood. Therefore, this study examined associations between household food insecurity and preschoolers' emotional well-being, social skills, and behavioral functioning in a low-income sample. Baseline data was collected in October-November 2024 from 151 caregiver-preschooler dyads recruited from 16 Head Start centers participating in an ongoing cluster randomized controlled trial. Preschoolers had a mean age of 47 months, 49% were male, 12% Hispanic, and 72% White. Caregivers had a mean age of 32 years; 51% were single, separated, divorced or widowed, 42% were unemployed, and 40% of families reported annual incomes below $20,000. Caregivers completed Qualtrics surveys assessing demographics, household food insecurity, and preschoolers' emotional, social, and behavioral functioning. Household food insecurity was measured using the U.S. Household Food Security Survey Module and child outcomes with the NIH Toolbox Emotion Battery and the Preschool and Kindergarten Behavior Scales-Second Edition. Data analysis included descriptive statistics, Pearson correlations, and linear mixed effects models, adjusting for childcare center clustering, and family demographic characteristics. Greater household food insecurity was significantly associated with increased preschooler sadness ($r=0.29$, $p<.001$), fear ($r=0.21$, $p=.001$), anger ($r=0.33$, $p<.001$), and internalizing and externalizing problems ($rs=.30$-$.34$, $ps<.001$). Food insecurity remained significantly associated with preschoolers' internalizing problems after accounting for caregiver coping strategies ($B=1.19$, $p=.048$). These findings suggest that household food insecurity is linked to increased emotional and behavioral difficulties among preschoolers in low-income families. This

highlights the importance of early identification, interventions, and family support to help promote more positive developmental outcomes.

NATIVE AND EDUCATED: UNDERSTANDING THE COMPLEXITIES OF INDIGENOUS COLLEGE STUDENTS & THEIR IDENTITIES
Presenter(s): Jacob Doss
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Ning Hsieh (College of Social Science)

Community can dictate everything - our roles in society, self-image and identification, life trajectories, and more. Particularly for many Indigenous people, communities weigh heavily on them to make life decisions. Finding, creating, or growing a community can be challenging for young Native adults pursuing areas like higher education, institutions that have historically been founded in the eradication of Indigenous culture and people, along with other marginalized groups. This leads to difficulty in defining themselves, their identity, and their place in the community, as many Natives grew up with indigenous teachings (Clan systems, Medicine Wheel, Multiple Names, etc.) that have influenced their views and ways of living. In this study, I ask: What social, cultural, and institutional factors shape how Indigenous students express their gender, sexual, and racial identities while maintaining their well-being during their transition from their home communities into higher education? I used semi-structured interviews with Indigenous college students to show how they come to understand their identities while maintaining their well-being in the process of moving away from their communities during college.

WOMEN'S EXPERIENCE WITH MENOPAUSE INFORMATION
Presenter(s): Katie Coles
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Brooke Wolfe (College of Communication Arts Sciences)

This study will be a set of interviews looking at how women experienced gaining information surrounding menopause, what their experience with menopause looked like, and what information they wish they had. We will then take this information and use their descriptions to create infographics to spread awareness surrounding the lack of menopause information that could be hung in doctors offices and informational spaces.

DECENTRALIZED SOLAR SYSTEMS: ADVANCING ENERGY EQUITY IN HAITI
Presenter(s): Natalie Crowley
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): David Baylis (College of Social Science)

In many countries in the Global South, a myriad of socioeconomic factors have hindered the development of reliable decentralized solar systems. Haiti exemplifies this challenge with its ongoing

political crisis, repeated natural disasters, and decades of poverty that have left the population with a fragile electrical grid that is unreliable. A decentralized solar program could transform access to energy by offering a stable, low-cost alternative. This project uses Haiti as a case study to empirically examine how decentralized solar systems could promote equitable energy access in a context shaped by political instability, historical injustice, and chronic energy insecurity, including insights gathered through interviews with local community members. Several theories help understand Haiti's energy insecurity. Postcolonial theory examines how Haiti's colonial history and foreign intervention shape its current energy inequities. Energy justice theory focuses on equitable access and fair distribution of energy resources. Community empowerment theory argues that projects are more successful when communities have decision-making power. Semi-structured interviews with residents and field experts provided support for these theories. To explore these questions, this study uses a mixed qualitative and comparative research approach. Bangladesh was selected as a comparative case because of its success in implementing decentralized solar systems. The research examined policy and development reports, as well as historical and political perspectives on Haiti's instability and governing structures. Based on the existing literature, case studies, and interview data, this research anticipates finding that Haitian communities are likely to prefer solar projects that are built and managed locally.

FROM STUDY TO STORY: TRANSLATING GREAT LAKES ENVIRONMENTAL STUDIES FOR REAL AUDIENCES.

Presenter(s): Isabella Figueroa Nogueira, Victoria Witke
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Eric Freedman (College of Communication Arts Sciences), Julia Belden (College of Communication Arts Sciences)

Most scholarly environmental research in the natural sciences, social sciences, and humanities appears in niche journals or discipline-related conferences that draw little or no attention from journalists and, thus, little or no attention from the public. This case study describes how students affiliated with a university-related regional environmental news service find, analyze, contextualize, and report on such new academic studies for general audiences. The news service, a project of the university's environmental journalism center, has a geographic focus on the Great Lakes region with an audience primarily in the eight U.S. states and two Canadian provinces in the Great Lakes Basin. It was launched as a publication venue for reporting by students in environmental journalism courses and writing for the center's news service. This model can be adapted by other journalism programs to encourage student reporting that draws on research on environmental topics. Keywords: environmental reporting; student journalism; scholarly studies; news dissemination; Great Lakes

BUILDING OPPORTUNITIES FOR STUDENT SUCCESS (BOSS)
Presenter(s): Riley Clark
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Aliza Lambert (College of Education)

BOSS is a program for college students with disabilities to gain industry-specific employment while in college. Throughout my time interning with STRIDE, I have completed various tasks to improve the BOSS program. I outlined initial suggestions for ways that the program could be more accessible, then I edited the original slide presentations to implement those changes. Once the BOSS weekly meetings resumed, I co-facilitated discussions and provided feedback on the newly proposed slides. I then worked with my colleague to rework the order and content of the BOSS topics. I did additional research on the set of BOSS topics to provide more context for the intersection of disability and employment. My work in BOSS has culminated in the creation of a manuscript. This presentation will outline how to take services and translate them into a practice brief.

CAPTAGON TRADE IN SYRIA
Presenter(s): Carson Shuart, Evan Norton
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Camelia Suleiman (College of Arts & Letters)

The Captagon Trade was an illegal drug trade that dominated the Syrian economy from 2018-2022 with approximately 80% of all Captagon being manufactured there. This trade was a vital source of funding for the Syrian military. Despite the many opportunities of employment that came with this operation, many citizens were exploited. The citizens that were given lower-level jobs such as smuggling were nearly forced into it due to their financial instability. The significant social costs along with political instability contributed to the quickening decline of the trade. The collapse of the Captagon trade began soon after the fall of the Bashar al-Assad Regime, but still exists partially.

WHERE HAVE ALL THE GAYS GONE?: CONTEXTUALIZING LANSING'S LGBTQIA2S+ COMMUNITY
Presenter(s): Carly Kalkauski
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Louise Jezierski (James Madision College)

This presentation examines the community capacity of LGBTQIA2S+ inhabitants in Lansing, Michigan. Community capacity is the capital - or network/connections on an individual, organizational, or social level - existing within a group that can be utilized to solve collective problems and aid the well-being of a community. To determine the LGBTQ+ community of Lansing's ability to use their capital for the greater good of the collective, a mixed-methods approach was implemented that includes ethnographic field notes, an oral interview, webpage content analysis, literature review, and examination of municipal policy. Additionally, it includes the utilization of analysis tools such a a concept map, causal model, and digital spatial map. The research demonstrates that Lansing's LGBTQ+ community sustains itself through

not just formal institutions or legal protections, but through networks of mutual aid, both in-person and online. While LGBTQ+ institutions in the city are not often obvious or plentiful, they are tight-knit and provide a diverse offering of support whenever they can. These networks face various challenges, but largely through the commitment of its members, the LGBTQ+ community in Lansing, MI has capacity that is often successfully leveraged to maintain the well-being of its community members.

THE ROLE OF KNUCKLE BIOMETRICS IN SUSPECT IDENTIFICATION IN IMAGERY
Presenter(s): Anael Garcia-Castro, Haley Sornig, Yousef Alrefay
Category: Social Science, Arts, Humanities (multiple disciplines)
Mentor(s): Daniella Ferrante (College of Social Science), Kathryn Seigfried-Spellar (College of Social Science), Thomas Swearingen (College of Social Science)

Biometric recognition primarily focuses on the face, fingerprint, and iris modalities in order to recognize individuals. However in some forensic contexts, the seized multimedia does not contain visible face, fingerprint, or iris traits. In such cases, alternative methods of offender recognition are crucial for increasing case evidence leading to the prosecution of offenders. In this regard, prior research shows that other modalities, specifically knuckle and nailbed, are viable biometric traits for person comparison. However, previous research was limited to constrained capture conditions and did not mimic real-world conditions. In this project, we pursued additional data collection which more closely resembles the real-world multimedia observed by digital forensic examiners. This research will allow us to develop a best practice protocol for taking photographs of hands for biometric analysis and provide guidance on the ideal lighting, distance, and angle for increasing the accuracy of biometric comparison. Such protocols will be directly applicable to law enforcement professionals. Ultimately, the developed innovations in evidentiary techniques will change the approach law enforcement takes to case prioritization and the ultimate success rate of cases.

Social Science: General

WHAT'S DRIVING US AIR FREIGHT EMISSIONS: PRIME 2-DAY OR TEMU?
Presenter(s): Sanjita Pulgam
Category: Social Science: General
Mentor(s): Michael Adetayo Olabisi (College of Agriculture & Natural Resources)

This paper examines how international air cargo that enters the United States generates additional domestic air freight activity, which extends the environmental footprint of global trade well past international routes. Imported goods, specifically electronics, pharmaceuticals, medicine equipment, and e-commerce parcels often require fast redistribution through domestic hub and spoke networks that are operated by major companies like FedEx, UPS, and Amazon. This results in heavy, concentrated flight activity and emissions within the United States. In the same way, air freight plays a role in how companies meet the consistent rising demand for speed, from e-commerce growth to pandemic-era

supply chain disruptions. Exploring whether the rise of programs like Prime 2-Day delivery drove an increase in the use of aviation emissions, given how such rapid consumer delivery is now the norm. By putting emphasis on the carbon intensity of air transport and the connection between international air deliveries and domestic air freight, this study shows that the environmental costs of international trade are increasingly embedded in domestic aviation systems. The findings indicate that the policies that address aviation emissions must also count for the interconnected nature of international and domestic air freight networks, rather than treating them as separate.

ACCESSIBILITY GAPS ON CAMPUS: MAPPING RESOURCE DESERTS AT MICHIGAN STATE UNIVERSITY
Presenter(s): Kiera Haver, Shreya John
Category: Social Science: General
Mentor(s): Erin Bunting (College of Social Science)

Access to resources has long been linked to college retention and graduation rates. For students to graduate it is not only about academic performance but the landscape around them in terms of resources such as: greenspace, health facilities, transportation, and food. This project looks to develop a geospatial and statistical analysis of resource deserts across the Michigan State University campus. The main objective of this project is to recognize patterns of access throughout MSU, using advanced geospatial modeling and statistics which will be presented as a series of maps in its final form. The purpose of these models is to identify areas on campus where the university could benefit from increased amounts of these services. The findings show distances students have to travel to access resources, where there is a spatial deficit in resources, and how population dynamics drive resource density. The implementation of the results of this project will support students and will be used as a tool by administration via application development. The maps will be uploaded into an enterprise GIS platform that will serve as the basis for said application, which will be released publicly.

MAKING ENDS MEET: WOMEN, WORK AND HOUSEHOLD BALANCE IN THE EVOLVING CARE ECONOMY
Presenter(s): Faith Greenwood, Nahlia Moncrief, Saumya Johri
Category: Social Science: General
Mentor(s): Louise Jezierski (James Madision College), Sejuti Das Gupta (James Madision College)

In 2020 during the Covid-19 pandemic and schools and daycare closed, 2 million women had to leave the workforce in large numbers due to the care burden in USA. After 2021, many of those women returned to the workforce, either to in person work or remote work which could only be made possible due to available care facilities which came back in a big way. This course aims to train the students to develop the skills to study the changing care economy in Michigan that undermined household social safety nets and labor markets. Since Covid, the reconstruction of childcare, eldercare, and women's labor force participation has been uneven. We are interested to learn how federal, state, and local policy initiatives have affected household safety nets which are moving in different directions; changing policies such as removing care and social safety net programs will likely affect labor market participation. We aim to train 2-3 students in the tools

FAMILY CENTERED PRACTICES IN CAREGIVER-IMPLEMENTED RECIPROCAL IMITATION TEACHING (CI-RIT): DIFFERENCES IN MARGINALIZED AND NON-MARGINALIZED CAREGIVER PERCEPTIONS
Presenter(s): Kavya Jonnalagadda, Nealy Patel, Sarrah Shakir
Category: Social Science: General
Mentor(s): Brooke Ingersoll (College of Social Science), Nicole Warren (College of Social Science)

Background: Family-centered care (FCC) is a collaborative approach that supports families' involvement in Early Intervention (EI). It strengthens family-professional partnerships and improves caregiver satisfaction and family well-being, particularly when care incorporates cultural respect and shared decision-making (Mestre et al., 2024). Although racial and ethnic disparities exist in EI access and engagement, few studies have examined differences in caregiver perceptions of FCC. Objectives: To identify whether racial and ethnic disparities exist in caregivers' perceptions of FCC for children with early signs of autism receiving EI services. Methods: Data was collected from a randomized controlled trial of caregiver-mediated intervention for toddlers with early signs of autism across four states. At four months post-enrollment, 163 participants completed the Family Centered Practice Scale (FCPS). Participants reported race across multiple categories. Caregivers were grouped as non-minoritized (White; n=90) and minoritized (all other identities; n=42). An independent samples t-test in SPSS compared mean FCPS scores between groups. Results: No significant difference was found between minoritized/non-minoritized caregiver's FCPS (M=0.02669, SD=0.06869), t(161) = (equal variances assumed) =0.389, p=.698). Discussion: Despite documented disparities in EI access and engagement, minoritized caregivers did not report lower perceptions of family-centered care. Limitations include possible sampling bias and limited representation. Future studies should investigate the protective factors, such as socioeconomic status and caregiver education, that may influence these outcomes.
Mestre, T. D., Lopes, M. J., Mestre, D. M., Ferreira, R. F., Costa, A. P., & Caldeira, E. V. (2024). Impact of family-centered care in families with children with intellectual disability: A systematic review. Heliyon, 10(7).

INDIGENOUS RECLAMATION AND PROSPERITY OF COMMUNITY AND ORGANIZATIONAL CAPACITY IN NKWEJONG
Presenter(s): Sonya Koenig, Sophia Jarvis
Category: Social Science: General
Mentor(s): Louise Jezierski (James Madision College)

Few studies have been dedicated to understanding Indigenous presence and history in Lansing, Michigan. To develop a deeper understanding of this history, this paper examines how the Indian Relocation Act (IRA) of 1956 and the auto industry influenced Indigenous migration v to Lansing, and how Indigenous communities and organizations build capacity and challenge ongoing settler-colonialism in the city. Research was conducted using primarily qualitative mixed methods, with some small sample quantitative data, and employs a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis to highlight barriers to, and opportunities for, expanding Indigenous community and organizational capacity

in Lansing. Findings indicate that while the IRA stimulated Indigenous movement and reinforced assimilationist ideologies that attempted to erase Indigenous identities, migration to Lansing was driven largely by economic and educational opportunities, with later return migration linked to tribal casino employment. Despite the absence of a Lansing Native Center and other structural limitations, local Indigenous programs and initiatives are actively sustaining Native presence and strengthening community and organizational capacity in the city. Overall, this paper argues that Indigenous organizations and communities in Lansing, Michigan have continually adapted to counter enduring settler-colonialism and sustain native presence, culture, and identity.

THE TURFGRASS INFORMATION FILE AND THE TURFGRASS THESAURUS
Presenter(s): Noah Kelly
Category: Social Science: General
Mentor(s): Kierra Jones (Libraries)

The Turfgrass Information File (TGIF) is an online bibliographic database that was established in 1984 at MSU Libraries with funding from the United States Golf Association to serve as an index of literature relevant to the turfgrass industry. The Turfgrass Information Center (TIC) was concomitantly founded within MSU Libraries to support the ongoing development, organization, and maintenance of the TGIF database. Today, TIC holds the largest public collection of turfgrass publications globally and functions to preserve and make available the breadth of turfgrass literature. To improve the searchability of TGIF, items within the database are subject-indexed. This process involves assigning representative, descriptive terminology to a document's record. These terms, known as descriptors or keywords, are referenced in user-conducted searches of the database so that indexed items are effectively retrieved during the search process. To account for natural variations and redundancies in language and to control the consistency and uniformity of subject indexing, TIC staff have constructed an in-house thesaurus which dictates which descriptors should be used during subject indexing and accounts for thousands of concepts relevant to the turfgrass industry. Maintaining a precise, comprehensive, and inclusive thesaurus is essential in the usage of the TGIF database by its patrons and thereby promotes the TIC's mission of making turfgrass literature more accessible.

HONEY I'M HOME! HOW CONCEPTS OF PLACE ATTACHMENT AND THEMATIC CODING INFLUENCE MANAGEMENT STRATEGIES AT BEAL BOTANICAL GARDEN
Presenter(s): Zoey Crossley
Category: Social Science: General
Mentor(s): Caitlin Henry (College of Agriculture & Natural Resources), Elizabeth Perry (College of Agriculture & Natural Resources), Shelby Marocco (College of Natural Science)

Beal Botanical Garden was established more than 150 years ago and still serves the community today. This campus space is a beloved campus "place," where students, employees, alumni, and visitors congregate for learning, serenity, and community. Our study assesses who makes up that community, what they want out of their experience, and their attributes and extents of place attachment. A survey of

19 questions was administered to visitors, asking about their experience in the garden that day, their visit frequency, their activities and perceptions, how they related to other campus green spaces, and an open-ended area for further reflections. In total, 850 surveys were administered and completed by participants, with 338 respondents contributing their open-ended reflections. Data were collected in summer and fall of 2025 and analysis is ongoing. In this poster presentation of qualitative findings across the surveys, we examine what visitors hope to get out of their experience and how this space has become a "place" to visitors. We thematically coded the open-ended question toward this concept of place definition and attachment, with major buckets of clarifying answers, appreciations, personal stories, and more. Detailed analysis is ongoing, but we expect synthesized results to allow us to better inform the Beal management on who they serve and improvements they can make. We also expect that it will have unique contributions in how a campus garden contributes to the place-making aspects of a university community and where there can be enhanced integrations here and in gardens at large.

EXPLORING EMPLOYMENT RATES OF DEAF AND HARD OF HEARING ADULTS IN THE US
Presenter(s): Natalie Westrate
Category: Social Science: General
Mentor(s): Jonathan Wlasiuk (Lyman Briggs College)

The goal of this project was to explore the differences in employment rates of deaf and hard of hearing compared to hearing adults in the United States, as well as look at reasonings behind those differences. Data from the US Census was used to compare these employment rates, as well as look at how they were affected by other factors such as race, ethnicity, gender, field of work, being a parent, having a disability, and more. It was found that, while these other factors can influence a person's likelihood of being employed, hearing people were more likely to be employed than deaf or hard of hearing people across all categories, with some variation by field. Existing literature was reviewed in an effort to bring more meaning to these findings, and potential accessibility improvements were proposed.

EMOTIONAL PUPIL RESPONSE TO VISUAL AND AUDITORY TASKS
Presenter(s): Paz Bonaventura, Zoe Ferguson
Category: Social Science: General
Mentor(s): Jan Brascamp (College of Social Science)

Using an eye tracking study, we would like to investigate the correlation between arousal and valence of stimuli with pupil size. While fixating on a small fixation point in the center of a computer screen, participants are either shown a picture in the visual stimulus blocks or listen to a word in the auditory stimulus blocks. The eye tracker captures their pupil size relative to baseline, which allows us to see dilations or constrictions in response to these different stimuli. The stimuli can range from high to low valence, meaning pleasant to unpleasant. The stimuli are also categorized as high to low arousal, meaning exciting to calming. We aim to investigate the differences in pupil dilations and constrictions relative to baseline based on this range of visual and auditory stimuli.

HIGH DEMAND ON THE HIGH DUNES: ORV USE DATA COLLECTION STRATEGIES AT A BELOVED MICHIGAN STATE PARK
Presenter(s): Avery Ramseyer
Category: Social Science: General
Mentor(s): Elizabeth Perry (College of Agriculture & Natural Resources), Sophia Loureiro (College of Agriculture & Natural Resources)

Silver Lake State Park (SLSP) encompasses 450 acres of dunes on the shores of Lake Michigan. SLSP is the only motorized dune recreation area east of the Mississippi River, which makes it a unique draw for locals and national and international tourists. This unique site generates high visitor-demand often exceeding the park's capacity and resources. Despite SLSP's efforts in implementing vehicle permits and parking vouchers, during peak season the park struggles with long wait times to access parking lots. Park managers have consulted user groups but have not incorporated user and community feedback into a capacity assessment. Safety concerns surrounding the ORV recreation area have become paramount to address due to the numerous injuries and fatalities that occur yearly. Because of the uniqueness of this site and the prominence of the user group coalitions present, we must deftly address this study. To accomplish this, we will pull from several conceptual frameworks to develop a robust visitor use management project, including the Interagency Visitor Use Management Framework (managerial alignment), the Integrated Recreation Amenities Framework (site components alignment), and frameworks related to crowding and conflict to mitigate negative visitor experiences. This poster will explore how utilizing a carrying capacity framework alongside managerial and topical area frameworks for a cohesive site examination, clarifying ORV users' limit of acceptable change and managerial action, and novel methods for understanding ORV users' spatial distributions using interactive elements. This poster will include interactive components with UURAF attendees to demonstrate planned approaches to data collection in summer 2026.

TRACKING INCREASES IN ORGANIZED OPPOSITION TO RENEWABLE ENERGY IN THE UNITED STATES
Presenter(s): Daniel Horowitz
Category: Social Science: General
Mentor(s): Douglas Bessette (College of Agriculture & Natural Resources)

Renewable energy development in the United States (U.S.) has accelerated in recent years, with larger solar and wind farms being built more rapidly and in locations closer to communities. As a result, the number of community-members opposing these projects has also increased. While national surveys have showed widespread, though declining, support from residents for hypothetical projects, case studies of specific projects often show considerable and well-organized opposition efforts. Yet to this point, no comprehensive dataset exists describing the total number of groups organized in opposition to, or in support of, renewable projects across the US. This knowledge gap makes generalizing about these individuals' motivations, preferences, and experiences difficult, as well as describing national trends in support for or opposition to renewable development.

As such, this research presents a first-of-its-kind dataset documenting organized renewable energy advocacy groups across the US. Each entry in the dataset includes detailed information on a renewable energy project and its associated advocacy group(s), including (when available): the name of the project, the project developer, acreage, development status, US EIA 860 data, the advocacy group name, an estimate of group membership count, and media accounts of group behavior along with more specific group information. The data was collected by a comprehensive internet keyword search supplemented by leads from existing data on renewable energy projects and coverage in published newsletters. The dataset is freely available online, updated annually, and provides a crucial starting point for examining, as well as improving, renewable energy development and outcomes in the US.

LOSING GROUND: THE CULTURAL AND ECONOMIC COSTS OF COASTAL EROSION
Presenter(s): Emily Mason
Category: Social Science: General
Mentor(s): Eddie Boucher (College of Social Science)

Coastal erosion is commonly framed as a technical and economic problem, yet this framing often obscures its cultural, social, and equity-related consequences. This study examines how coastal erosion management in Manistee, Michigan is shaped by land-use conflicts, bureaucratic constraints, and limited integration of local and cultural knowledge. Using qualitative methods, the research draws on semi-structured interviews with landowners, business owners, advocates, and elected officials, alongside critical media observations and policy documents. A mixed deductive-inductive coding approach was used to analyze stakeholder perceptions and governance processes. Findings reveal that land-use tensions persist due to conflicts between private property protection, public trust obligations, and ecological priorities, particularly during high-water events. Excessive bureaucracy and fragmented permitting processes were widely described as hindering timely and effective adaptation, imposing significant financial and emotional burdens on residents. Although shoreline identity is central to community life, erosion adaptation strategies largely emphasize technical fixes and economic efficiency, with minimal attention to cultural meaning, sense of place, or local and Indigenous knowledge. As a result, some interventions have exacerbated erosion or produced unintended social and environmental harms. Overall, Manistee's approach highlights structural governance challenges that limit proactive and inclusive coastal management. The study concludes that without meaningful community integration and streamlined, collaborative governance, current erosion responses are neither scalable nor equitable. These findings offer broader insights for coastal communities seeking resilient, culturally grounded adaptation strategies in the face of accelerating climate impacts.

A BYGONE ERA: WHEN HONG KONG WAS THE BEAT OF ASIA
Presenter(s): Alex Guo
Category: Social Science: General
Mentor(s): Michael Ristich (College of Arts & Letters)

Once the dominant sound of Hong Kong and a defining cultural force across East and Southeast Asia, Cantopop thrived in a golden age from the 1970s through the 1990s. But its decline over the past two decades has been shaped by a complex blend of political transitions, economic shifts, and linguistic suppression. From the 1997 handover of Hong Kong to the erosion of Cantonese-language education and the deaths of beloved stars like Leslie Cheung and Anita Mui, the genre has struggled to retain its cultural space amid the rise of Mandopop and K-pop and the expanding influence of mainland China.

This poster introduces Cantopology (???)-a proposed new field dedicated to the critical study, preservation, and revitalization of Cantopop as both a cultural archive and a living art form. Tracing Cantopop's rise and its gradual decline, the poster situates its trajectory within broader questions of identity, linguistic politics, and autonomy in the postcolonial Cantonese-speaking era world. In response to this decline, Cantopology is not merely analytical-it is also actionable. The field proposes a multi-pronged strategic campaign to combat cultural erosion: investing in youth-led music production, launching transnational archive projects, promoting cross-genre collaborations, and using digital platforms to amplify but also preserve Cantonese voices globally. By centering diasporic creativity and cross-linguistic artistry, Cantopology offers a blueprint for reimagining Cantopop as a resilient and adaptive cultural force for the next generation.

EXPLORING A TRANSFER SENSE OF BELONGING THROUGH NARRATIVE INQUIRY
Presenter(s): Amber Hazel
Category: Social Science: General
Mentor(s): Frank Dachille (Lyman Briggs College), Vashti Sawtelle (Lyman Briggs College)

Our project documents transfer students' - who begin their post-secondary education at associate's degree granting institutions (ADGIs) - transitional journeys. With this research, we explore an understanding of Transfer Sense of Belonging (TSB) in a way that aligns with the lived experiences of transfer students as they transfer into a bachelor's degree granting institution (BDGI). Developing TSB with transfer students is a step towards equity as statistically, 80% of students who begin at an ADGI aim to earn at least a bachelor's degree, yet only 29% actually achieve that within six years (Horn & Skomsvold, 2011). Additionally, more than a third of transfer students who begin at ADGI's also come from racially historically marginalized backgrounds (CCRC, 2021). We use a qualitative narrative inquiry methodology to elucidate how TSB is developed through the lived experiences of transfer students. Building on pre-existing literature, we analyze interview data from mentors in a peer mentoring program. In this presentation, we share the case of 'Jake' - identifying key elements across his trajectory that align with TSB. We share a narrative that reveals evidence of TSB development that demonstrates 1) Jake has a strong community pretransfer. 2) Building a community at his receiving institution after transferring is important to him and his TSB. 3) A TSB is important to Jake because although he didn't share his transfer

student identity, he sought out communities like a mentoring program and other transfer student spaces, where he showed evidence of being proud of his transfer student identity.

Sociology

THE "FREEDOM" PARADOX: WHY SURVIVORS REMAIN VULNERABLE DESPITE STRONG ANTI-TRAFFICKING LAWS IN BANGLADESH
Presenter(s): Sumaiya Imad
Category: Sociology
Mentor(s): John Waller (College of Social Science)

Despite having one of the most comprehensive anti trafficking legal frameworks in South Asia, Bangladesh continues to experience persistent trafficking and re-trafficking of women. This research examines why legal protections alone have not reduced vulnerability, arguing that the failure lies not in law but in the economic conditions shaping survivors post exit realities. Existing responses focus heavily on rescue, prosecution, and short term rehabilitation, often overlooking the structural forces that reproduce risk. Using a mixed methods design, this study investigates how gendered labor markets, informal employment, debt dependency, and financial exclusion shape vulnerability to trafficking and re-trafficking. Qualitative interviews with women who have exited trafficking contexts explore labor trajectories, wage control, debt burdens/bondage, and access to financial systems before and after reintegration. These narratives are complemented by policy and program analysis of Bangladesh's anti trafficking legal framework and reintegration strategies. Findings suggest that re-trafficking risk is strongly linked to structural economic insecurity rather than individual skill deficits. Women who remain trapped in informal labor markets, carry unresolved debt, and lack access to secure financial systems face significantly higher vulnerability regardless of participation in vocational programs. The study argues that current legal and reintegration frameworks fail because they address symptoms rather than underlying economic drivers. By reframing reintegration failure as a structural economic issue, this research contributes to law and policy, gender, and trafficking research and proposes survivor centered reforms integrating labor protections, debt mitigation, and financial inclusion to prevent re-trafficking more effectively.

TRAUMA, TRUST, AND TREATMENT: PATIENT AND FAMILY PERSPECTIVES ON HOSPITAL CARE AFTER GUN VIOLENCE IN DETROIT
Presenter(s): Cameron Cooper
Category: Sociology
Mentor(s): Nilufer Akalin (Lyman Briggs College)

In Detroit, Michigan, as in many cities across the United States, hospital care is often the first point of contact after gun violence has occurred. Detroit is a key site to study how patients and families experience care after shootings because of its extensive history of firearm violence and community

resiliency. Detroit experiences some of the highest rates of violent crime in the United States, making firearm injuries a significant public health issue and a frequent cause of hospitalization in the city.1 For patients and their families, perceptions of care extend beyond clinical outcomes to the interpersonal interactions they experience during hospitalization. Drawing on semi-structured interviews with (11) gun violence survivors and family members of individuals injured or killed by gun violence, this study examines experiences of hospital care following injury and explores how patients and families describe their treatment and interactions with providers. Participants are identified through Detroit-based gun violence grassroots organizations and interviewed about their hospitalization experiences following firearm-related injuries. The study's findings are expected to demonstrate how patients' and families' perspectives of hospital care after gun violence are influenced by their interpersonal interactions with healthcare professionals. For people and families impacted by firearm injuries, these findings will offer patient-centered insights that could guide more adaptable, trauma-informed care strategies.

GENDER, LEADERSHIP, AND ENVIRONMENTALISM: A STUDY ON GENDERED REPRESENTATION WITHIN ENVIRONMENTALIST MEDIA
Presenter(s): Maggie Frost
Category: Sociology
Mentor(s): Samantha Castonguay (College of Social Science)

As the Anthropocene closes in on the earth, examining long-held paradigms about the environment becomes increasingly necessary. This includes staying curious about where power is centralized in society, and who can bring about environmental change. This is where our research finds its place: in connecting tightly held ideas about social power and leadership - from its gendered aspects to its political character - to environmental action. We draw on gendered organizations theory, which demonstrates that the structures of an organization are built upon gender inequalities. There are several ways that organizations can perpetuate gender inequalities- from ideologies, to images in the workplace, to workplace interactions. Using qualitative content analysis, this study will examine subtle gendering communicated to the public by a prominent environmental organization. We ask the following: How do environmental organizations construct gender through symbols, images, and ideologies in ways that undermine women's leadership? Our project uses three years of archival data (2016; 2019; and 2024) from Sierra Magazine and pairs this with quantitative data from the Internal Revenue Service on numerical gender representation in environmental organizations broadly. We examine themes such as gender essentialism - in which men and women are positioned in a way that aligns with biologically deterministic, "traditional" ideals - as well as gendered divisions of labor in organization projects. While our quantitative data find that women are underrepresented, our qualitative data will uncover organization dynamics that construct nature in gendered ways, and keep women out of both positions of power and conversations on environmental solutions.

SEXUAL EDUCATION OUTSIDE OF THE CLASSROOM
Presenter(s): Ada Tussing, Trevin Bathgate
Category: Sociology
Mentor(s): Sarah Prior (College of Social Science)

Our project will be focusing on topics outside of a classroom setting that help to educate people on topics in sexual culture. Many times we see that people gain much of their knowledge about sexual education through other lenses such as pornography, media, or personal experiences. We will be using survey data to look at and understand how people have received sexual education outside of the classroom, and what this education included. We will also look at the ways that the education received through different platforms can lead to different understandings of sexual encounters, consent, and relationships. We find that the ways people perform sexual activity and the responsibilities associated with these activities vary based on the ways that people were educated on the topics.

HOW FINANCIAL STATUS AFFECTS BELONGING AT MSU
Presenter(s): Carolina Mercado
Category: Sociology
Mentor(s): Jennifer Carrera (College of Social Science)

For Sociology 281: Qualitative Research Methods, taught by Dr. Jennifer Carrera, we spent the semester studying different dimensions of belonging for MSU students. Specifically, we focused on the following aspects: physical capital (dorms, buildings on campus), natural capital (access to outdoors, garden), economic capital (finances), social capital (networks, friends), cultural capital (traditions, representation of cultural backgrounds), and human capital (sense of self-efficacy). With this, the focus of the class was to develop the concept of exploring belonging from an undergraduate perspective and study belonging from a holistic frame. I present my research involvement from this larger project, which consists of an interview that I conducted and a test survey that was created and analyzed by the class. From our interviews, we coded the capital themes and developed potential survey questions. We then piloted the survey questions in our class to test the questions for comfortability and answerability. We analyzed our questions against externally validated questions on belonging by calculating chi-square tests, with significance at p-value < .05. The larger project is ongoing to discern a subset of questions from those generated by the class to measure holistic belonging. This implemented survey that will be administered by the SSC College of Institutional Access.

INEQUALITIES IN THE CRIMINAL JUSTICE SYSTEM
Presenter(s): Anneth Figueroa Aguilar
Category: Sociology
Mentor(s): Michael Ristich (College of Arts & Letters)

My project will be focusing on the inequalities presented in the criminal justice field. Many people awaiting trials are often people of color or people with English as a second language. This causes many unfair trials and doesn't give everyone proper access to resources.

VISUALIZING ASPECTS OF DETROIT'S ECONOMIC LANDSCAPE AS SHAPED BY THE MOTOR CITY MATCH GRANT PROGRAM
Presenter(s): Nathaniel Nowsch
Category: Sociology
Mentor(s): Marya Sosulski (College of Social Science)

One of the hurdles of conducting a research study is conveying the results or outcome of collected data. In the world of community development asset mapping and data visualization are valuable skills to have in one's tool box as they allow various audiences to engage with the findings of a research study at a glance. Being able to succinctly communicate the sometimes massive amount of data is important to ensuring proper dissemination of knowledge gained from research in addition to allowing for different forms of data analysis. For example, in the context of an efficacy study on a small business grant program like the Motor City Match Program (MCM) in the City of Detroit, simply having data in the form of a list does not allow for easy data analysis. Asset mapping, however, allows researchers and community members alike to visually map out where grant money is being distributed in a specific community, easily identifying any potential gaps or inequities in resource distribution, or proving the overall efficacy of the program. Data visualization on the other hand again allows for researchers and community members alike to synthesize data in a different way therefore facilitating a more diverse analysis of data sets.

BEYOND BURNOUT: UNDERSTANDING RETENTION IN MICHIGAN'S DIRECT CARE WORKFORCE
Presenter(s): Anthony Mina, Kamalika Gogineni, Vaishnavi Rayannavar
Category: Sociology
Mentor(s): Jaroslava Pallas-Brink (College of Osteopathic Medicine)

Direct Care Workers (DCWs) provide essential long-term care and personal assistance to older adults and individuals living with disabilities or chronic conditions, yet persistent workforce shortages threaten the stability of this sector. High turnover, low wages, limited benefits, and demanding working conditions continue to shape the experiences of DCWs nationally. Understanding job satisfaction and workplace barriers is critical to improving retention and strengthening care systems. This study examines job satisfaction and structural challenges among Michigan's direct care workforce using a large-scale survey administered by the IMPART Alliance at Michigan State University. The survey collected data on employment conditions, wages and benefits, training, transportation and scheduling constraints,

workplace relationships, stress, and motivations for remaining in or leaving the field. Findings suggest that DCWs derive strong intrinsic satisfaction from meaningful relationships with clients and a sense of purpose in care work. However, structural barriers significantly affect job satisfaction and retention. Workers frequently report low pay, inconsistent or limited benefits, transportation challenges, heavy workloads, insufficient time off, and limited opportunities for career growth. Many also experience job-related stress and competing caregiving responsibilities outside of work. The gendered nature of care labor and its effects on pay, recognition, and mobility can also be observed. Despite these challenges, commitment to clients and the rewarding nature of care relationships remain strong motivators for staying in the profession. These results underscore the need for policy and employer interventions that improve compensation, benefits, training pathways, and workplace supports to enhance job satisfaction and stabilize the direct care workforce.

LEADING WITH JOY: JOY IN MSU LEADERSHIP
Presenter(s): Tori Bush
Category: Sociology
Mentor(s): Sarah Prior (College of Social Science)

Leadership research often focuses on outcomes, but less attention is paid to how leaders actually feel at work. This project, conducted with Dr. Sarah Prior, looks at what brings joy to people in leadership roles at Michigan State University and what gets in the way of experiencing that joy. By coding and analyzing interviews with MSU leaders, this study identifies common themes around joyful moments, meaningful work, and everyday challenges. Early findings suggest that joy often comes from relationships and purpose, while time pressure and administrative demands can limit leaders' ability to experience joy. This research highlights why joy matters in leadership and workplace well-being.

SOCIAL PRESSURES AND THEIR EFFECTS ON SEXUAL ACTIVITY/HOOKUP CULTURE ON CAMPUS
Presenter(s): Amanda Kore, Saumya Naidu
Category: Sociology
Mentor(s): Sarah Prior (College of Social Science)

Exploring sexual culture on campus, specifically looking at social pressures (parties, drinking, dating apps, Greek Life, etc.) and the effects they have on hookup culture and sexual activity. Focus on consent, sexual education, and campus resources and how they intersect. Ongoing process and current data is preliminary from the Campus Sexual Culture Lab.

QUALITATIVE RESEARCH ANALYSIS ON MICHIGAN STATE STUDENTS DATING APP USAGE, PREFERENCES, PURPOSES AND PATTERNS
Presenter(s): Alyssa Berkaw, Mia Stromberg
Category: Sociology
Mentor(s): Sarah Prior (College of Social Science)

Using data collected via survey and qualitative journal entries we will analyze the goals of Michigan State University students have when they log on to dating apps. Are they looking for long term relationships or contributing to MSU hookup culture? Are different apps being used to find different types of relationships?

BLACK CULTURE IN THE TWENTY-FIRST CENTURY: HOW BLACK CULTURE IS BEING DELIGTIMIZED
Presenter(s): Ari Walker
Category: Sociology
Mentor(s): Clifford Broman (College of Social Science)

This study works to examine how Black culture (music, clothes, and speech) is being redefined through the use of social media. The goals of this study include: To see how Black Culture is delegitimized online and to examine if that delegitimization affects anti-racist efforts in America. The population group for this study is MSU students. I will be reviewing the data with an understanding that Black culture has been delegitimized in the 20th and 21st Centuries and that commodification has served to alleviate racism while reinforcing racial hierarchies (Cherid,2021). With this understanding I will look for connections between proximity to black people and efforts for racial equality and consumption and reproduction of Black Culture. Bibliography: Cherid,M."Ain't Got Enough Money to Pay Me Respect": Blackfishing,Cultural Appropriation, and the Commodification of Blackness.SagePub. 2021

CONSENT IN SEX EDUCATION
Presenter(s): Aquinnah Buell, Baylor Swanson, Rachel Poss
Category: Sociology
Mentor(s): Sarah Prior (College of Social Science)

Preliminary research on consent education in sexual health education and its effect on consent and hookup culture. Through analysis of prior qualitative data collected by Dr. Prior as well as newly collected quantitative survey data.

POVERTY AMONG OLDER TRANSGENDER AMERICANS
Presenter(s): Camden Robbins
Category: Sociology
Mentor(s): Jennifer Carrera (College of Social Science)

Despite growing mainstream cultural acceptance, transgender Americans face higher rates of poverty and financial instability than their cisgender counterparts. Earlier research into this phenomenon, investigating the broader sex-gender minority community, cites discrimination in employment as a major contributing factor. Furthermore, these issues have been noted to worsen along intersectional lines, particularly for those belonging to racial or ethnic minority groups. Examining data from the large, nationwide TransPop survey, we investigated the nuances of this issue specific to the transgender community, analyzing factors such as age, access to support systems, and gender identity across the categories of transgender men, transgender women, and nonbinary individuals. We found that trans respondents aged 50 years and older experienced poverty rates at a statistically significant level higher than cis respondents within the same age range. These findings remained true across all aforementioned gender identities. We explored connection to weaker social support systems and isolation from kin but most findings were inconclusive.

BETTER VISUAL COMMUNICATION
Presenter(s): Teneshia Thomas
Category: Sociology
Mentor(s): Michael Ristich (College of Arts & Letters)

Communication is a way to share information and have an understanding amongst peers. My goal is to bridge the gap between nice visuals like ads and missed communication amongst the city of Lansing and MSU campus. So that way there is more of an opportunity for jobs and a better way to send out information that reaches everyone.

Visual & Performing Arts

BOLD AMERICAN TRUTH
Presenter(s): Jewl Markle
Category: Visual and Performing Arts
Mentor(s): Madison Higgs (College of Arts & Letters)

In my second week of undergrad, I broke my leg. Technically, as my physical therapist keeps reminding me, I didn't break any one bone; I just tore quite a few of the muscles surrounding my knee. This was not a fun experience. It has taken the last five months of my life to reach a point where I can walk with only one crutch. When people ask why I haven't been drawing, writing, or engaging in any of my hobbies, that is the reason I give. The one upside to having a broken (torn) knee: It's a convenient excuse. While the incident itself occurred during an MMA sparring match, the much more real and distal reason my leg

finds itself broken (torn) is that I was angry. I was frustrated by my lack of autonomy, my inability to express myself and the constant dread that has become a permanent fixture in my gut. This anger and anxiety has only grown as I became trapped by the confines of using one leg. And when made this piece, I wanted to express my frustrations with self pity. I've spent the past few months allowing myself to create this pain into an identity in and of itself, and have allowed to to shape the reality I find myself in. There is nothing bold, and nothing true, about excuses. In the end, it's all just trash.

FEMALE DIRECTORS IN THE TRANSNATIONAL WORLD OF MUSICALS
Presenter(s): Elizabeth Goosen, Kara Hwang
Category: Visual and Performing Arts
Mentor(s): Laura MacDonald (Residential College in Arts & Humanities)

Today, the musical as a genre of theater and performative art is no longer a proper noun designated to the Broadway or the West End. However, one thing remains consistent for any production across the globe; they require the hands and ideas of a large cast and crew with one role facilitating it all, the director. Despite growing popularity worldwide, the role of director remained largely the domain of male work until recently, when several female directors took over the scene and bedazzled the world with the spectacles they created on stage. This presentation will discuss how musicals and theater are presented around the world through two contemporary yet accomplished directors: Diane Paulus, a Japanese-American director based in New York City, and Ohrupina, a Korean director based in Seoul. Their realm of creation reaches far beyond musicals, and their work has been recognized by the theater community. The two directors not only create memorable and distinctive productions but also devote their time in giving opportunities and mentorship to those who are new to the industry. Among Paulus's productions, Hair (2009), The Gershwins' Porgy and Bess (2012), and Pippin (2013) won the Tony Award. More recently, she directed an opera titled The Monkey King (2025) and is currently working on a novel project of Masquerade (2026). Ohrupina debuted with Rocky Horror Show (2008), which won her Yegrin Musical Awards in 2018. She also won Korean Musical Awards with Hope (2019) in 2020, which she brought to Japan as well.

CRIME AND PUNISHMENT MEDIA AND AUDIO DESIGN
Presenter(s): Nathan Zarkowsky
Category: Visual and Performing Arts
Mentor(s): Kirk Domer (College of Arts & Letters)

Throughout the process of designing Crime and Punishment with A.D. Players at the George Theater in Houston, Texas, I had the opportunity to work alongside theatre professionals while observing and assisting in the production's design process. I collaborated closely with sound and media designer Michael Mullins to implement the media design in coordination with video designer Jesse GrothOlson and the scenic design by Professor Kirk Domer. In this role, I programmed a majority of the show and contributed to creative decision-making throughout the process. The Houston Press later referred to the design team as the "wizards behind the pictorial phantasmagoria."

EMIGRE MAGAZINE
Presenter(s): Kara Chapman
Category: Visual and Performing Arts
Mentor(s): Rebecca Tegtmeyer (College of Arts & Letters)

The story of Emigre Magazine began in 1984 during the development of the home computer; a new technology that was met with much skepticism amongst graphic designers. The eventual adoption of the MacIntosh computer by Emigre Magazine founders Rudy Vanderlans and Zuzana Licko would usher in a legacy of innovative type and print design when they begin their small quarterly publication of Emigre Magazine in 1984. The limited run issues gained a reputation quickly within the graphic design community as a pioneer in experimental, non-traditional design practice and digital typography using the Macintosh computer, while also filling its pages with discourse as though it were an analog discussion forum for contemporary design. The magazine would continue publication until its last issue 'The End' in 2005, but Emigre Fonts lives on to this day. An analysis of Emigre is important as it was a clear example of the foundational relationship between experimental graphic design and computer technology that we take for granted now. Through an exploration of interviews and visual analysis we can learn much about the design thinking and process that went behind the development of Emigre, and how that analog information can be introduced to newer generations of graphic designers.

RE-DEFINING CREATIVITY: EXPANDING ACCESS TO ART THROUGH INTENTIONAL CHANGES TO CURATIVE RHETORIC
Presenter(s): Allison Doneth, Braden Kurth
Category: Visual and Performing Arts
Mentor(s): JULIAN CHAMBLISS (College of Arts & Letters), Natalie Phillips (College of Arts & Letters)

Re-Defining Creativity is a project examining a key aspect of Art as Medicine, an emerging project in MSU's Digital Humanities and Literary Cognition (DHLC) Lab. This presentation examines how the re-imagining of creativity to include everyday acts - such as gardening, knitting, and baking, nature walks, poetry, etc - broadens access to creative practice, concurrently increasing access to creativity's proven therapeutic effects. In highlighting unconventional forms of creativity and creatives through a virtual art exhibition, we seek to re-define which forms of expression are valuable or worthy of showcase. This project aims to inspire mentally, socially, and physically beneficial creative expression in exhibition visitors of all backgrounds. Re-Defining Creativity is an extension of the DHLC and Art as Medicine's ever-present commitment to principles of accessibility and our goal of promoting creation as a restorative practice for participants, regardless of their ability, circumstance, or background.

ALL THE WORLDS A CLASSROOM
Presenter(s): Rileigh Wine
Category: Visual and Performing Arts
Mentor(s): Dionne O'Dell (College of Arts & Letters)

To prepare high school students from across the state to see MSU Department of Theatre's production of Othello, I worked with faculty person and mentor, Dionne O'Dell to update a study guide and tailor it to our production of Othello. This study guide includes interviews with the director of Othello, designs from our production, activities for students, research of Shakespearean text, and history of Shakespeare's life and work. I visited two schools in the greater Lansing area to do a workshop for their theatre students about Shakespeare's text. These workshops engaged students to work with the classical texts of Shakespeare and dig deep into the language of his plays. Bringing the timeless stories of Shakespeare into the classroom provided students with the opportunity to analyze and engage with classical text while developing performance skills.

GRAPHIC DESIGN'S IMPACT IN MOTION PICTURE PRODUCTION AND PROMOTION
Presenter(s): Yasmin Daher Macri
Category: Visual and Performing Arts
Mentor(s): Rebecca Tegtmeyer (College of Arts & Letters)

This research gives a comprehensive explanation of the role graphic design and designers have in the movie production process. For this research, a qualitative approach to the areas of poster-making, prop-making, and fictional branding helps to outline the multiple scopes of graphic design work in the movie production process, how they may vary, and their importance. With a dual focus on the theoretical and pragmatic aspects of these three areas, the research aims to dismantle the profession and examine how design functions as a narrative tool by studying the designer's role and strategies within this specific field. Identifying these processes is a key tool for fully grasping the requirements for these positions, how they present themselves during a job search, and the tendencies between studios and producers. This research provides insight into the necessary skills, trends, and history of graphic design in motion pictures for individuals considering these professional paths, as well as those who weren't aware of them.

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